System Design for Sayyara

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1 Revision History

Table 1: Revision History

Date	Developer(s)	Change
December 28, 2022	Arkin Modi	Revision History & Mark Not Applicable Sections
January 7, 2023	Joy Xiao	Introduction & Purpose
January 11, 2023	Leon So	Undesired Event Handling
January 12, 2023	Leon So	Normal Behaviour & Introduction
January 13, 2023	Timothy Choy	Connection Between Requirements & Design
January 13, 2023	Timothy Choy	Scope
January 16, 2023	Joy Xiao	Component Diagram
January 17, 2023	Arkin Modi	Create Timeline
January 17, 2023	Arkin Modi	Add Work Order Mockups
January 17, 2023	Joy Xiao	Add Shop Appointments, Services, Customer Landing Page Mockups
January 17, 2023	Leon So	Add Login & Sign Up, Shop Owner/Employee Landing Page, Shop Profile, Employee Management Mockups
January 17, 2023	Timothy Choy	Add Customer Appointments, Quotes, Shop Lookup Mockups
January 18, 2023	Leon So	Add team reflection
March 25, 2023	Joy Xiao	Add Component Diagram Description
April 4, 2023	Arkin Modi	Add description for Work Orders Mockups
April 4, 2023	Joy Xiao	Add Descriptions to mock ups
April 4, 2023	Arkin Modi	Clarify sections are not applicable due to this not being a mechatronics project

2 Reference Material

This section records information for easy reference.

2.1 Abbreviations and Acronyms

symbol	description
MG	Module Guide
MIS	Module Interface Specifications
PWA	Progressive Web Application
Sayyara	Explanation of program name
SRS	Software Requirements Specification
REST	Representational State Transfer

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3 Introduction

The following document details the System Design for project Sayyara. Sayyara is a progressive web application (PWA) which will act as a single platform for independent auto repair shops and vehicle owners. This platform will allow independent auto repair shops and vehicle owners to interact in a more efficient and effective manner.

Complementary documents include the Module Interface Specifications and Module Guide. The full documentation and implementation can be found at https://github.com/arkinmodi/project-sayyara/.

4 Purpose

The purpose of this document is to display the component decomposition of the system and provide the user interface designs of the software being built. The implementation of the software will be based off of the designs within this document. The MIS https://github.com/arkinmodi/project-sayyara/blob/main/docs/Design/SoftDetailedDes/MIS.pdf and MG https://github.com/arkinmodi/project-sayyara/blob/main/docs/Design/SoftArchitecture/MG.pdf are also created to give details to the software architecture and detailed component breakdowns for the project.

5 Scope

The system is designed to connect vehicle owners and independent shop owners, providing users with the ability to communicate with one another, and respectively view and manage the interactions and processes involved in a typical auto repair and maintenance service experience. All functionality of the system has been defined in the SRS https://github.com/arkinmodi/project-sayyara/blob/main/docs/SRS/SRS.pdf and everything not included in the SRS is not part of the scope.

The system includes a PWA and the relevant database to store information relevant to the application.

5.1 Context Diagram

Below is a context diagram detailing the boundary between the system and the environment around it.

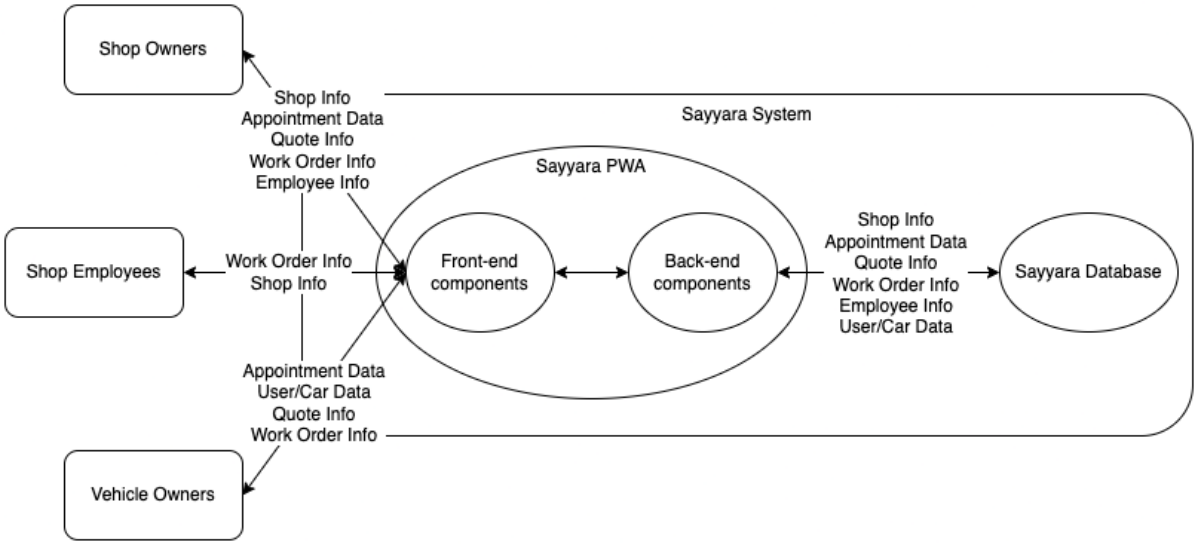

Figure 1: Context Diagram

6 Project Overview

6.1 Normal Behaviour

Sayyara is an event-driven application which handles inputs from the intended users including: vehicle owners, and independent auto repair shop owners and employees. The application will accept various inputs through a variety of input forms and controls. Under normal behaviour where valid inputs are entered and valid events are triggered, the application will: update the appropriate local and global application states, trigger the corresponding side-effects, and/or update the database accordingly.

Vehicle owners can search for auto repair shops and services; request quotes for service; book, view, and manage service appointments and work orders. On the application, auto repair shop owners will be able to manage a list of employees; manage a list of service types and corresponding service appointment availabilities; manage store information such as location, hours of operation, and contact information. Auto repair shop owners and employees will be able to view and manage quotes, service appointments, and work orders.

6.2 Undesired Event Handling

Undesired events will be handled both client-side and server-side.

On the client-side, if an unexpected event arises or the application enters a bad state, the application will reset to a safe state. For example, if a user attempts to access a route that they are not authorized to access, they will be either redirected to an appropriate route, prompted to login, or an error page will be displayed with instructions to return to the home page. Input forms will also include input validation to ensure only properly formed data is handled. If the user attempts to input invalid data, the form field will reset and form submission will be blocked. The user will be prompted to enter a valid input value in the form field. Similarly, various user actions and inputs that may pose

cause that the application to enter an undesirable state will be validated before updating the application state.

On the server-side, each API will return a response with the appropriate error status code and message. Subsequently, the client will have logic to gracefully handle unsuccessful responses and status codes, preventing the system from entering an undesirable state. Inputs will also be validated on the server-side by parsing the input data using defined schemas. This will ensure data integrity and prevents the undesirable data from entering the workflows or database.

6.3 Component Diagram

The Authentication Module is responsible for ensuring users have the appropriate permissions to access resources and modules to perform specific actions. The Authentication Module is responsible for handling authentication for requests between the client and server, and providing mechanisms for authorizing access to requests resources. The Authentication Module will ensure that any actions and interactions between modules are authorized based on the user and their permissions. The Shop Module is responsible for handling requests associated with any shop entity, including handling requests for shop creation, update, and look up. The Quotes Module is responsible for handling requests and interactions for quotes, including the live chat module. The Appointments Module is responsible for handling any appointment creations, appointment status updates, appointment cancellations, and appointment edits. The Work Orders Module is responsible for handling requests regarding the work order of a service, including creating the work order and updating the work order. The Users Module is responsible for handling user account related requests such as retrieving user data and user account creation for the shop owner, employee, and customer. The Employee Management Module is responsible for handling employee requests such as getting all employees in a shop and updating the employee account status to suspend employees. The Services Module is responsible for handling requests to create, update, delete services and parts used for each service. The Database Driver Module is responsible for providing a standard interface for communication between the application and the database management system (DBMS).

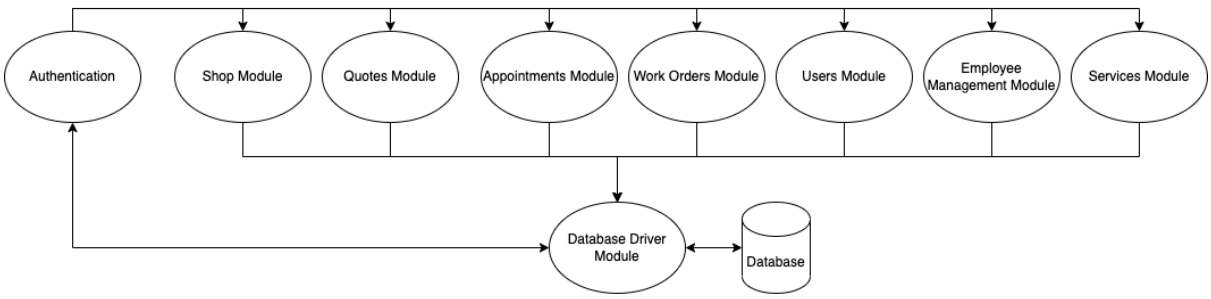

Figure 2: Component Diagram

6.4 Connection Between Requirements and Design

The following table shows the connections between the requirements stated in the SRS https://github.com/arkinmodi/project-sayyara/blob/main/docs/SRS/SRS.pdf and our

design decisions to implement the requirements. The requirements in the table will refer to the requirement number as stated in the SRS.

Table 2: Connection Between Requirements and Design

Requirement	**Design Decision**
BE4	A calendar dropdown is used to allow the user to view appointment dates
BE8, BE20	The quotes, appointments are in a tab view for easy visibility
BE25	Employees are listed in a list view
BE32	Shops are listed in a list view, with tags showing information relevant to the filters (such as services provided and parts used)
LF1	Each screen has a desktop and mobile view so that it can adjust cleanly based on the user's screen size
SR1, SR2	Separate views are created for each type of user, so that they have access to only information that the specific user needs. Each account is created with a unique user type, so that they can only access the correct view
LR1	Images and assets used are either created by the team or provided by the stakeholder

7 System Variables

The application is being built following a RESTful software architecture, and therefore operates in a stateless manner. Any stateful data that needs to be persisted will be stored in a database which is external to the application and not being developed by the core team.

7.1 Monitored Variables

This section is not applicable as this application is a software project (i.e., not a mechatronics project).

7.2 Controlled Variables

This section is not applicable as this application is a software project (i.e., not a mechatronics project).

7.3 Constants Variables

This section is not applicable as this application is a software project (i.e., not a mechatronics project).

8 User Interfaces

8.1 Home Page

The Home Page features all the auto repair shops that match the search criteria. Users can search by shop name or service name. By default, when no search criteria is entered, the Home Page will show all shops in a paginated list view. There are also filters for OEM parts or aftermarket parts, new parts or used parts, and also a location filter. Users can view the shop profile by clicking one of the search entries.

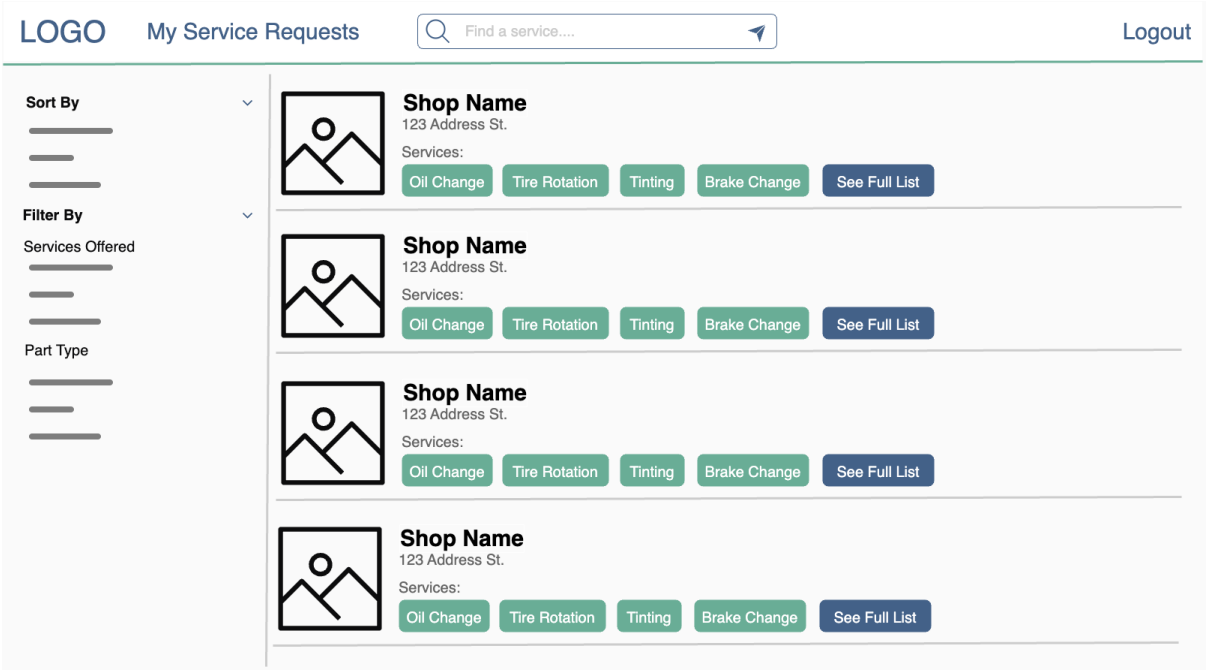

Figure 3: Home Page — Logged In (Desktop)

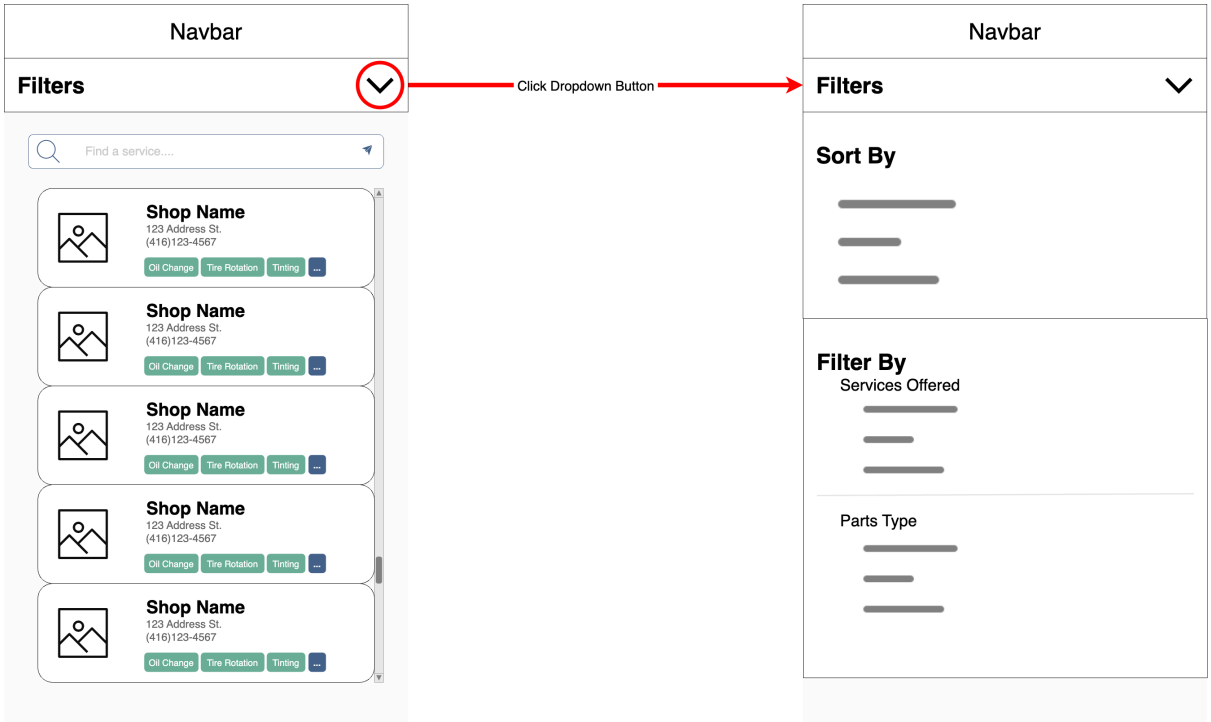

Figure 4: Home Page — Logged In (Mobile)

8.2 Manage Shop Employees

The Manage Shop Employees page is where shop owners and employee can view a tabular view of all shop employees. Shop owners can manage their employees by searching for their employee, suspend employees, and view employee details such as name, phone number, email, etc.

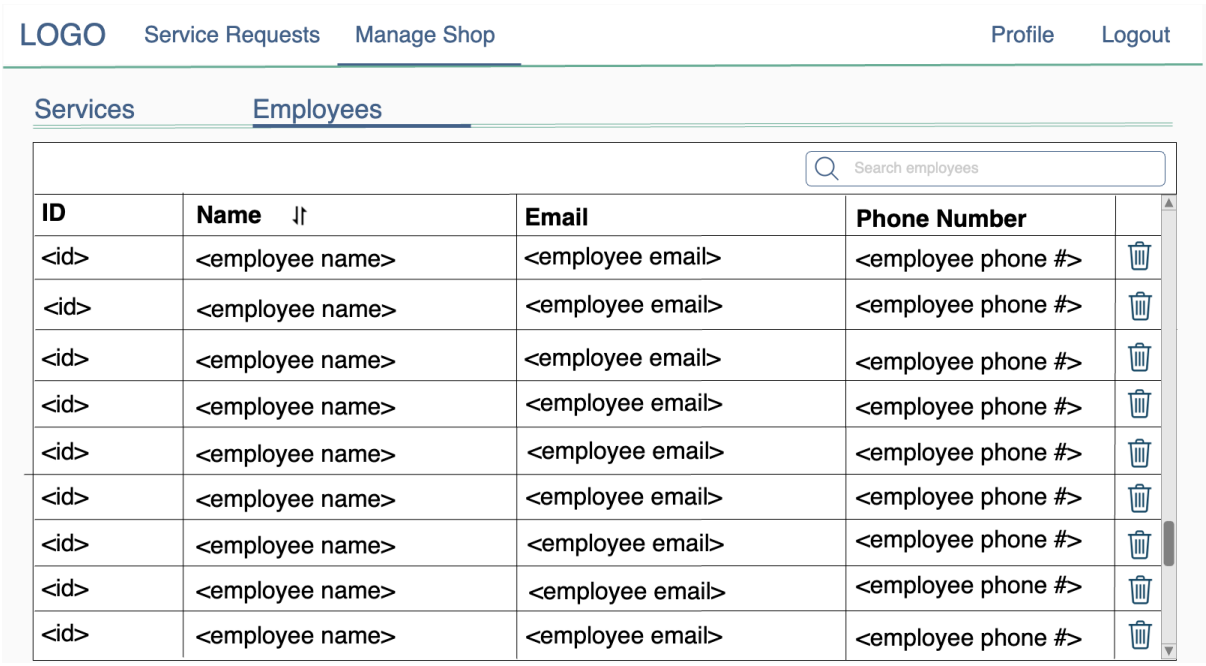

Figure 5: Manage Shop — Employees (Desktop)

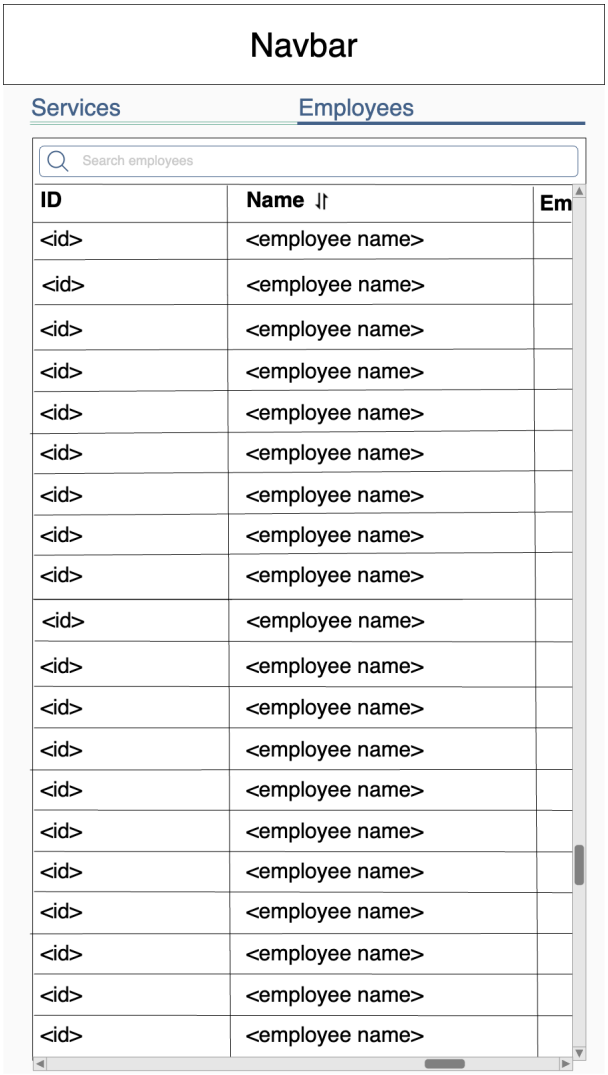

Figure 6: Manage Shop — Employees (Mobile)

8.3 Manage Shop Details

The Manage Shop Details page is where shop owners can manage their shop services. Shop owners can manage their basic services, custom services, and add any information about the parts being used for the service.

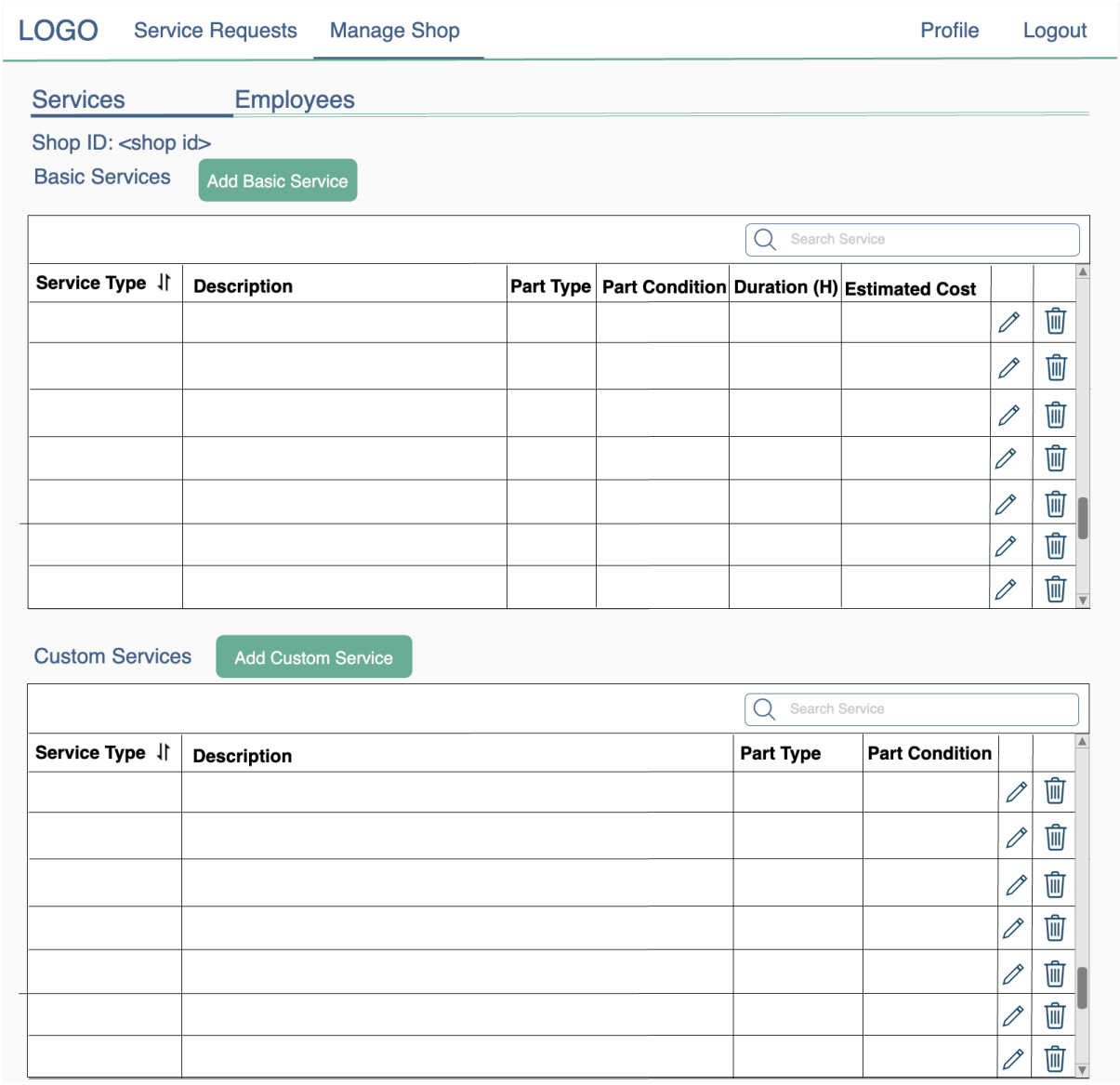

Figure 7: Manage Shop — Details (Desktop)

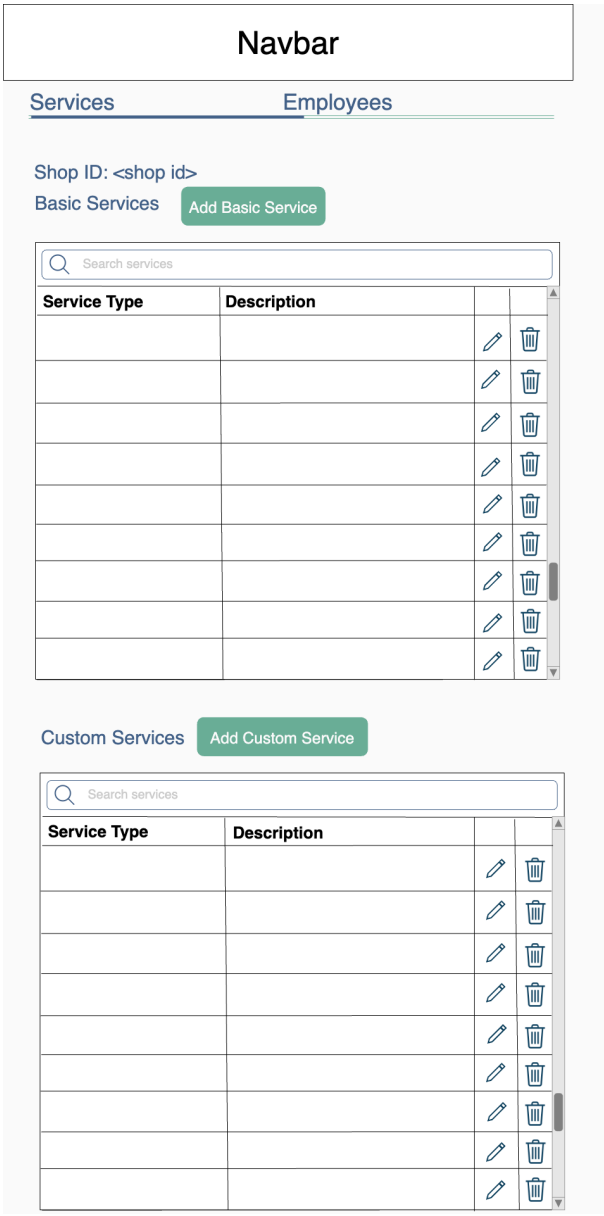

Figure 8: Manage Shop — Details (Mobile)

8.4 Shop Profile

The Shop Profile page contains information about a shop such as location, contact information, hours of operation, and services offered. Vehicle owners, employees, and shop owners can view, however, only the shop employee has edit permission to edit the hours of operation.

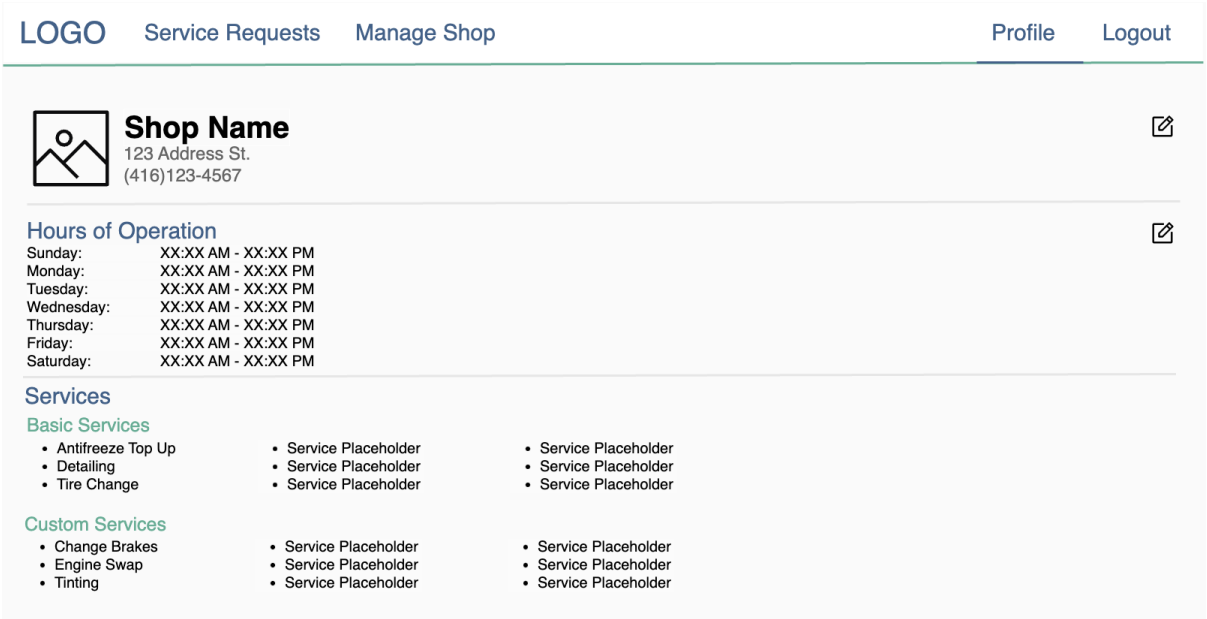

Figure 9: Shop Profile — Shop Owner (Desktop)

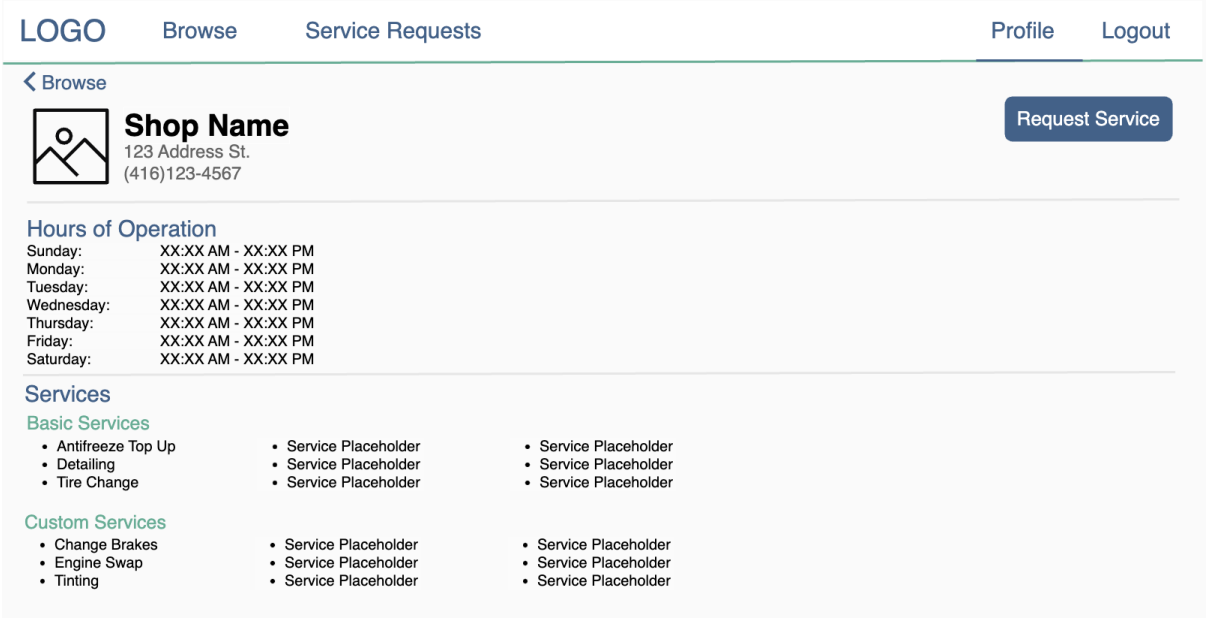

Figure 10: Shop Profile — Vehicle Owner (Desktop)

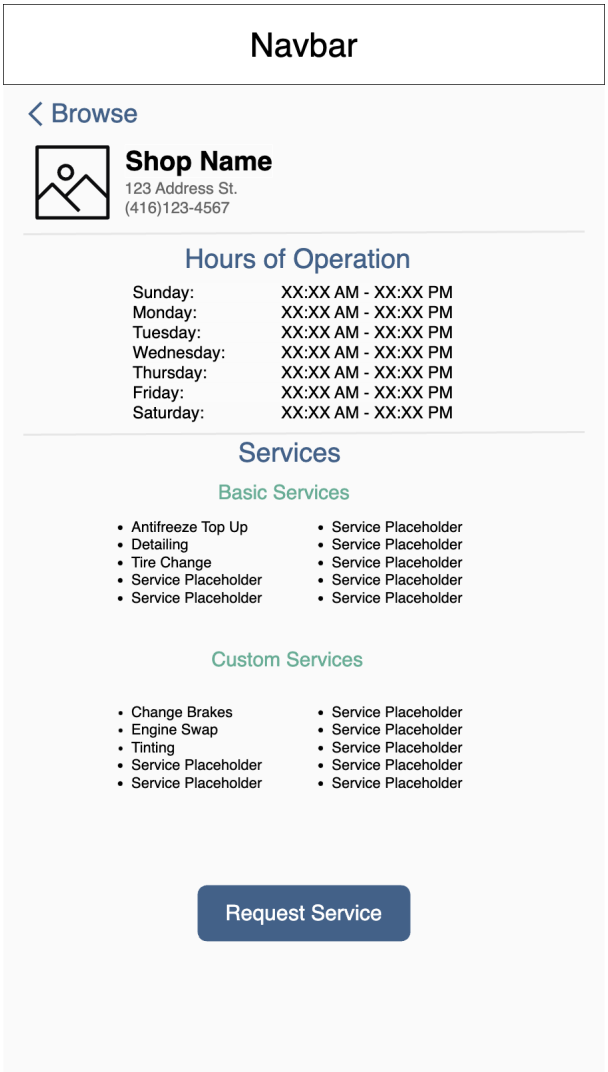

Figure 11: Shop Profile (Mobile)

8.5 Add Service to Shop

These popups show the form that shop owners need to complete to add a service to the shop. After the form is submitted, the service will be shown in the table on the manage shop details page.

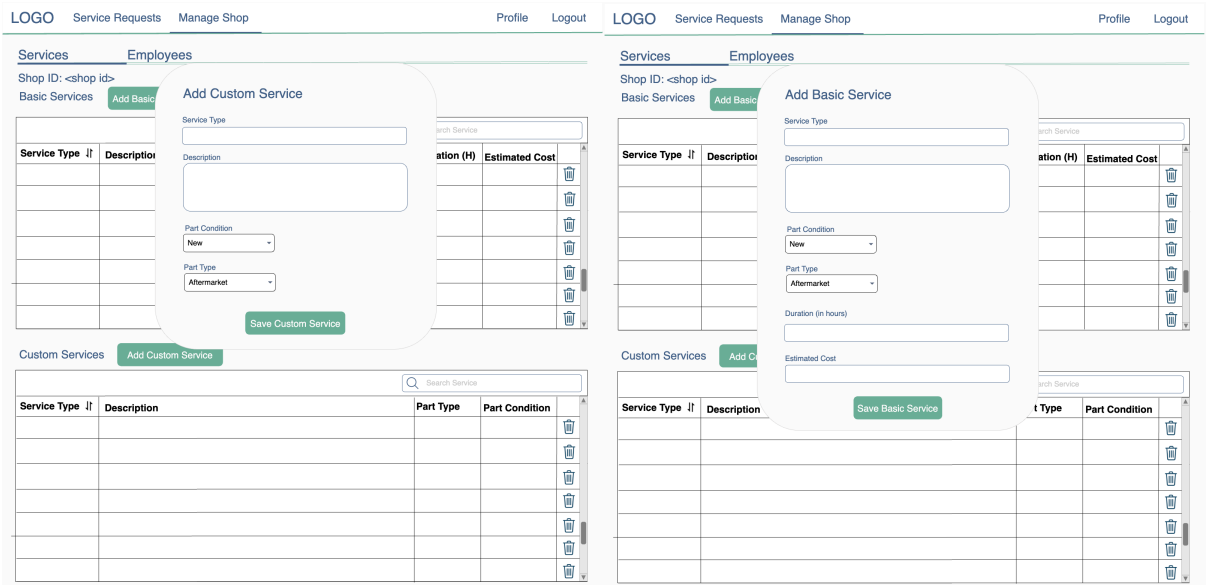

Figure 12: Add Service to Shop (Desktop)

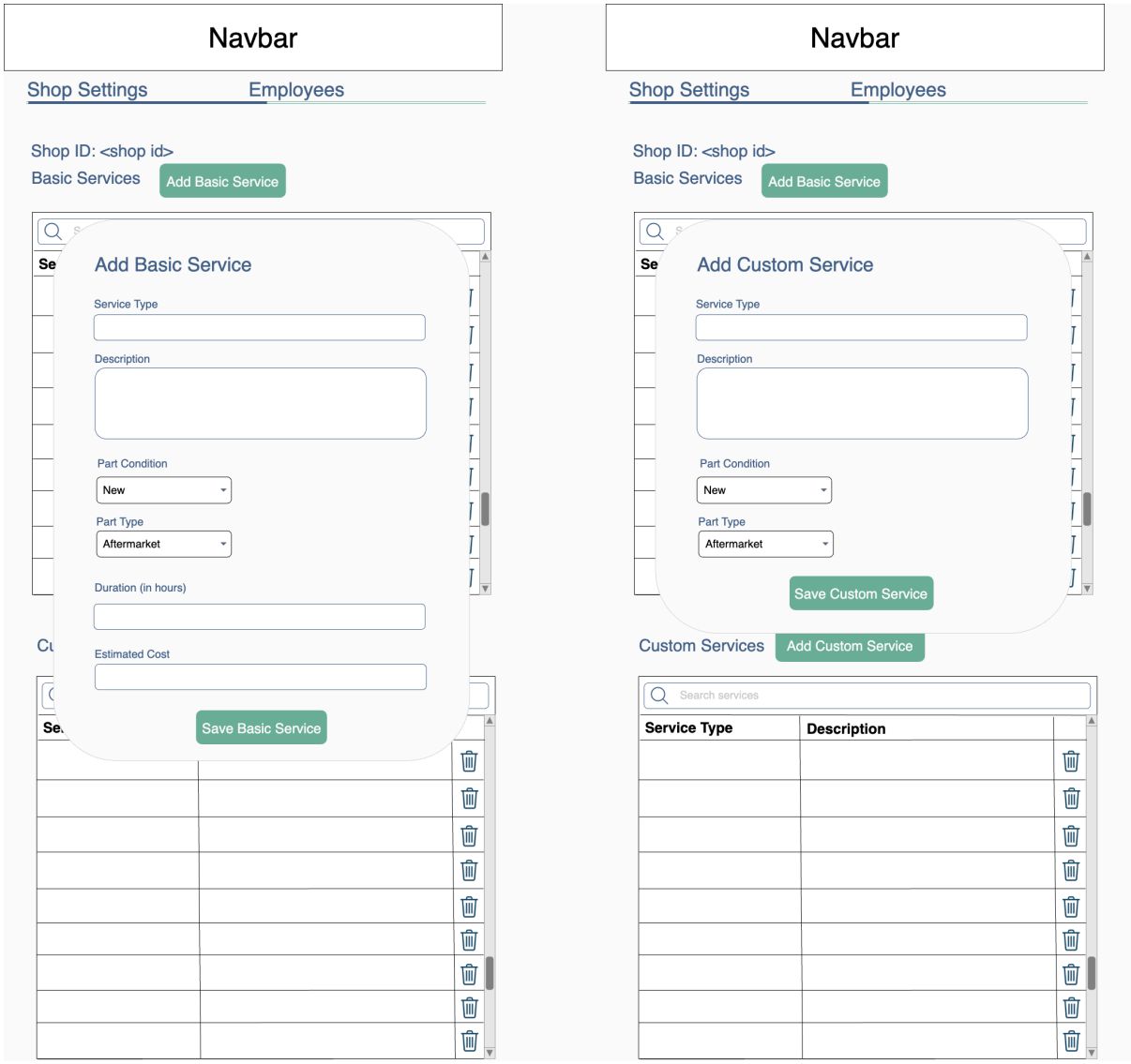

Figure 13: Add Service to Shop (Mobile)

8.6 Shop Owner/Employee Registration

These popups show the sign up form for shop owners and employees. The sign up has multiple steps which the user can access once completing the previous steps. When all fields are entered and validated, the user can successfully sign up. Depending on if the user is signing up as an employee or shop owner, they will be directed to different steps containing relevant fields required for registration of that specific role.

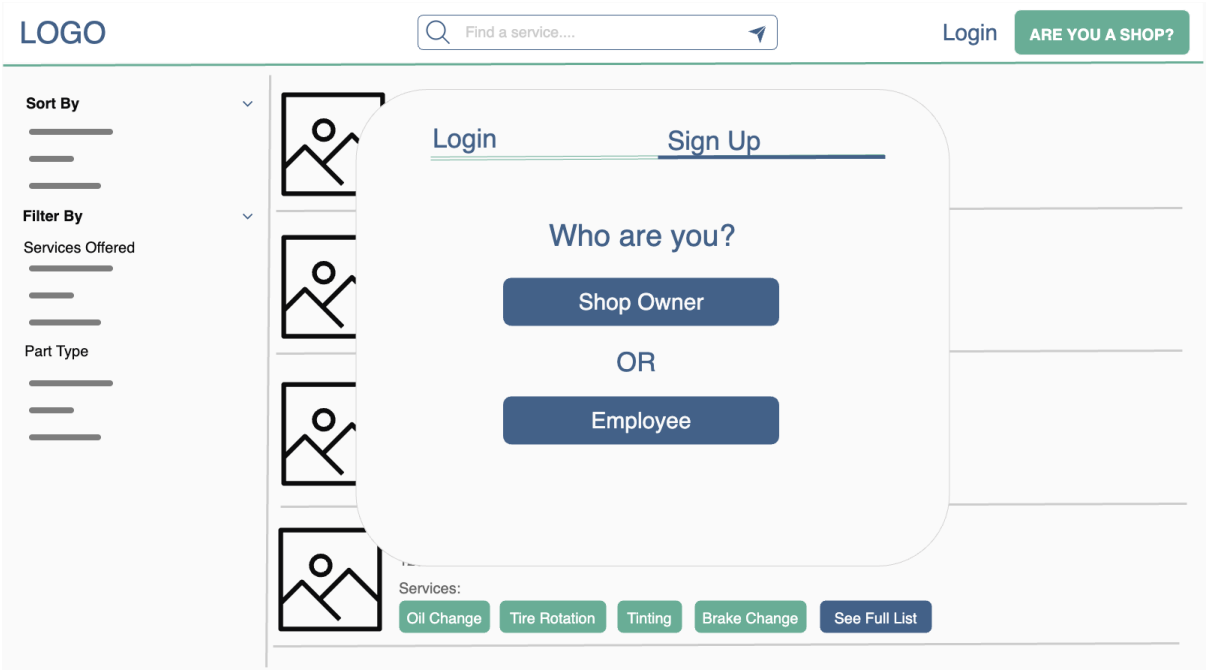

Figure 14: Shop Owner/Employee Registration — Part 1 (Desktop)

Figure 15: Shop Owner/Employee Registration — Part 1 (Mobile)

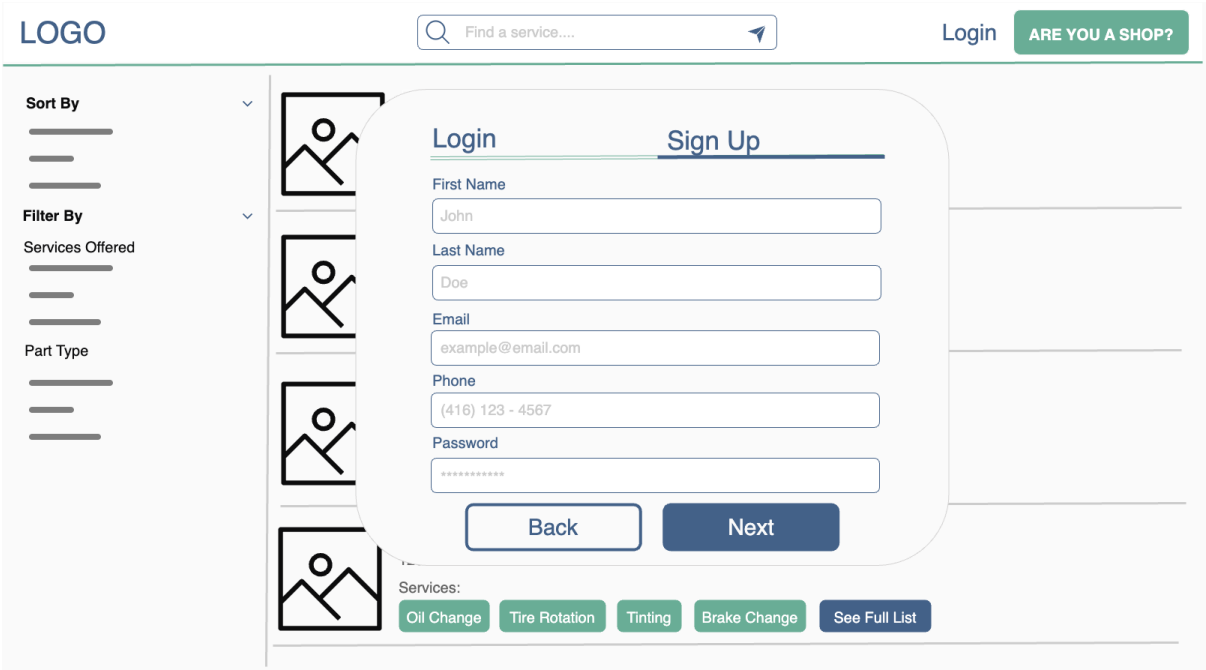

Figure 16: Shop Owner/Employee Registration — Part 2 (Desktop)

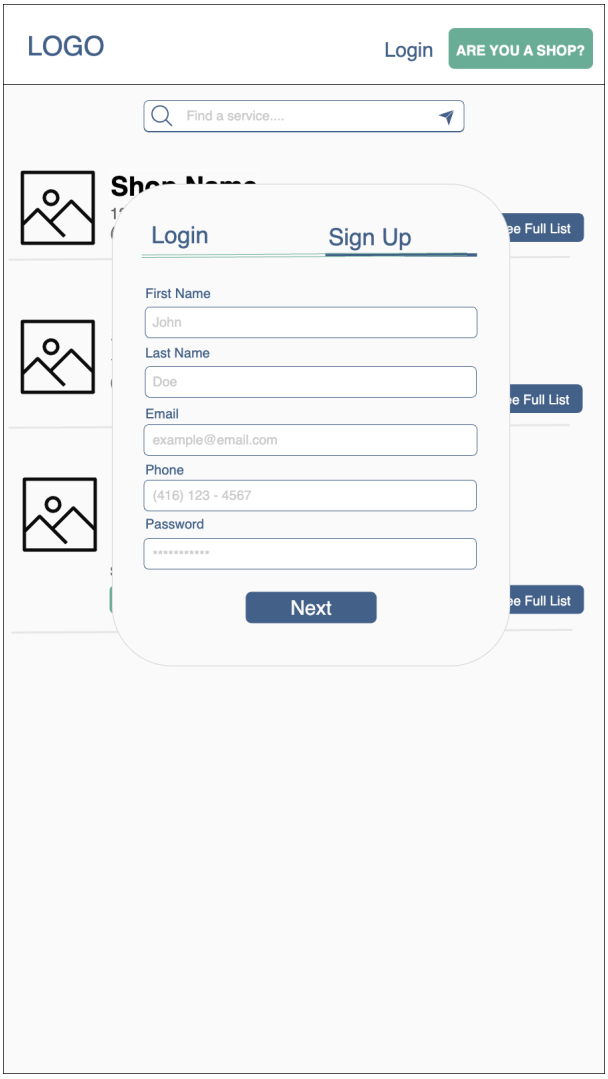

Figure 17: Shop Owner/Employee Registration — Part 2 (Mobile)

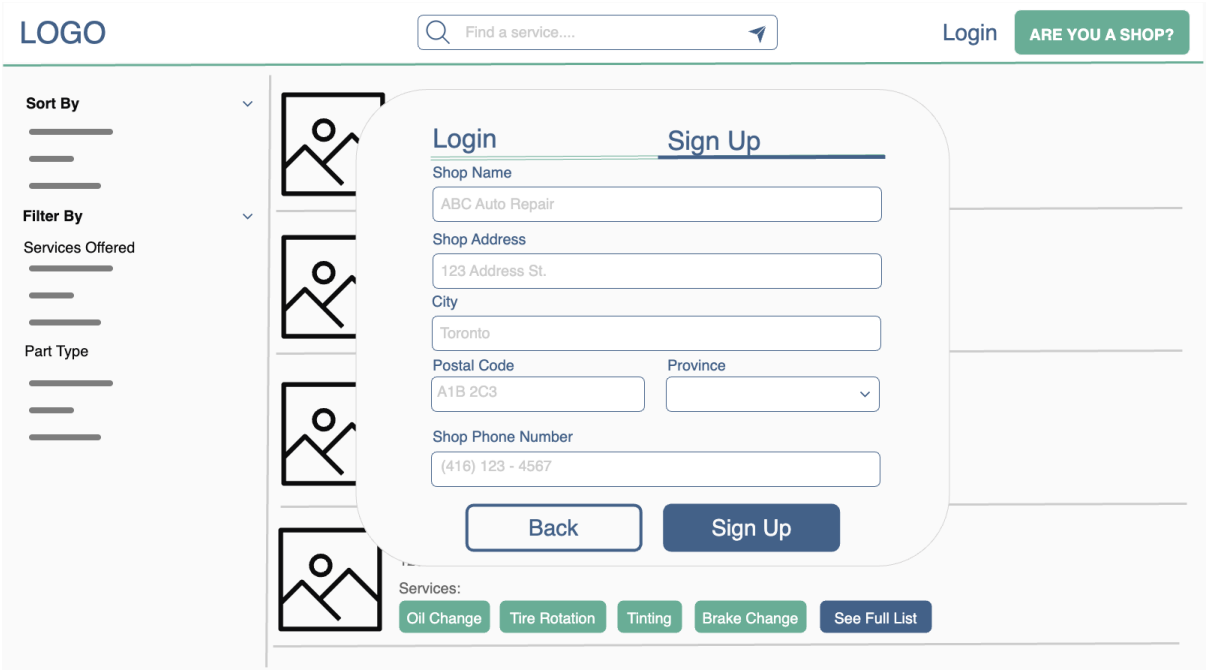

Figure 18: Shop Owner Registration — Part 3 (Desktop)

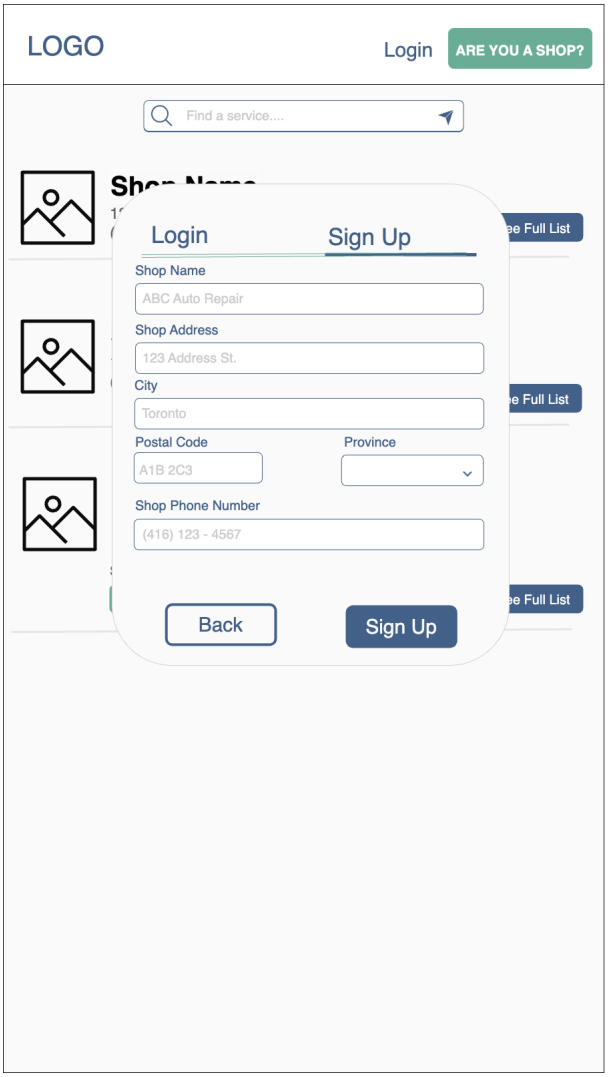

Figure 19: Shop Owner Registration — Part 3 (Mobile)

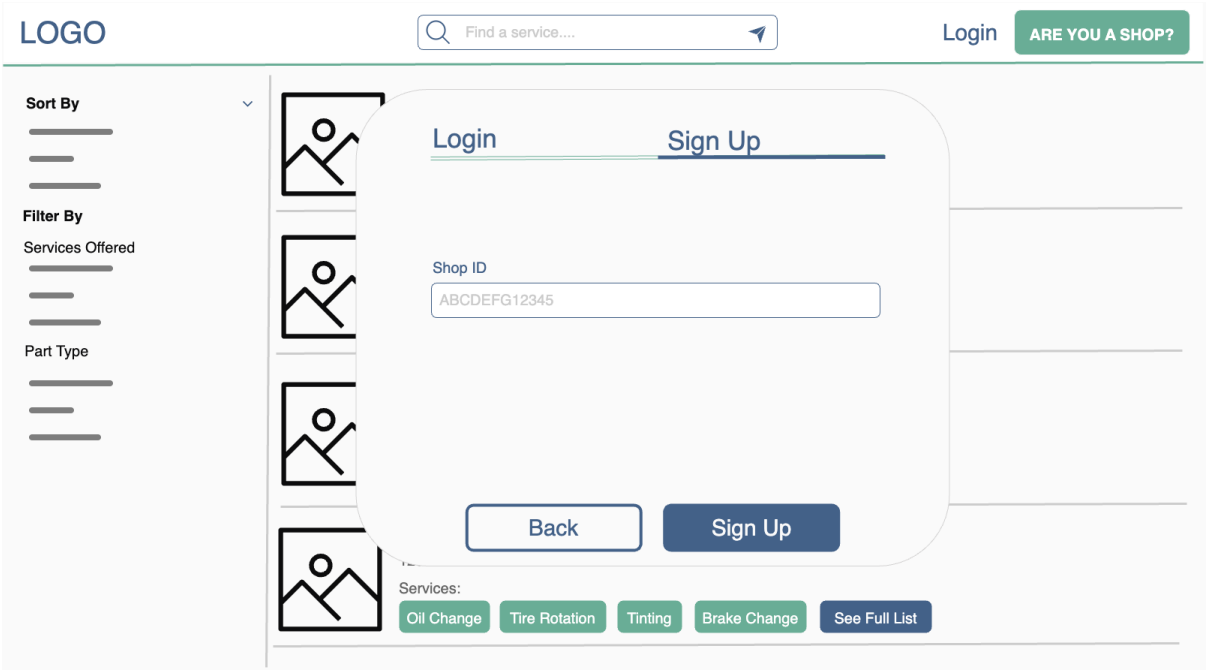

Figure 20: Employee Registration — Part 3 (Desktop)

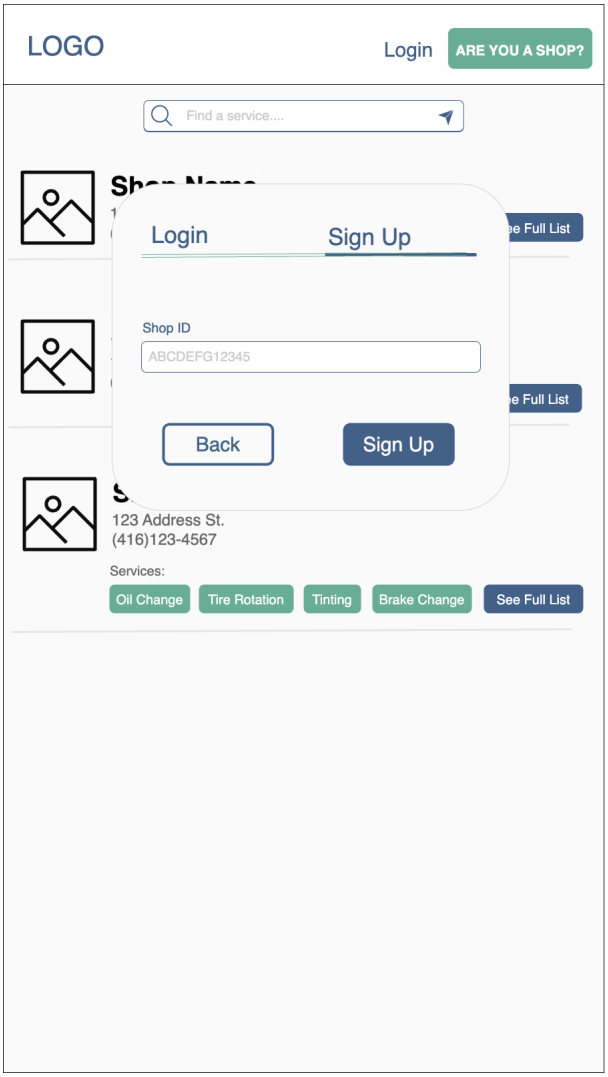

Figure 21: Employee Registration — Part 3 (Mobile)

8.7 Vehicle Owner Registration

This shows the sign up process for vehicle owners. The form includes information about the vehicle owner's vehicle which will be used when booking appointments.

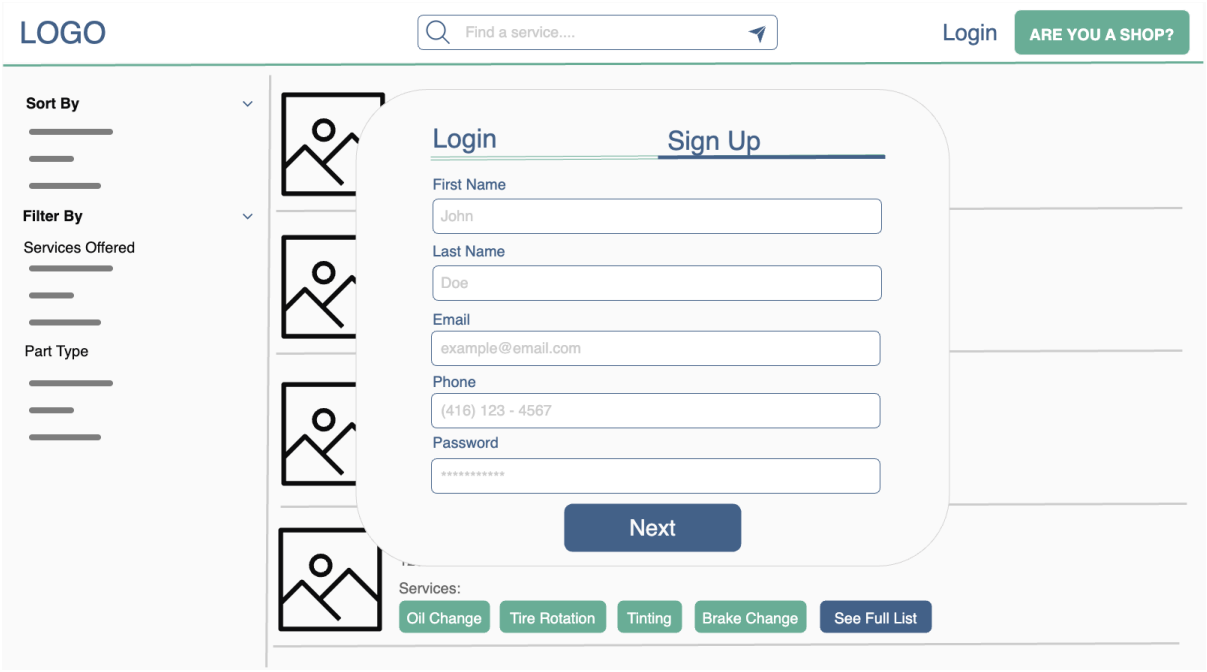

Figure 22: Vehicle Owner Registration — Part 1 (Desktop)

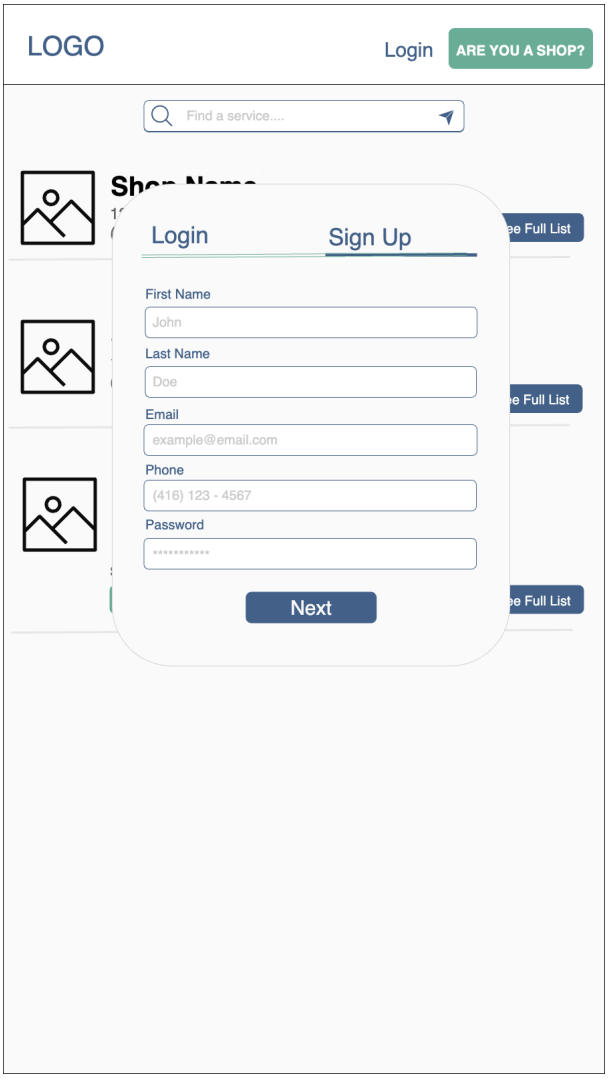

Figure 23: Vehicle Owner Registration — Part 1 (Mobile)

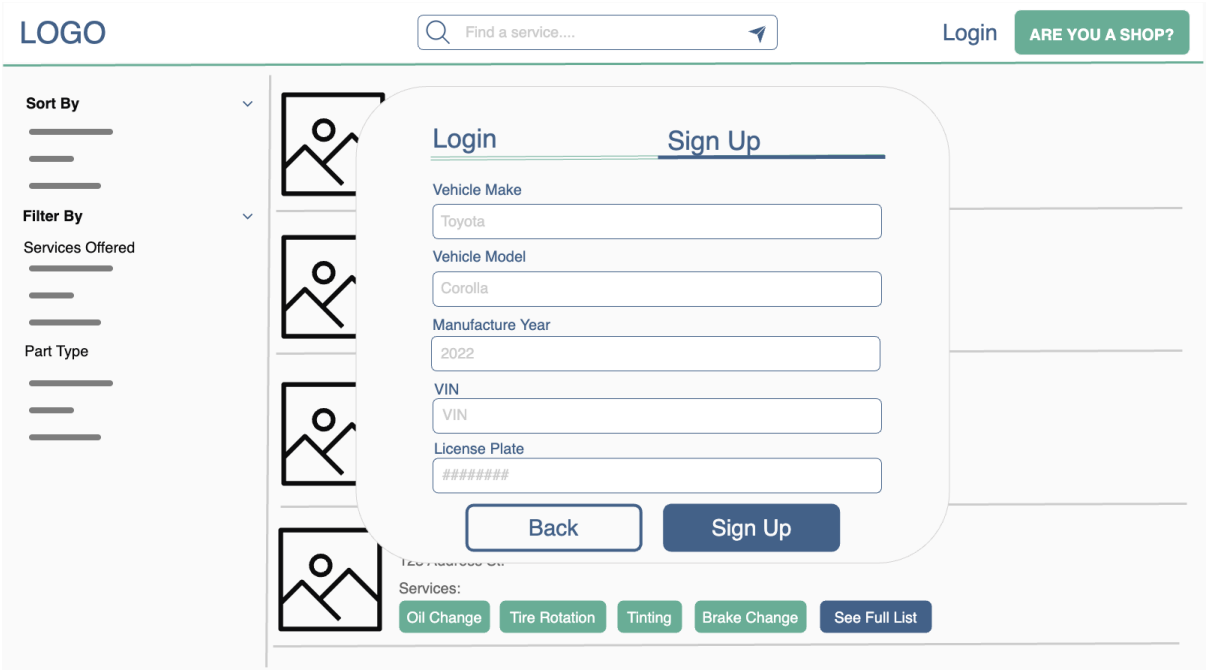

Figure 24: Vehicle Owner Registration — Part 2 (Desktop)

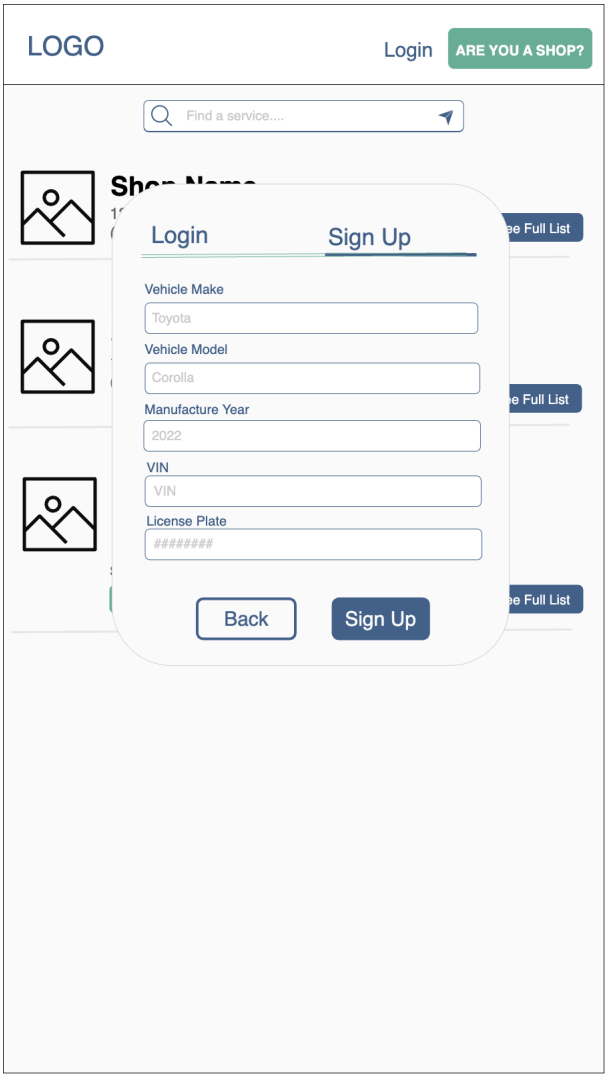

Figure 25: Vehicle Owner Registration — Part 2 (Mobile)

8.8 Vehicle Owner/Shop Owner/Employee Login

These popups show the login form for the application. Vehicle owners, shop owners, and employees use the same login flow.

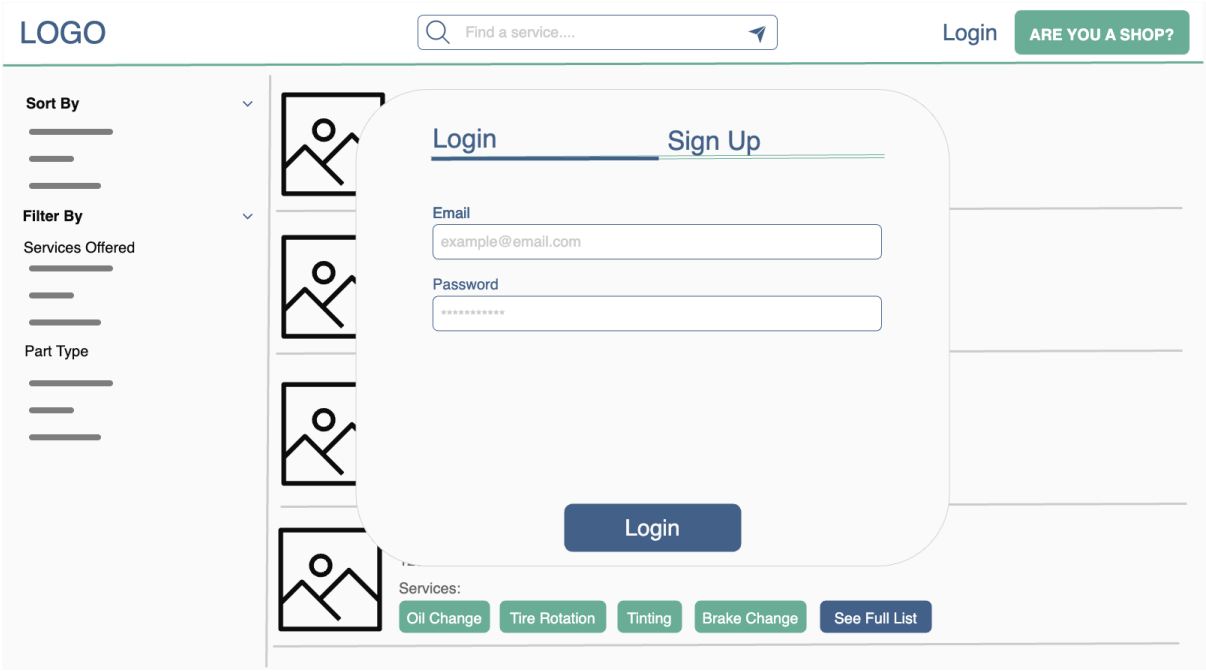

Figure 26: Vehicle Owner/Shop Owner/Employee Login (Desktop)

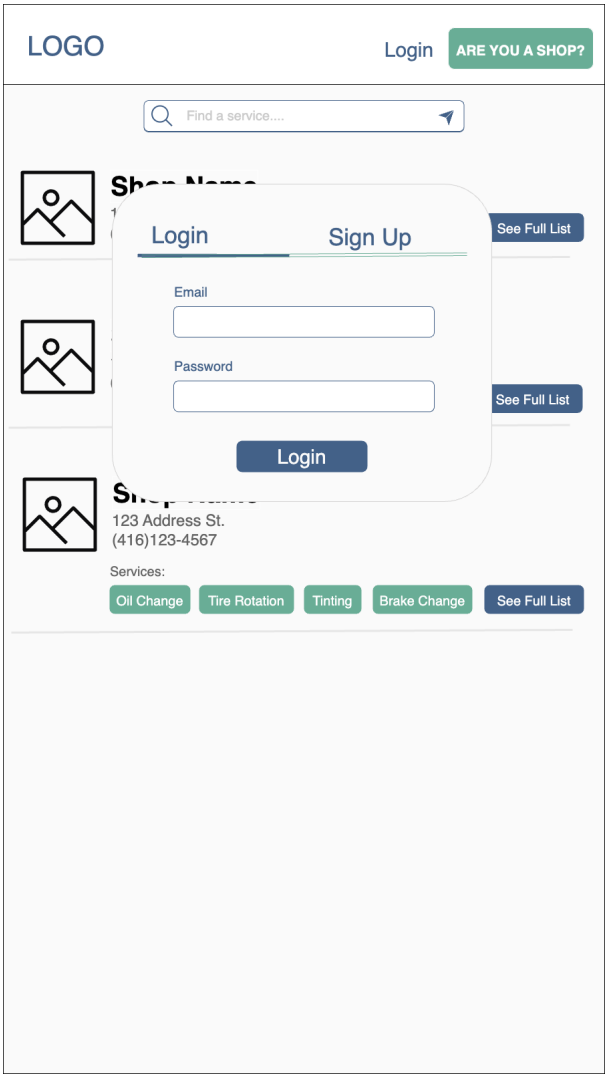

Figure 27: Vehicle Owner/Shop Owner/Employee Login (Mobile)

8.9 Vehicle Owner Dashboard

8.9.1 Services

The Service page shows the all user's services. The services are split into the categories Requested, Scheduled, In-Progress, Completed and Cancelled/Rejected.

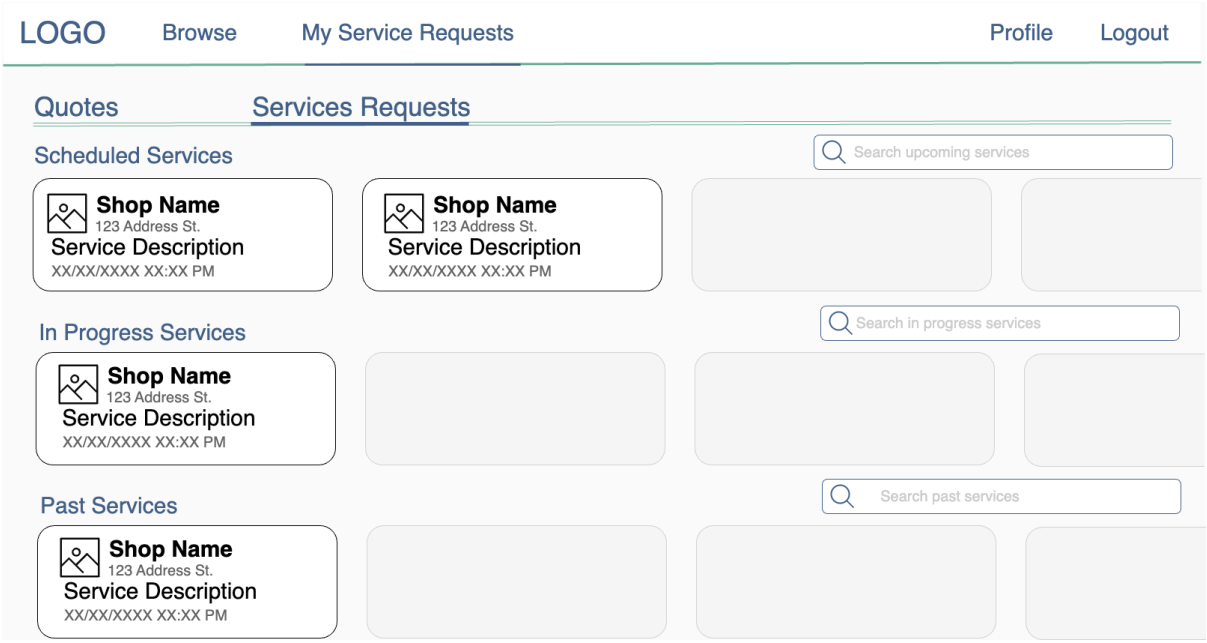

Figure 28: Vehicle Owner Dashboard — Service Requests (Desktop)

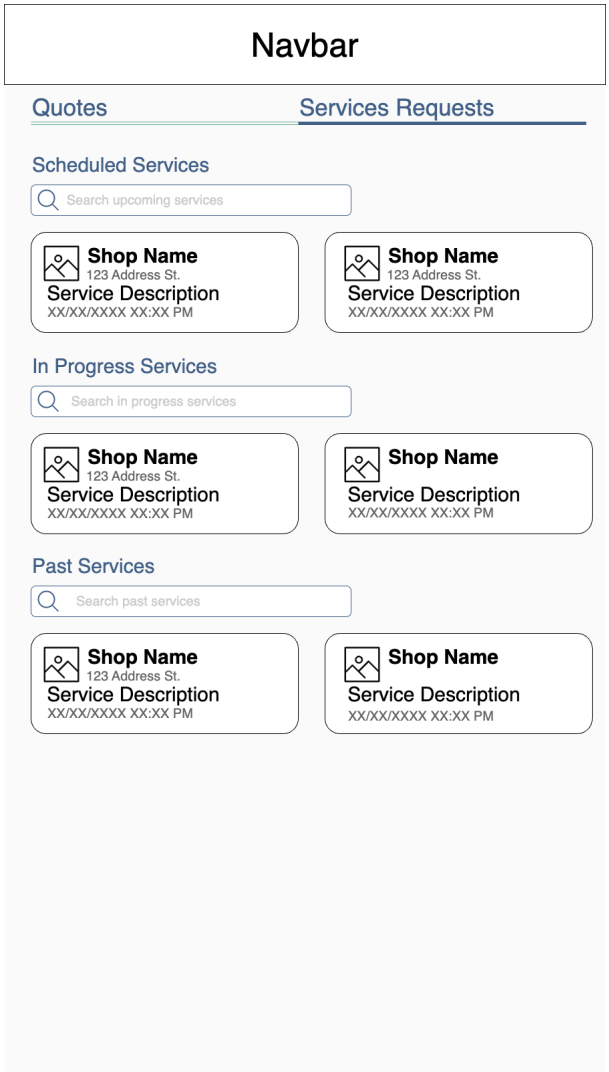

Figure 29: Vehicle Owner Dashboard — Service Requests (Mobile)

8.9.2 Quotes

The Quotes page displays any chats the vehicle owner has had with shop owners to receive a quote. Vehicle owners can send chat messages to shops using this page. Users can also query and search for a specific chat using the search bar.

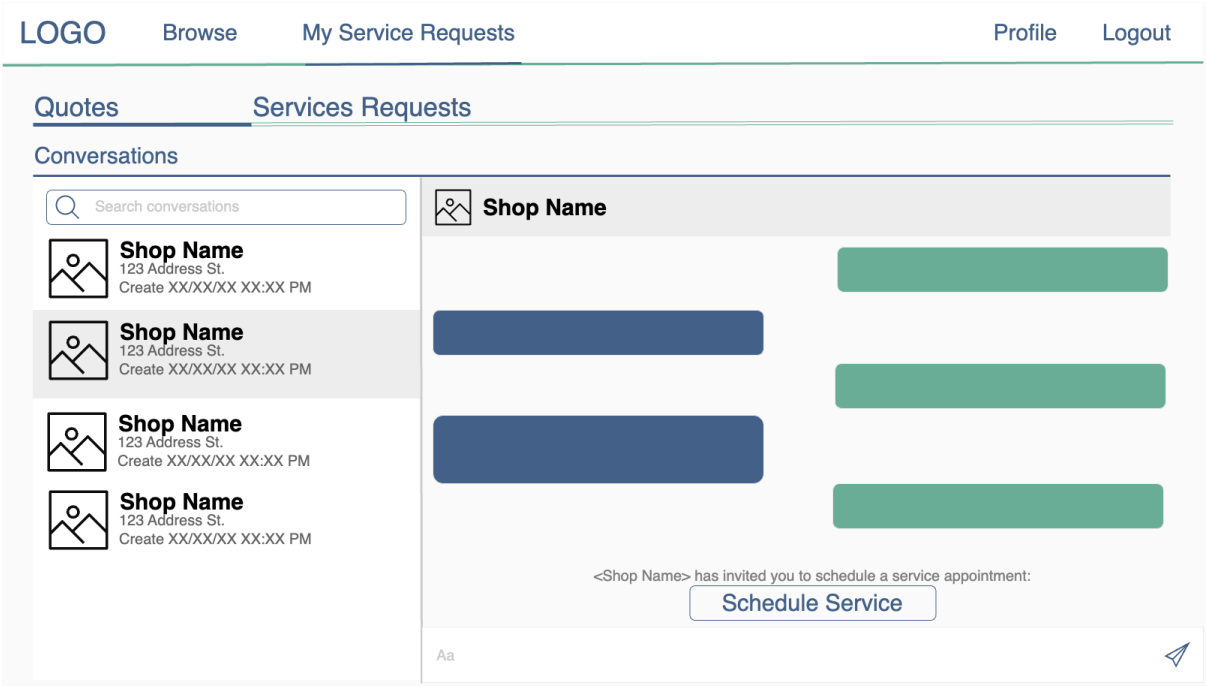

Figure 30: Vehicle Owner Dashboard — Quotes (Desktop)

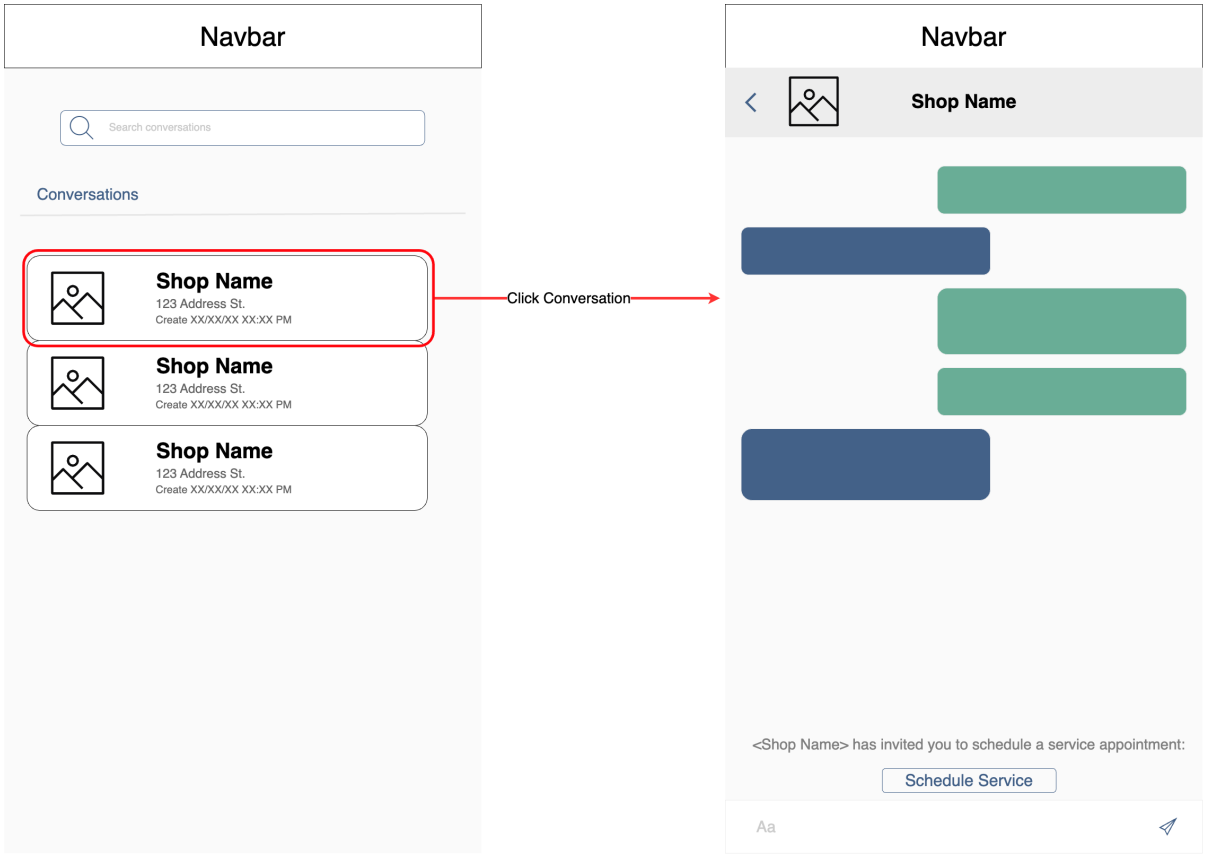

Figure 31: Vehicle Owner Dashboard — Quotes (Mobile)

8.10 Vehicle Owner Create Appointment

The popup to create an appointment contains various steps. The grey fields represent pre-filled fields that are read-only. These fields are populated using vehicle metadata associated with the user and service metadata associate with the service. The shop availabilities will be displayed according to their hours of operations and any hours that currently do not have a service requested, scheduled, or in-progress.

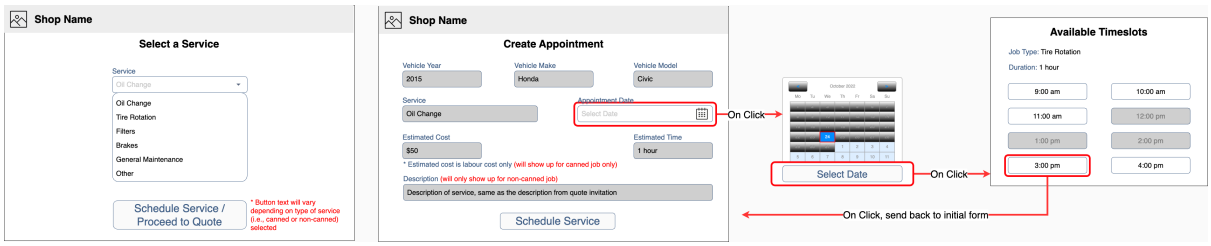

Figure 32: Vehicle Owner Create Appointment (Desktop)

8.11 Shop Owner/Employee Dashboard

8.11.1 Quotes Requests

The Quotes page displays any chats that have been initiated by vehicle owners. Shop owners and employees can send chat messages to vehicle owners on this page. Users can also query and search for a specific chat using the search bar. Shop owners can invite an employee to schedule an appointment once they are ready.

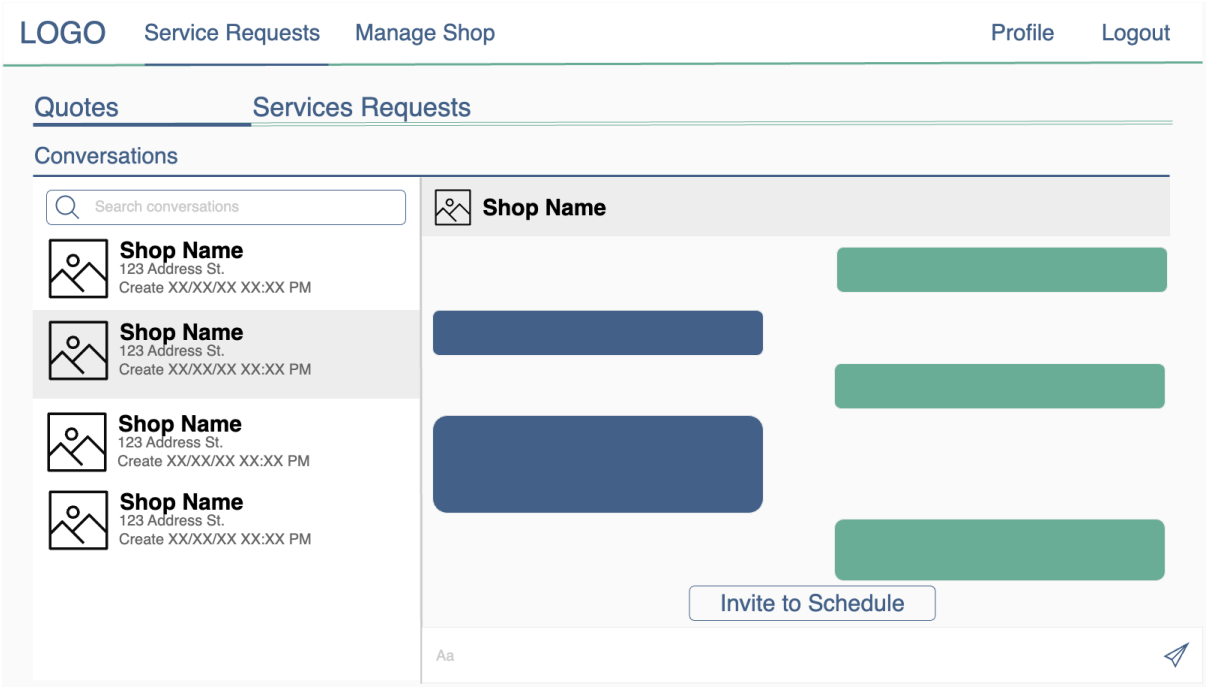

Figure 33: Shop Owner/Employee Dashboard — Quotes Requests (Desktop)

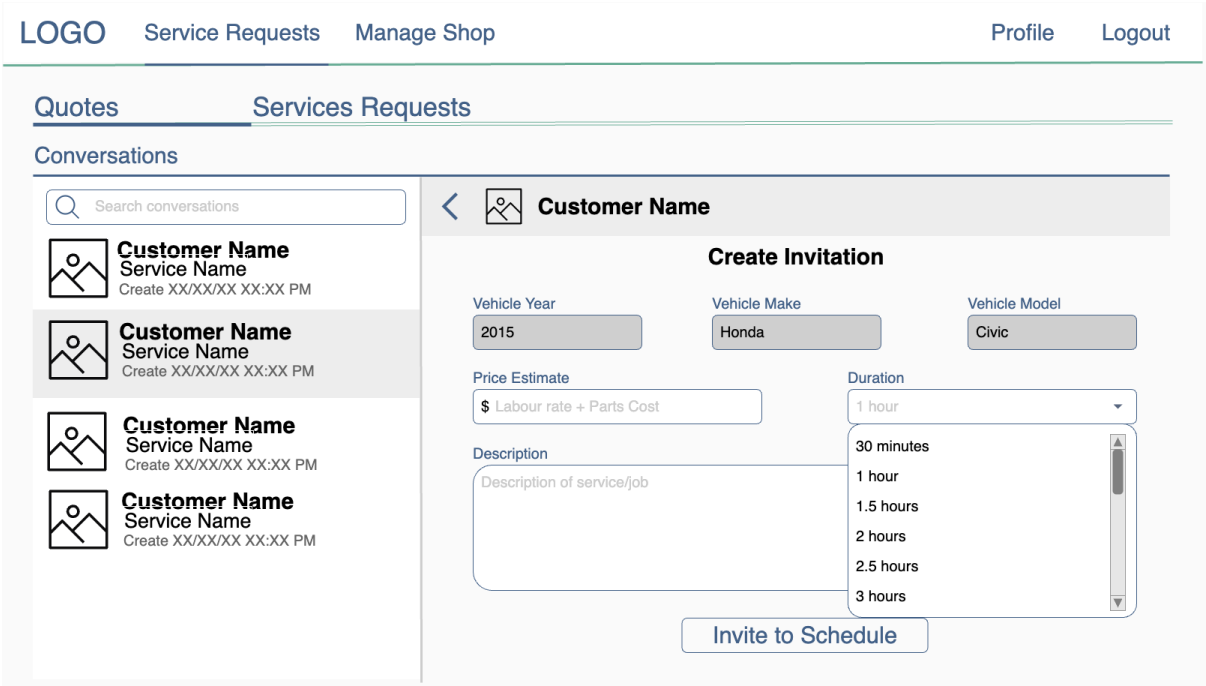

Figure 34: Shop Owner/Employee Dashboard — Quotes Requests — Invitation (Desktop)

8.11.2 Service Requests — Requested

The Requested Services are shown on this page. By clicking on an appointment, the work order for the appointment will be displayed. Requested Services can be rejected or accepted. Accepting an appointment will automatically reject all conflicting appointments.

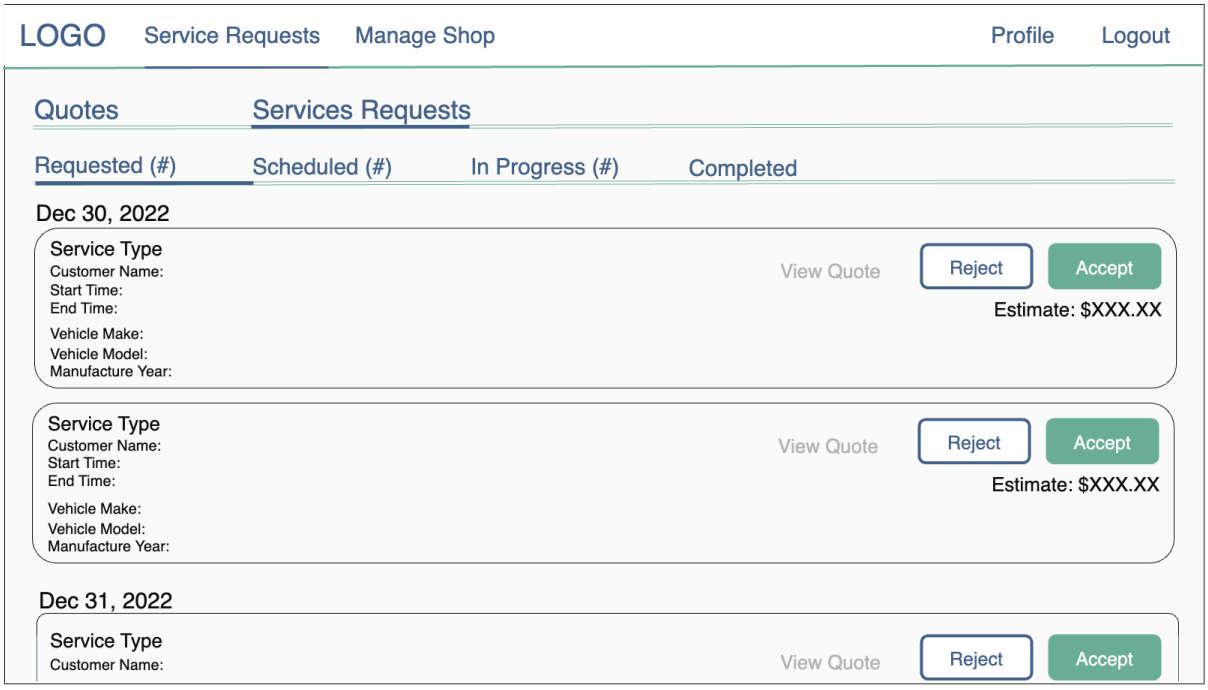

Figure 35: Shop Owner/Employee Dashboard — Service — Requested (Desktop)

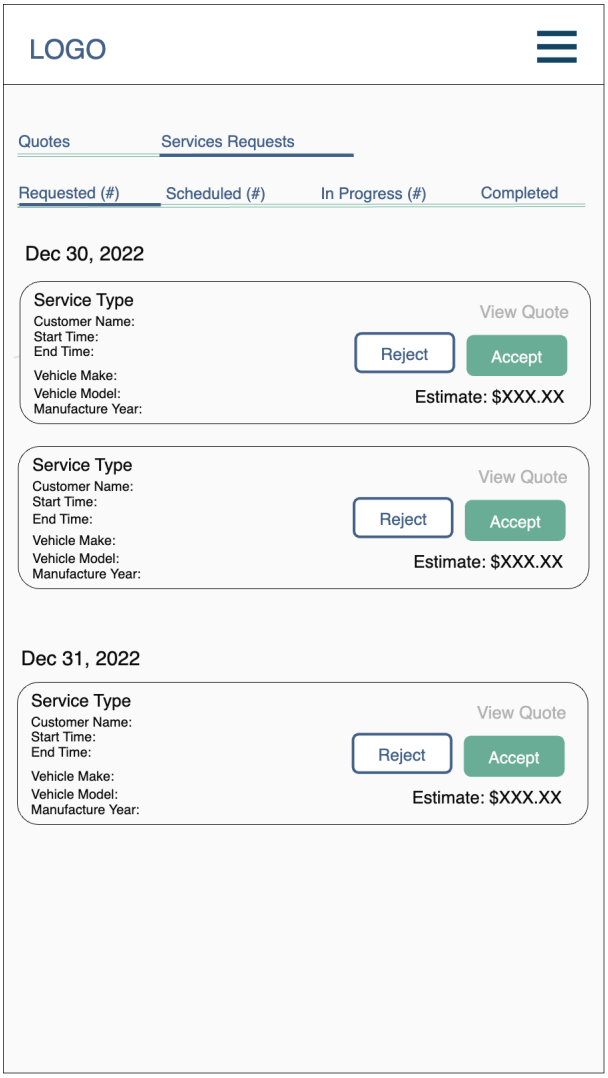

Figure 36: Shop Owner/Employee Dashboard — Service — Requested (Mobile)

8.11.3 Service Requests — Scheduled

The Scheduled Services are shown on this page. By clicking on an appointment, the work order for the appointment will be displayed.

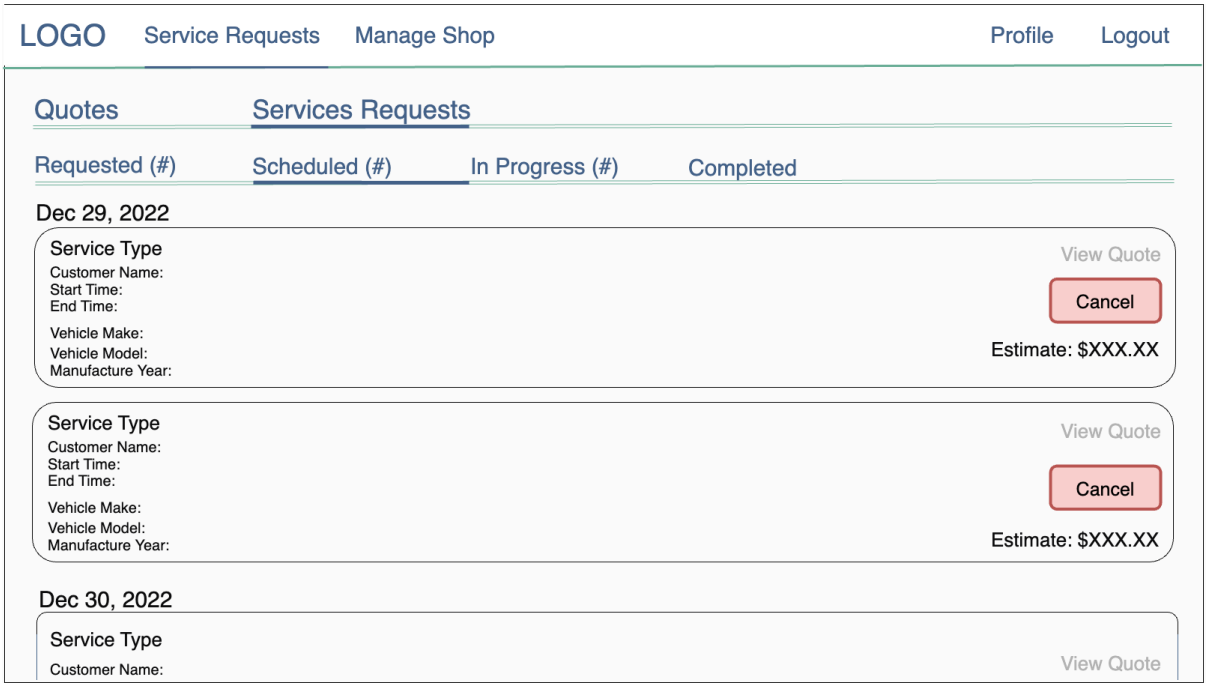

Figure 37: Shop Owner/Employee Dashboard — Service — Scheduled (Desktop)

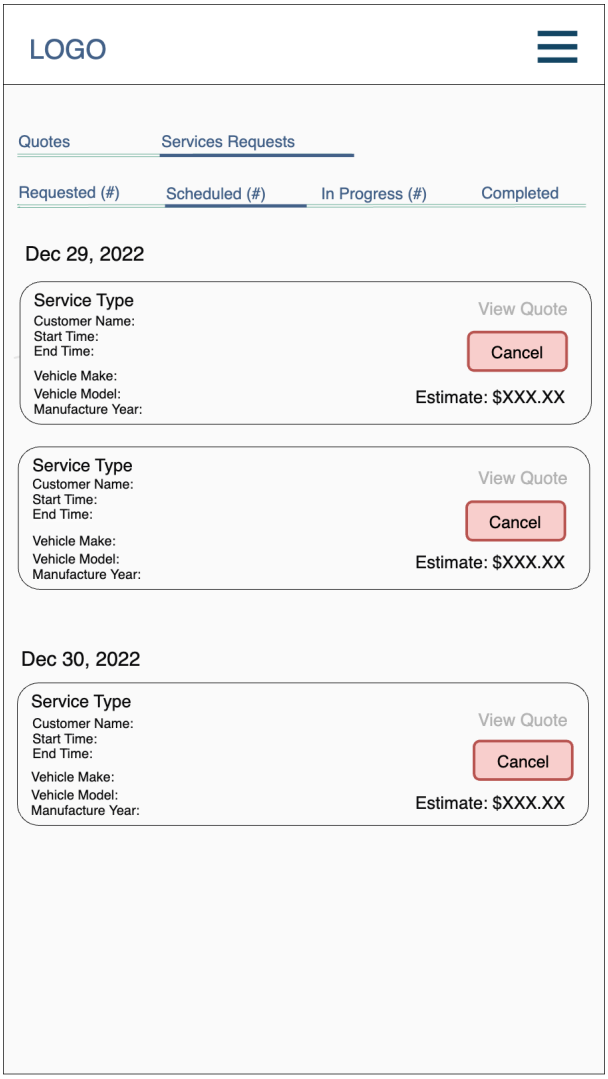

Figure 38: Shop Owner/Employee Dashboard — Service — Scheduled (Mobile)

8.11.4 Service Requests — In Progress

The In Progress Services are shown on this page. By clicking on an appointment, the work order for the appointment will be displayed.

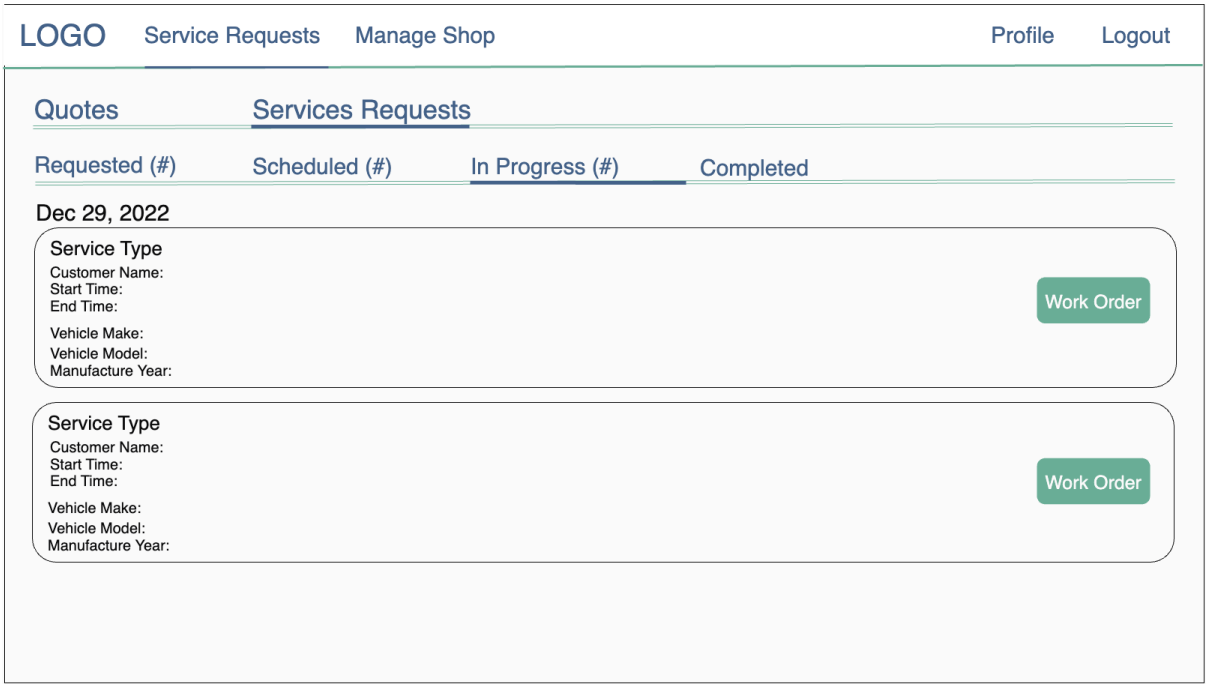

Figure 39: Shop Owner/Employee Dashboard — Service — In Progress (Desktop)

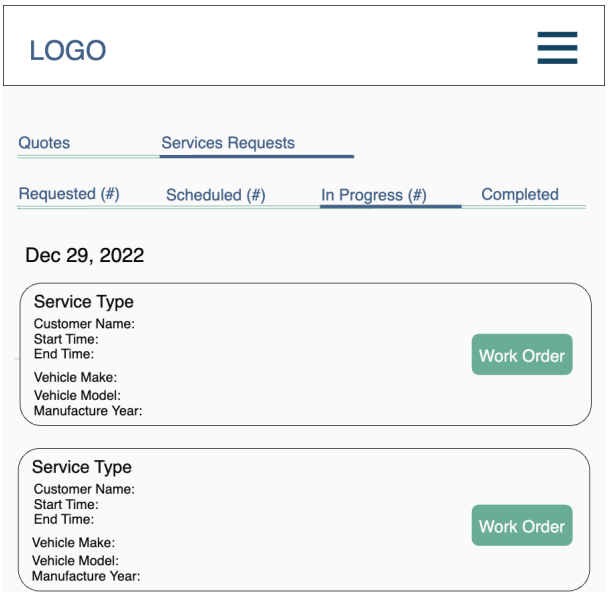

Figure 40: Shop Owner/Employee Dashboard — Service — In Progress (Mobile)

8.11.5 Service Requests — Work Orders

The Work Orders page features a list of information about the appointment and a rich text editor for any notes the shop would like to share with the customer. The appointment information can be edited from the Work Orders page by clicking the "Edit Metadata" button. The "Save" button can be used to save any changes. The "Back" button will take the user back to the Service Requests page. Customers will be presented a read-only version of this page, while Employees and Shop Owners will be able to make changes.

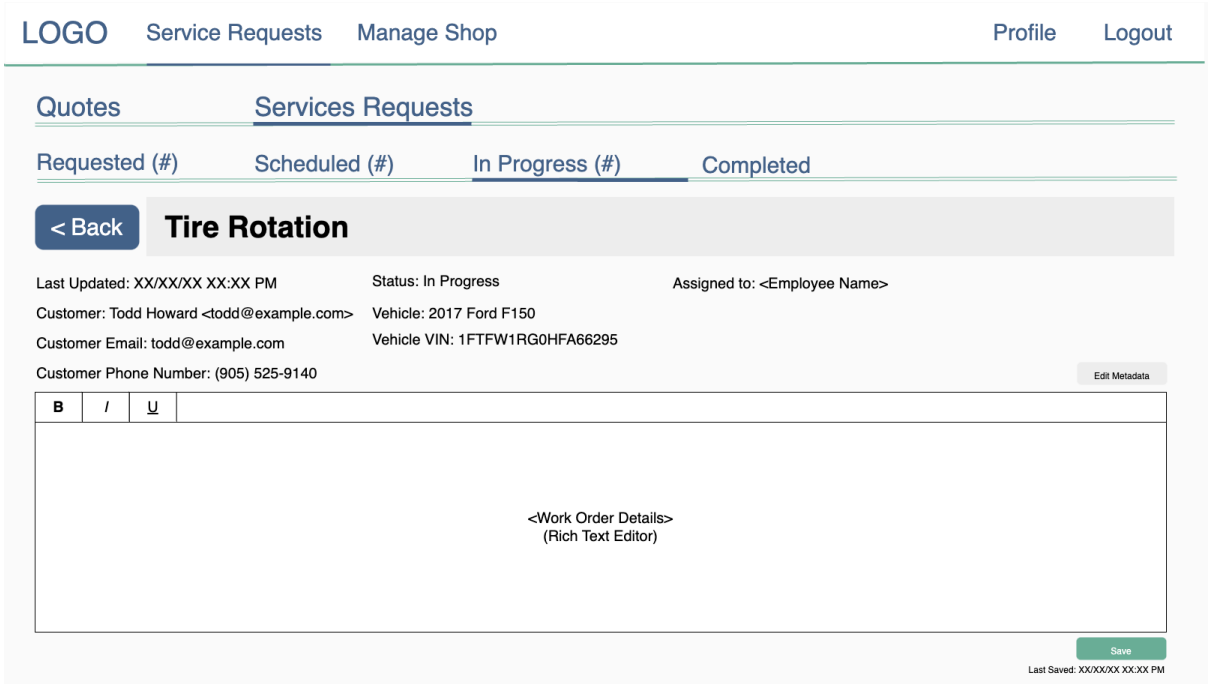

Figure 41: Shop Owner/Employee Dashboard — Service Requests — Work Orders (Desktop)

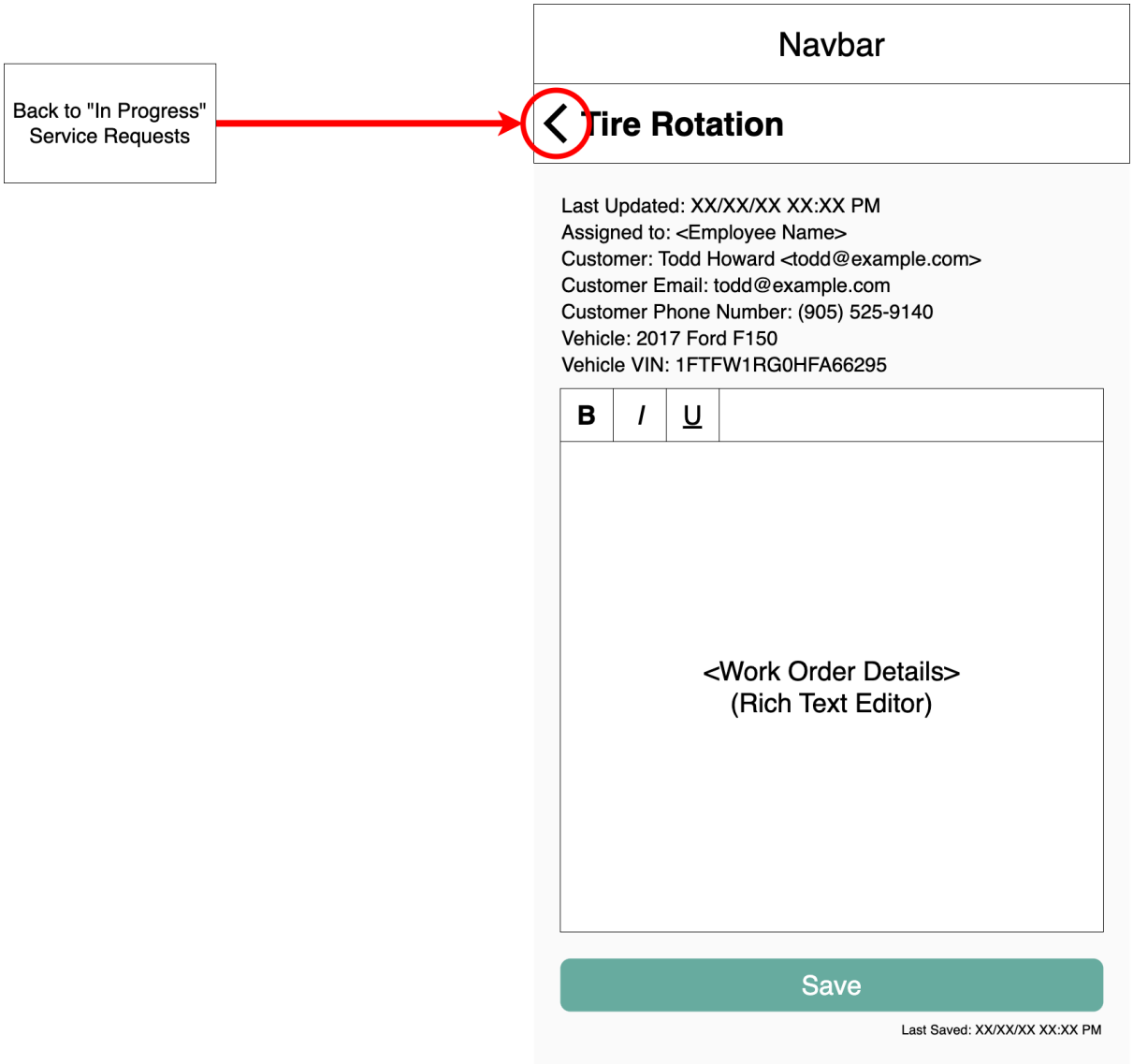

Figure 42: Shop Owner/Employee Dashboard — Service Requests — Work Orders (Mobile)

8.11.6 Service Requests — Completed

The Completed Services are shown on this page. By clicking on an appointment, the work order for the appointment will be displayed.

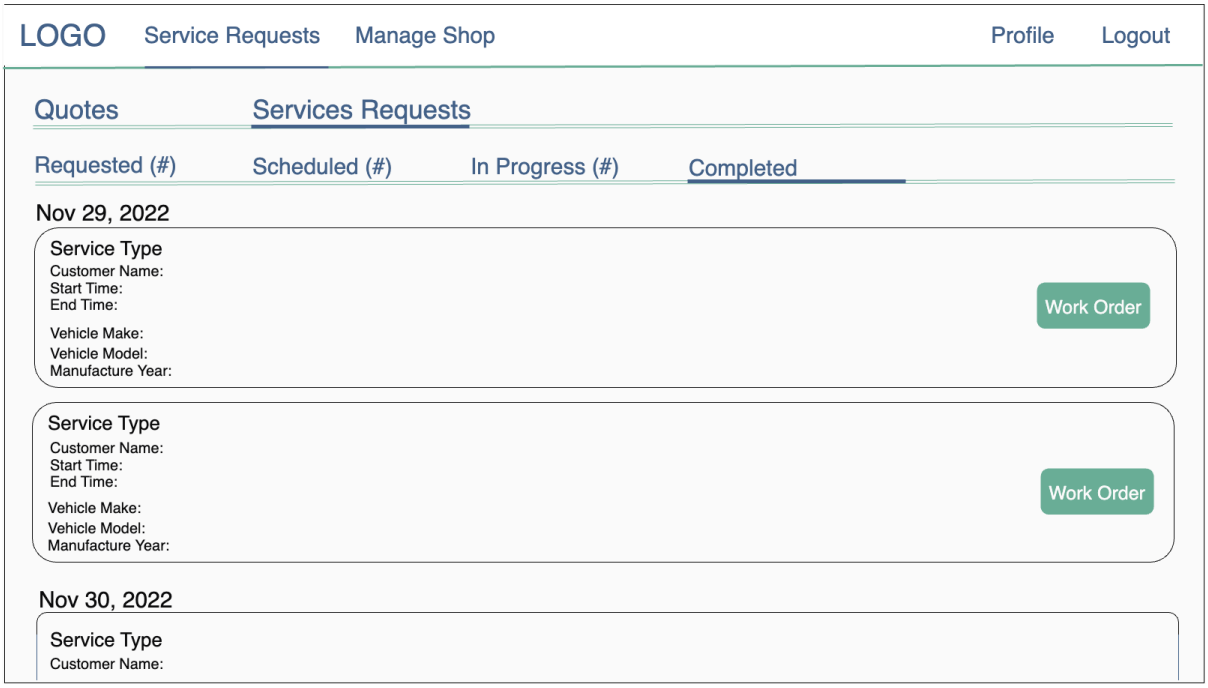

Figure 43: Shop Owner/Employee Dashboard — Service — Completed (Desktop)

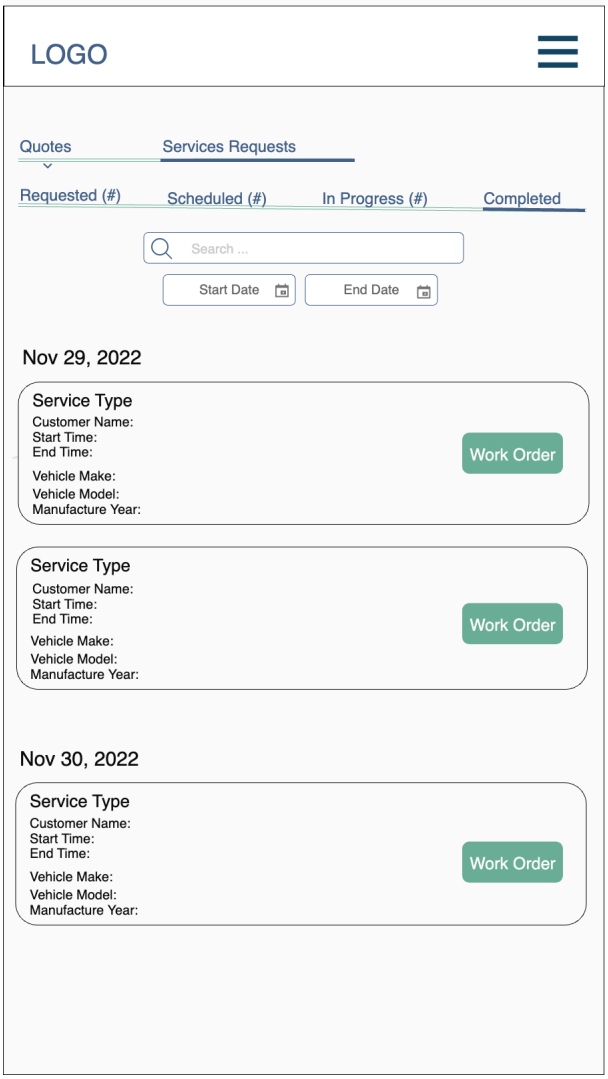

Figure 44: Shop Owner/Employee Dashboard — Service — Completed (Mobile)

9 Design of Hardware

This section is not applicable as this application is a software project (i.e., not a mechatronics project).

10 Design of Electrical Components

This section is not applicable as this application is a software project (i.e., not a mechatronics project).

11 Design of Communication Protocols

This section is not applicable as this application is a software project (i.e., not a mechatronics project).

12 Timeline

12.1 Module Development

The development of the modules shall take place over the months of December 2022 and January 2023. Specific dates, and responsibilities are described in Table 3.

Table 3: Module Development Timeline

Module Name	**Development Timeline**	**Developer(s)**
Database Driver Module	Dec. 1, 2022 — Jan. 31, 2023	Arkin Modi, Joy Xiao, Leon So, Timothy Choy
Users Module	Dec. 1, 2022 — Dec. 15, 2022	Arkin Modi, Leon So
Employee Management Module	Dec. 15, 2022 — Dec. 22, 2022	Joy Xiao, Leon So
Shop Module	Dec. 15, 2022 — Dec. 22, 2022	Leon So, Timothy Choy
Quotes Module	Jan. 1, 2023 — Jan. 8, 2023	Arkin Modi, Timothy Choy
Services Module	Jan. 1, 2023 — Jan. 8, 2023	Arkin Modi, Joy Xiao
Appointments Module	Jan. 15, 2023 — Jan. 22, 2023	Arkin Modi, Joy Xiao, Timothy Choy
Work Orders Module	Jan. 15, 2023 — Jan. 24, 2023	Arkin Modi

12.2 Module Testing

The testing of the modules shall take place over the months of December 2022 and January 2023. The tests conducted shall primarily consist of manual testing and have the primary goal of certifying confidence for the Revision 0 Demonstration. This testing will not include everything described in the System Verification and Validation Plan. Generally, testing will take place for the week after development is scheduled to finish. Specific dates, and responsibilities are described in Table 4.

Table 4: Module Testing Timeline

Module Name	**Testing Timeline**	**Developer(s)**
Database Driver Module	Dec. 1, 2022 — Jan. 31, 2023	Arkin Modi, Joy Xiao, Leon So, Timothy Choy
Users Module	Dec. 15, 2022 — Dec. 22, 2022	Arkin Modi, Leon So
Employee Management Module	Dec. 22, 2022 — Dec. 29, 2022	Joy Xiao, Leon So
Shop Module	Dec. 22, 2022 — Dec. 29, 2022	Leon So, Timothy Choy
Quotes Module	Jan. 8, 2023 — Jan. 15, 2023	Arkin Modi, Timothy Choy
Services Module	Jan. 8, 2023 — Jan. 15, 2023	Arkin Modi, Joy Xiao
Appointments Module	Jan. 22, 2023 — Jan. 29, 2023	Arkin Modi, Joy Xiao, Timothy Choy
Work Orders Module	Jan. 24, 2023 — Jan. 31, 2023	Arkin Modi

13 Appendix

13.1 Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Problem Analysis and Design. Please answer the following questions:

1. What are the limitations of your solution? Put another way, given unlimited resources, what could you do to make the project better? (LO_ProbSolutions)

   One of the main limitations on the resources available is the time allotted for this project. This has limited the number of features which we could support for this project.

   To improve the project, we would propose adding the following features:

   - Supporting multiple vehicles per customer
   - Ability to specify employee skill sets and assign employees to service appointment bookings accordingly
   - Adding email notification functionality
   - Adding a profile page for employees and customers
   - Add analytics dashboards for shop employees and owners
   - Ability to delete and remove accounts
   - Ability to sign up for employees to sign up to multiple shops
   - Ability for shops to view and manage existing customers
   - Add a parts entity and inventory management system
   - Add a vehicle inspect checklist

   In addition, there are some financial constraints on resources made available for the project. If we had unlimited financial resources, we would make the following improvements:

   - Add a long-lived server to support and manage features that can benefit from being stateful
   - Add an email server to support email communication and notifications

2. Give a brief overview of other design solutions you considered. What are the benefits and tradeoffs of those other designs compared with the chosen design? From all the potential options, why did you select documented design? (LO_Explores)

   Our supervisor provided us with existing mockups for a UI, however, our team took initiative to completely refactor and redesign the application to be more user-friendly. With this, we simplified workflows for the user, to make the user experience more efficient and tailored to fulfill the desired functionality. We also gathered feedback from the project supervisor, and incorporated such feedback into the designs.

   For the navigation bar, we considered two alternatives for the positioning of the navigation bar. We considered a top and bottom navigation bar for mobile devices.

We decided on a top navigation bar, as many of the pages show lots of information and often require scrolling. A top navigation bar is less intrusive when it comes to interfering with scrolling on mobile devices. A top navigation is also more visible and noticeable as the user interacts with the application on their phone.