Software Requirements Specification for Sayyara: A Progressive Web Application for the Automotive Industry

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Revision History

Date	Version	Notes
Sept. 29, 2022	0.0	Adaptation of Volere template
Oct. 4, 2022	0.5	Preliminary draft
Oct. 5, 2022	1	Final version of revision 0
April 5, 2023	1	Revision 1

Table 1: Revision History

The team is using the Volere template for this SRS.
Adapted from: https://www.volere.org/templates/volere-requirements-specification-template/

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1 Introduction

This document outlines the stakeholders, requirements, and potential issues in developing a progressive web application for the automotive industry. The document will serve as a guide for for upcoming design stages, and will also provide the stakeholders with a high level description of the application. The requirements listed in this document will be consulted for validation of features during development, and to ensure that the scope matches the client's expectations.

1.1 The User Business or Background of the Project Effort

Automobile maintenance and repairs are an unavoidable and recurring part of any car owner's experience. Despite its ubiquity, acquiring professional auto service remains a time-consuming and hassle-prone process. Without a systemic procedure, this process consists of a number of scattered and repetitive tasks, beginning with finding local providers including mechanics, tire shops, and body shops through traditional means such as a search engine, with little assurance of the trustworthiness or service quality of the providers in the search results.

After obtaining a list of service providers, customers are required to contact each service professional separately, repeatedly describing the same problems in order to receive a quote. Furthermore, different providers may have different availability. Scheduling a time preferred by the customer at available auto service providers, therefore, requires further communication with multiple providers through methods such as phone or in-person visits, costing additional time and effort.

2 Goals of the Project

To address these problems in the auto service industry, The team seeks to deliver an all-in-one tool that connects customers with auto shop owners and employees for frequent tasks such as service inquiries, quotes, and scheduling.

G1. Allow vehicle owners to find automotive service providers based on personal criteria (location, availability, offered services, customer ratings, etc.)

G2. Allow automotive service providers to easily get an online presence and increase their customer base.

G3. Allow vehicle owners to save time by getting quotes for service on their car from multiple auto shops at a time.

G4. Allow automotive service providers to digitize their records.

G5. Allow vehicle owners to flexibly schedule their service based on the availability of their desired automotive service provider.

G6. Allow automotive service providers to more effectively schedule the use of resources such as vehicle bays and employees.

G7. Allow quick communication between vehicle owners and automotive shops for topics such as providing estimates, asking questions or giving general updates on service.

G8. Allow vehicle owners to maintain digital records of servicing their vehicle including inspection results, invoices and appointment records.

G9. Provide individuals with no background in website/online management a simple and satisfying experience working digitally.

3 Stakeholders

3.1 The Client

Nabil Ibrahim of Sayyara is the project sponsor and supervisor who stipulates the scope of the project and verifies the deliverables.

3.2 The Customers

Owners of automotive service shops, including body shops, tire shops, and independent mechanics are the intended customers of the product. The owners will acquire the license to use the software on behalf of employees and their potential customers.

3.3 The Other Stakeholders

3.3.1 Developers

Members of Team 31 are the developers of the application, responsible for the design, implementation, and testing of the software.

3.3.2 Capstone Staff

Dr. Spencer Smith, the instructor of the Software Engineering capstone course at McMaster University, and his team of teaching assistants are advisors who provide evaluation and feedback of project deliverables.

3.3.3 Automotive Part Vendors

Car part vendors may have a stake in the project as the process of streamlining auto service client-provider interactions may also include ordering parts directly or indirectly through the application.

3.4 The Hands-On Users of the Product

3.4.1 Automotive Shop Owners

Shop owners are responsible for the initial setup of the shop profile in the application. They may also use the application to monitor performance related metrics such as customer volume and service statistics. The owners may have limited experience with web applications, but should at minimum have access to a computer or mobile device.

3.4.2 Automotive Shop Employees

Shop employees are a group of primary users of the software, who interact with customers through the application to provide services. Employees are adults of all ages with limited to moderate levels of experience in using web applications.

3.4.3 Automobile Owners

Car owners are the main group of intended users, who can use the application to connect to auto shops and schedule for services. There is great diversity in the age, knowledge, and background among the customers, thus all levels of technological experience can be expected. At the minimum, they must have access to a computer or mobile device with an Internet connection, and have some previous experience in using the device.

3.5 Personas

N/A

3.6 Priorities Assigned to Users

N/A

3.7 User Participation

Users, regardless of whether it is an automotive shop owner, employee, or customer, will be required to fill out a few forms when they are interacting with the website. These forms will be as as minimal and simplistic as possible to ensure that users do not get frustrated and exit the application halfway through what they are working on. Since it is expected that users may not have much technology experience, this process will be made as comfortable as possible for them.

3.8 Maintenance Users and Service Technicians

Team 31 will be the primary maintenance users of the system since they are the developers and will have the most knowledge to debug and fix any issues. Additional workers may need

to be hired on at a later date to assist with maintenance depending on the final scope and outcomes of the project.

4 Project Constraints

4.1 Solution Constraints

- The final product must be a PWA.
- The final product must be fully functional and usable by all potential user types.
- The final product must be fully functional on desktop devices.

4.2 Implementation Environment and the Current System

- The final product must be connected to a database that can encrypt and store user information.
- The final product must be developed with both a front-end and a back-end.

4.3 Partner or Collaborative Applications

N/A

4.4 Off-the-Shelf Software

- Database software
- Front-end frameworks and libraries
- Payment authentication system

4.5 Anticipated Workplace Environment

The anticipated workplace environment where the product is expected to be used will be in automotive vehicle shops. The application will be used to make automotive shop owners' and employees' various tasks more efficient.

4.6 Schedule Constraints

- End of March 2023 - Final demonstration of finished product due
- April 5, 2023 - Final documentation for product due

4.7 Budget Constraints

- $750 total budget (database and web hosting will be a cost)

4.8 Enterprise Constraints

N/A

5 Naming Conventions and Terminology

5.1 Glossary of All Terms, Including Acronyms, Used by Stakeholders involved in the Project

5.1.1 Stakeholder Naming

Term	Meaning
User	Any individual directly interacting with the system.
Shop Owner	A User who has administrative authority over an automotive shop.
Employee	A User working under a Shop Owner.
Vehicle Owner/Customer	A User responsible for a vehicle which may need servicing.

Table 2: Stakeholder Naming

5.1.2 Other Terms

Term	Meaning
Business	An automotive service provider.
PWA	Progressive Web Application - an application that can natively run on both desktop and mobile browsers without the need for an external application.
POC	The proof of concept is a low fidelity demonstration of a few core functions displayed on a skeletal front end.
MVP	The minimum viable product is the project deliverable by the end of the capstone development phase containing the core features as requested by the client.

Table 3: Other Terms

6 Relevant Facts and Assumptions

6.1 Relevant Facts

- The product is being specifically designed for use in the automotive industry.
- Currently in the automotive industry,
  - Shop owners cannot scale their businesses or retain customers long term as they are unable to compete with dealers when it comes to convenience, availability, and trust.
  - Shop owners cannot provide accurate time estimates as to when they can work on servicing a customer's vehicle.
  - Shop owners have a hard time answering all the calls they get on a daily basis.
  - Customers have a fear of being overcharged.
  - Customers have to endure a cumbersome process to obtain quotes and book service appointments.
  - Customers have no digital trail of the work performed on their vehicle.

6.2 Business Rules

N/A

6.3 Assumptions

- All users own a computer.
- All users have a basic understanding of how to use a computer.
- All users have a basic understanding of how to use a web browser.
- All customers own a vehicle.

7 The Scope of the Work

7.1 The Current Situation

There is currently no application or service that easily presents a customer, who needs to service their vehicle, with a network of automotive businesses and the option to easily view the businesses' schedules and book an appointment. We will build such a service, where the customer will also have the option to describe their issue in detail and receive a quote from the variety of businesses before committing to any one business. The main service, which will be seen and used by the users, which include vehicles owner, shop owners, and

shop employees, will be a PWA. The service is built with the front-end framework React and TypeScript, while the back-end is built using Python. The user database and appointment information are managed by Supabase.

7.2 The Context of the Work

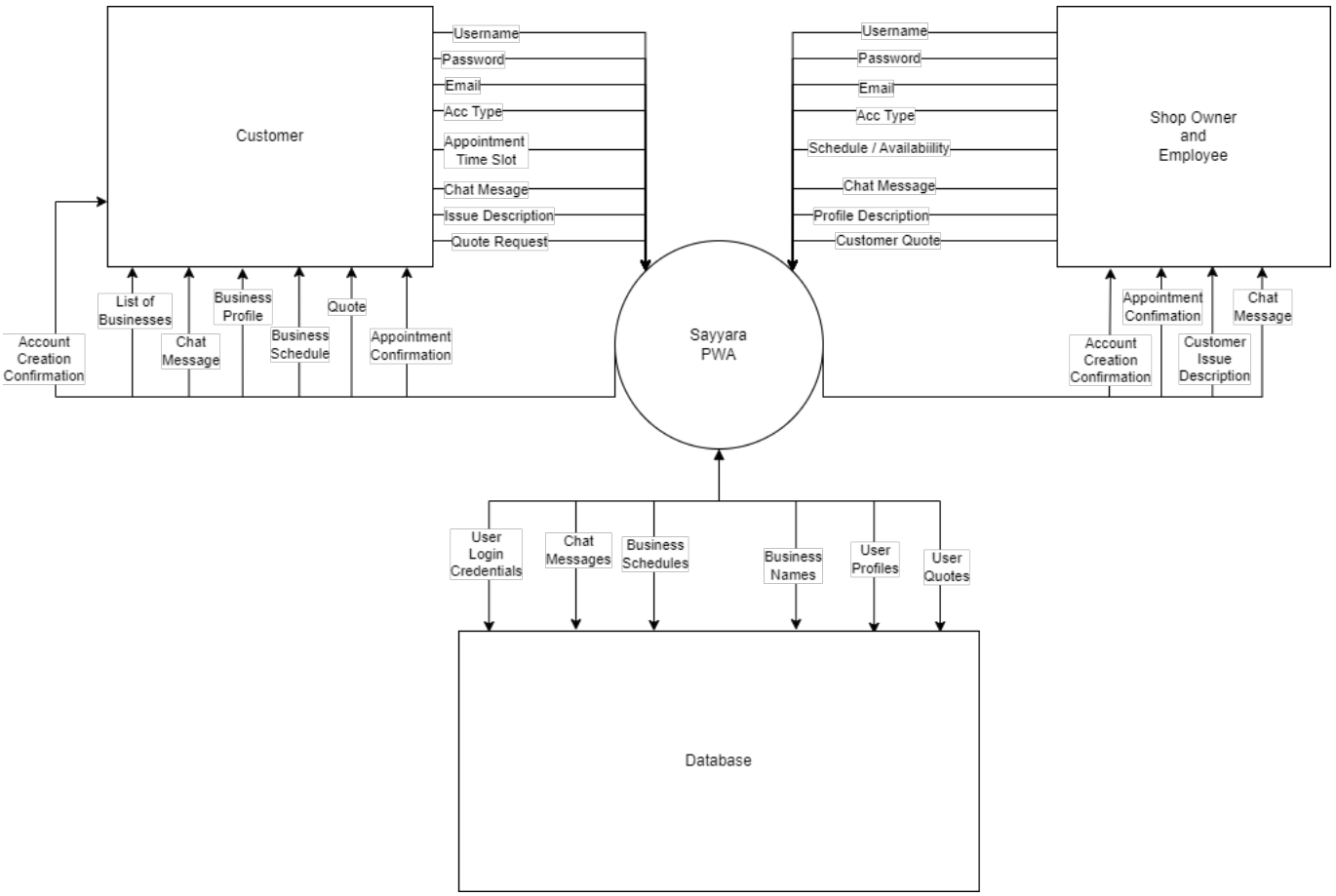

Figure 1: Work Context Diagram

7.3 Work Partitioning

No.	Event Name	Input and Output	Summary

1	User creates account	User Type (IN) User Name (IN) User Password (IN) Email (IN) Confirmation (OUT)	User will be able to sign up to create an account by providing a username and password. User will also be able to choose which type of user they are (e.g. Customer, Shop Owner, Employee)
2	User logs in	User Name (IN) User Password (IN)	User logs into the app with their chosen username and password.
3	Customer requests a quote	User Info (IN) Issue Description (IN) Quote(s) (OUT)	Customer describes their issue in detail and requests and quote. They will receive a quote from any interested shop owners.
4	Customer views businesses	Businesses List (OUT)	Customer will be able to view the list of currently available businesses where they can service their vehicle.
5	Customer views schedule	Business Name (IN) Schedule (OUT)	Customer can click on a business to view its current schedule.
6	Owner or Employee views schedule	Time Slots (IN) Schedule (OUT)	Show owners and employees will be able to view their own schedule to view any appointments and will also be able to edit their availability.
7	Customer books an appointment	Time Slot (IN) Confirmation (OUT)	Customers will be able to select a time slot from a given schedule to book and appointment. The customer, shop owner, and employee will then be given a confirmation receipt of the customer's appointment.

8	User chat	User1 Message (IN) User2 Response (OUT)	Two users, a customer and a shop owner/employee will be able to chat with one another to further discuss the customer's vehicle problems and other details.
9	User Profile	Description (IN)	Shop owners and employees can go to their profile page to update their own descriptions.
10	User Search	Shop Search Query (IN) Shop Search Results (OUT)	Vehicle Owners will be able to search for shops registered to the system by name or by address. Additionally, they can apply filters to further refine the search results. They can then perform a number of quick actions from the search list.

Table 4: Work Partitioning

7.4 Specifying a Business Use Case (BUC)

Business Event 1: User wants to create an account
Business Use Case: Create a user account
Trigger: Account Creation Request
Preconditions: None
Interested Stakeholders: Developers, Maintainers
Active Stakeholders: Customer, Shop Owner, Employee
- The User requests to create an account
- The User will be prompted to choose their account type and for a username, password, and email
- The system will create the account if the given username is not taken
- The User will receive an account creation confirmation

Business Event 2: User wants to log in
Business Use Case: User will be authenticated by the system
Trigger: Login Request
Preconditions: User has created an account
Interested Stakeholders: Developers, Maintainers
Active Stakeholders: Customer, Shop Owner, Employee
- The User will request to log in

- The User will provide their username and password
- If the credentials are exist and are correct, the user will be logged in
- If not, the user will be notified that the username or password is incorrect

Business Event 3: Customer wants to request a quote
Business Use Case: Shop Owner or Employee provides a customer quote
Trigger: Quote Request
Preconditions: User must provide a detailed explanation of their vehicle issue
Interested Stakeholders: Developers, Maintainers
Active Stakeholders: Customer, Shop Owner, Employee
- Customer will first provide a detailed description of the issue their vehicle is encountering
- Willing Shop Owners and Employees will review the description, diagnose the issue, and then provide the customer with a quote

Business Event 4: Customer wants a list of the available businesses
Business Use Case: Provide a list of participating businesses
Trigger: Business List Request
Preconditions: There must be at least one available business
Interested Stakeholders: Shop Owner, Employee, Developers, Maintainers
Active Stakeholders: Customer
- Customer will click on the shop lookup page
- System will provide the customer with a list of all participating businesses.
- Customer can search through this list and filter the results.

Business Event 5: Customer wants to views the schedules of a certain business
Business Use Case: Provide a certain business' schedule
Trigger: View Schedule Request
Preconditions: There must be at least one available business that filled out their availability
Interested Stakeholders: Shop Owner, Employee, Developers, Maintainers
Active Stakeholders: Customer
- Customer will click on a business from a list of participating businesses
- Customer will be provided with a description of the business and their schedule / availability

Business Event 6: Shop Owners or Employees wants to view or edit their schedules
Business Use Case: Display and/or edit schedule
Trigger: View Schedule Request
Preconditions: Must be logged into a shop owner or employee account
Interested Stakeholders: Customer, Developers, Maintainers
Active Stakeholders: Shop Owner, Employee
- Shop Owner or Employee clicks on their profile
- User will be able to view their schedule as a customer might see it

- User can edit the schedule by filling out time slots in which they are available or unavailable
- System will make the corresponding changes to their schedule

Business Event 7: Customers wants to book and appointments
Business Use Case: Create an appointment
Trigger: Appointment Creation Request
Preconditions: Appointment time slot is available, user is logged in
Interested Stakeholders: Developers, Maintainers
Active Stakeholders: Customer, Shop Owner, Employee
- Customer will be able to provide a business a time slot that is available
- System will keep track of the time slot, and update Shop Owner and Employee's schedules as unavailable
- Customer, Shop Owner, and Employee will each receive a confirmation of the appointment
- Employee will receive a confirmation if they were available during the appointment

Business Event 8: User wants to chat with another user
Business Use Case: Send user message to target user
Trigger: Chat Request
Preconditions: User must be logged in
Interested Stakeholders: Developers, Maintainers
Active Stakeholders: Customer, Shop Owner, Employee
- User will have an option to message another user
- Chat can only be created between a Customer and Shop Owner/Employee and vice versa
- User will input their message and send
- System will log the message and send to the receiving user

Business Event 9: User wants to view or update their personal profile
Business Use Case: Update Personal Profile
Trigger: View Profile Request
Preconditions: User must be logged in
Interested Stakeholders: Customer, Developers, Maintainers
Active Stakeholders: Shop Owner, Employee
- Shop Owner or Employee clicks on their profile
- User will be able to view their profile as a customer might see it
- User will be able to edit their profile description by providing an updated description.
- System will make the corresponding changes to their profile

8 Business Data Model and Data Dictionary

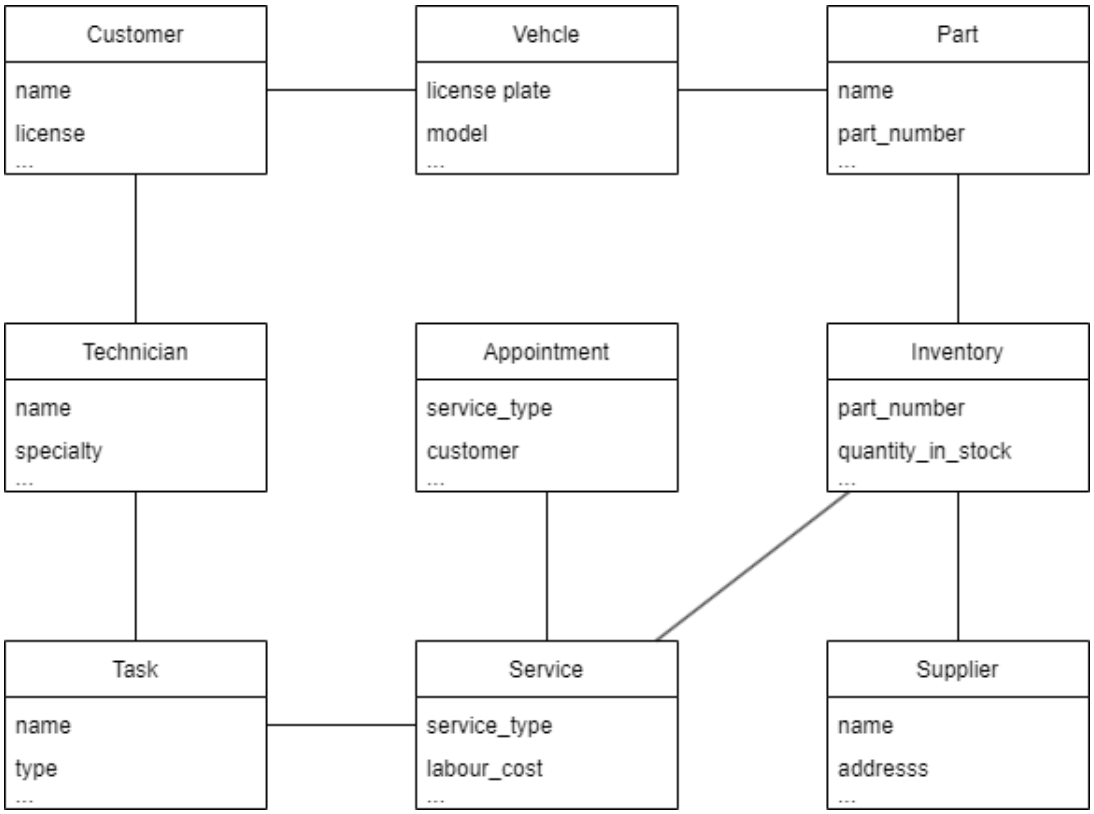

Figure 2: Business data model for Sayyara

8.1 Business Data Model

The business data model illustrated in figure2 defines the foundational entities and associations used in the automotive repair shop. Vehicles are owned by customers and are brought in to be serviced. Vehicles that are serviced are assigned a service order by the service bay manager or generally the owner. A repair shop technician is assigned to the service order. The technician inspects the car and makes repairs to the car. The technician keeps a detailed record of the repairs made on the car, which are routed back to the customer.

Note that the data models related to Inventory, Supplier and Part are a part of the extended goals in the our scope of work and will not be a part of the MVP or POC demo.

8.2 Data Dictionary

The data dictionary below outlines a brief overview of the data flowing through the PWA. The following classes provide the atomic data classes to build the PWA.

Name	**Content**	**Type**
Customer	Customer ID	Class
Vehicle	Vehicle Details	Class
Technician	Name	Class
Service	Service Type + Service Cost	Class
Task	Task Name + Task Type	Class
Appointment	Customer ID + Vehicle + Service + Appointment	Class

Table 5: Data Dictionary Table 1

Name	**Content**	**Type**
Vehicle Details	{License Plate + VIN + Make, Model, Year}	Attribute
Customer ID	hash(Customer Name + License Number)	Attribute
Customer Name	*from Customer*	Attribute
License Number	*from Customer*	Attribute
Technician Specialty	*Specialization of the technician*	Attribute
Technician Schedule	*Provided free and occupied blocks of time*	Attribute
Service Type	Type of a service	Attribute
Service Cost	{Parts Cost + Labour Cost}	Attribute
Task Name	*provided*	Attribute
Task Due Date	*provided*	Attribute
Appointment Time	Scheduled time of the appointment	Attribute
Availability	{Technician Schedule + Service + Vehicle + Appointment}	Attribute

Table 6: Data Dictionary Table 2

Note that above is not an exhaustive list of all the entity attributes and relationships, however, it is complete for implementing a POC of the product.

9 The Scope of the Product

9.1 Product Boundary

Product boundaries are explored in detail in sections 8.2 and 8.3 of this document.

9.2 Product Use Case Table

PUC No	PUC Name	Actors	Input and Output
1	Sign Up/Log-in	Vehicle Owner, Shop Owner, Shop Employee	Email/Password (in), Access Token/Account DB Entry (out).
2	Search Quotes	Vehicle Owner, Shop Owner, Shop Employee	Query Term and Filters (in), Detailed List View (out).
3	Create/Edit Quotes	Vehicle Owner	Quote Description Text and Options Selected (in), Quote DB Entry (out).
4	Start Chat and Send Chat Messages	Vehicle Owner, Shop Owner, Shop Employee	Account and Message (in), Chat Notification and Chatbox (out).
5	Search Appointments	Vehicle Owner, Shop Owner, Shop Employee	Query Term and Filters (in), Detailed List View (out).
6	Create/Edit Appointments	Vehicle Owner, Shop Owner, Shop Employee	Text, Options Selected, and Date Range (in), Appointment DB Entry (out).
7	Set Availability for Appointments	Shop Owner	Date Range (in), Modified Appointment DB Entry (out).
8	Search Shops	Vehicle Owner	Query Term and Filters (in), Detailed List View (out).
9	Search Work Orders	Shop Owner, Shop Employee	Detailed List View (out).
10	Edit Work Orders	Shop Owner, Shop Employee	Text and Options Selected (in), Modified Work Order DB Entry (out).

11	Search Services	Shop Owner, Shop Employee	Text and Options Selected (in), Detailed List View (out).
12	Create/Edit Services	Shop Owner	Text and Options Selected (in), Service DB Entry (out).
13	Search Employees	Shop Owner	Email Text (in), Detailed List View (out).
14	Invite Employees	Shop Owner	Employee Account (in), Email Invitation and Modified Employee List DB Entry (out).
15	Edit Profile Bio	Shop Owner, Shop Employee	Text and Options Selected (in), Modified Profile DB Entry (out).
16	Add Payment Information	Shop Owner	Payment Information (in), Access to Application (out).

Table 7: Product Use Case Table

9.3 Individual Product Use Cases

UC1. The Shop Owner or Shop Employee will give an input of their email and username to sign up, and the output will result in an account database entry. The Vehicle Owner will launch the application and input an email, and an output of an access token for automatic login will be stored on their device.

UC2. The Vehicle Owner, Shop Owner, and Shop Employee will input a query term and input selected filters from the given options (checkbox, etc), and the output will result in a detailed list view of all quotes that match the query and filter.

UC3. The Vehicle Owner will create and edit a quote by inputting a quote description text and selected option filters, and it will produce an about of a quote database entry that is searchable and viewable.

UC4. The Vehicle Owner, Shop Owner, and Shop Employee will start a chat and send messages by inputting a target account and text, and it will produce an output of a chat notification and a chatbox on their screen.

UC5. The Vehicle Owner, Shop Owner, and Shop Employee will input a query term and input selected filters from the given options (checkbox, etc), and the output will result in a detailed list view of all appointments that match the query and filter.

UC6. The Vehicle Owner will create and edit an appointment by inputting a text description, options selected, and a desired date range, and it will produce an appointment database entry that is searchable and viewable.

UC7. The Shop Owner will set an appointment availability by inputting a date range, and it will produce a modified appointment database entry including their availability.

UC8. The Vehicle Owner will be able to search for shops by inputting query terms and selecting filters, and this will produce an output of a detailed list view of all shops that match the query and filters.

UC9. The Shop Owner and Shop Employee will be able to search for work orders by navigating to their work orders tab on the website, and the output will be a detailed list view of all work orders.

UC10. The Shop Owner and Shop Employee will be able to edit existing work orders by inputting new text and new options selected for their reference, and the output will be a modifid work order database entry that is viewable and searchable and still editable.

UC11. The Shop Owner and Shop Employee will be able to search for services by inputting text and options selected, and the output will be a detailed list view of the database entries that match the text and filters.

UC12. The Shop Owner will be able to create and edit services by inputting new text and options, and the output will be a modified database entry.

UC13. The Shop Owner will be able to search for employees by inputting an email text, and the output will be a detailed list view of accounts that match the email query.

UC14. The Shop Owner will be able to invite employee accounts to their shop by inputting the employee account that was searched for, and the output will be an email to join the shop group.

UC15. The Shop Owner will be able to edit their profile bios by inputting text and options selected (such as email, location, and bio), and the output will prouce a modified profile database entry.

UC16. The Shop Owner will be able to add payment information through an authentication system, with the input being their payment type and details, and the output being access to the application.

UC17. The Vehicle Owner will be able to search for registered shops by name or address. The Vehicle Owner will be given a list of shops that contain or match their query.

UC18. The Vehicle Owner will be able to refine their search by filtering out shops that do not offer their required service, or shops that are too far from them.

UC19. The Vehicle Owner will be able to view additional details of any search result. This will include shop contact info, offered services, the shop description, and reviews.

UC20. The Vehicle Owner will be able to perform quick actions on any search result such as quick call, quick email, or quick quote request.

10 Requirements

This section provides the functional requirements, the business tasks that the software is expected to complete, and the nonfunctional requirements, the qualities that the software is expected to exhibit.

10.1 Functional Requirements

10.1.1 Authentication Requirements

AuR1. The system must allow users to create a user account using a valid username and password. (*Planned for Rev0*)
Priority: High

AuR2. The system must allow users to only use a valid username and password when logging into the system. (*Planned for Rev0*)
Priority: High

AuR3. The system must allow users to reset their password using external authentication methods. (*Planned for Rev0*)
Priority: High

10.1.2 Service Requirements

SR1. The system must allow shop owners to create and edit vehicle services their shop offers. (*Planned for Rev0*)
Priority: High

SR2. The system must allow shop owners and employees to view all vehicle services their shop offers. (*Planned for Rev0*)
Priority: High

10.1.3 Profile and Analytic Requirements

PAR1. The system must allow shop owners to update the address of their business. (*Planned for Rev0*)
Priority: High

PAR2. The system must allow shop owners to update the contact information of their business. (*Planned for Rev0*)
Priority: High

PAR3. The system must allow users to update their personal information, including address and contact methods. (*Planned for Rev0*)
Priority: High

PAR4. The system must allow users to view the address and contact information of a business. (*Planned for Rev0*)
Priority: High

PAR5. The system must allow customers to add their vehicle information to their profile on the application. (*Planned for Rev1*)
Priority: High

PAR5. The system must allow shop owners to view analytics for their shop including revenue, most frequently serviced vehicles, and most requested service. (*Planned for Rev2*)
Priority: Low

PAR6. The system must allow shop owners to view employee statistics in the form of a detailed, searchable list view. (*Planned for Rev2*)
Priority: Low

PAR7. The system must allow shop owners to manage the accounts of employees attached to the same business including actions such as adding, removing, and updating employee accounts. (*Planned for Rev1*)
Priority: High

PAR8. The system must allow shop owners to send an email invitation to their employee to set up an account on the website. (*Planned for Rev1*)
Priority: High

PAR9. The system must allow employees to view and edit their profile information when accepting an invitation from the shop owner, including their address, phone number, email, salary, vacation taken/left, and sick days. (*Planned for Rev1*)
Priority: High

PAR10. The system must not allow employees to delete their own account. (*Planned for Rev0*)
Priority: High

10.1.4 Appointment Requirements

ApR1. The system must allow shop owners to be able to change their shop's availability settings for appointments on the calendar. (*Planned for Rev1*)
Priority: High

ApR2. The system must allow only shops to schedule appointments to service a vehicle. (*Planned for Rev1*)
Priority: High

ApR3. The system must allow all users to optionally include a note in the appointment booking for organizational purposes. (*Planned for Rev1*)
Priority: Low

ApR4. The system must allow customers to interact with a virtual AI assistant to assist the user in scheduling an appointment. (*Planned for Rev2*)
Priority: Low

10.1.5 Quote Requirements

QR1. The system must allow all users to use a live chat service to discuss vehicle service quotes. This interaction will be possible between either a shop owner or employee user and a customer user. (*Planned for Rev1*)
Priority: High

QR2. The system must allow customers to be able to create a quote detailing the issue(s) with their vehicle that will be sent to a relevant automotive shop to assist them in servicing the issue. (*Planned for Rev0*)
Priority: High

10.1.6 Shop Lookup Requirements

SLR1. The system must allow customers to be able to search for all shops registered to the system by name or address. (*Planned for Rev0*)
Priority: High

SLR2. The system must allow customers to be able to filter the shop search results by offered services, and distance from a given location. (*Planned for Rev0*)
Priority: High

SLR3. The system must allow customers to be able to view additional details of a search result. (*Planned for Rev0*)
Priority: High

SLR4. The system must allow customers to be able to select desired shops from the search result and request quotes for them. (*Planned for Rev0*)
Priority: High

SLR5. The system must allow customers to be able to quick call and quick email a shop from the search results. (*Planned for Rev0*)
Priority: High

SLR6. The system must allow customers to be able to filter shops by availability, reviews, and canned jobs. (*Planned for Rev1*)
Priority: Low

10.2 Functional Decomposition Diagrams

Figured below are the functional decomposition diagrams of the system for each of the three user types (customer, shop owner, and employee). The functions and views are all detailed in the above section (10.1).

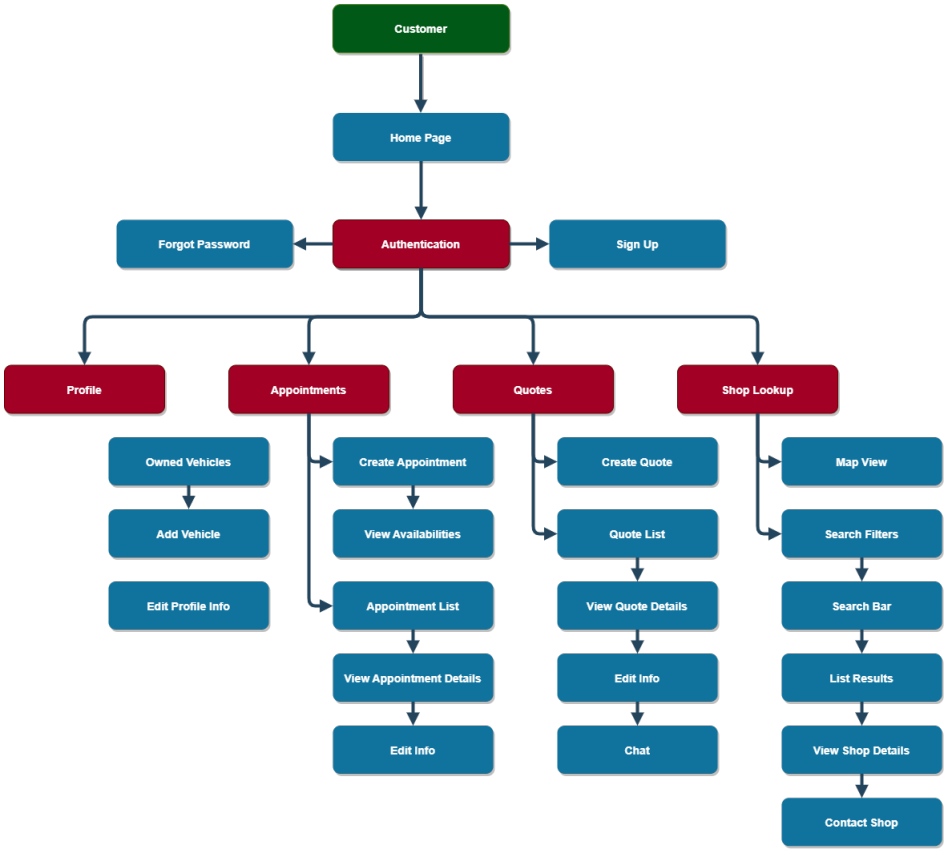

Figure 3: Customer Functional Decomposition Diagram

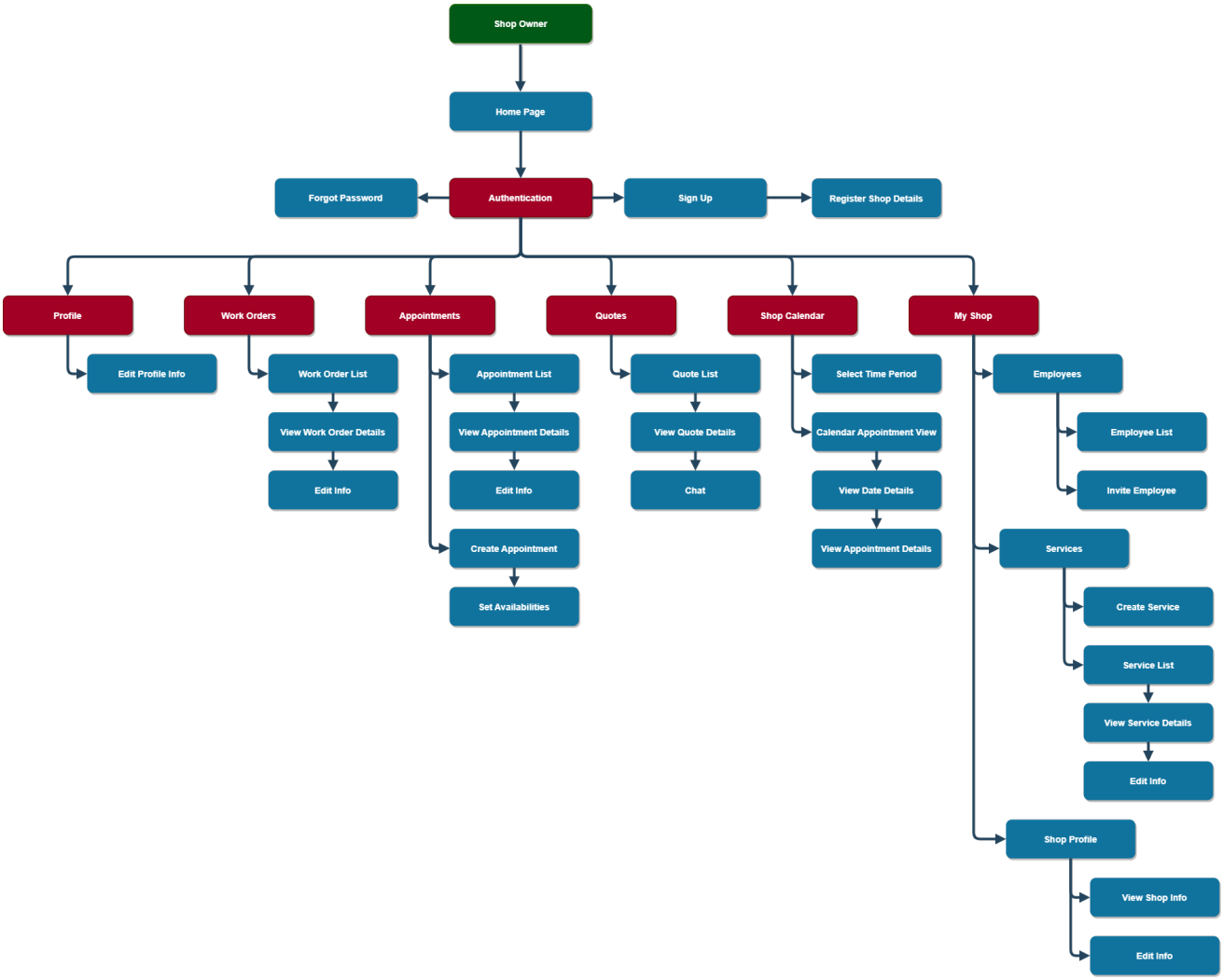

Figure 4: Shop Owner Functional Decomposition Diagram

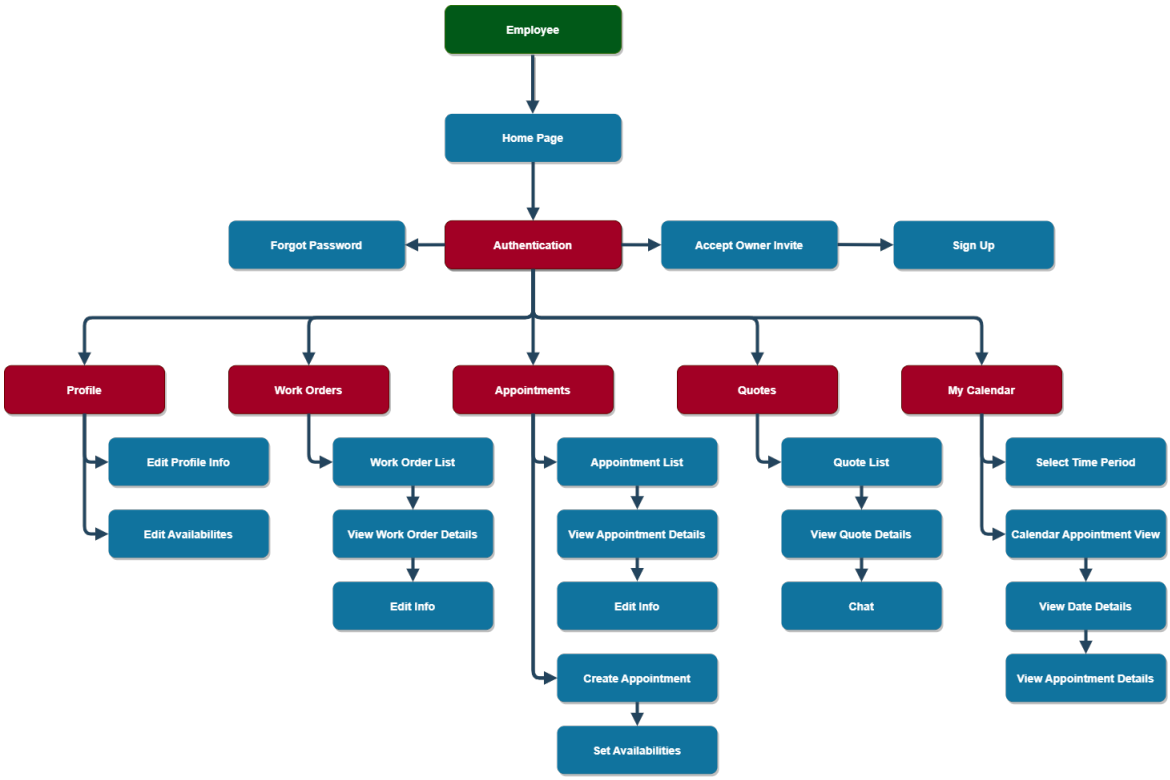

Figure 5: Employee Functional Decomposition Diagram

10.3 Nonfunctional Requirements

10.3.1 Look and Feel Requirements

LFR1. The system shall maintain a minimalist interface. Text information shall be concise and well-known iconography shall be used in place of text whenever applicable.
Priority: High

LFR2. The system shall have components that create an illusion of depth based on gestalt design principles including colours, closure, and figure/ground.
Priority: Medium

LFR3. The system shall have smooth transitions with animations after interactions to enhance both aesthetics and feedback for user input.
Priority: Low

LFR4. The system shall have smoothed and rounded edges consistent with modern mobile application aesthetics instead of a box-like design.
Priority: Low

LFR5. The system interface shall take on a consistent and limited colour palette (under 6 colours for functional or informative components such as buttons and text) to reduce

visual clutter and reinforce signifiers.
Priority: High

10.3.2 Usability and Humanity Requirements

UHR1. The system shall be simple to use for someone with little technological background. Major functions for each user type shall be learnable in under 15 minutes for an average user with prior experience using a browser or mobile device.
Priority: High

UHR2. The system shall have support for accessibility. This would include making all features interactable with a screen reader.
Priority: High

UHR3. The system shall have emphasized interactive components. This should make forms the user can fill out, for example, have text fields that are easily identifiable as editable.
Priority: Medium

UHR4. The system shall attempt to minimize the number of clicks or taps per action.
Priority: High

UHR5. The system shall avoid forcing the user to input text, instead preferring selection from a list of options or auto-generation of required fields.
Priority: Medium

10.3.3 Performance Requirements

PR1. The system shall be up and running 24/7 except for periodic monthly maintenance or unexpected server-hosting issues.
Priority: High

PR2. The system shall not require memory storage except for an automatic sign-in token.
Priority: Medium

PR3. The database get and update requests shall require less than 1 and 5 seconds respectively.
Priority: High

10.3.4 Operational and Environmental Requirements

OER1. The product shall be available as a website.
Priority: High

OER2. The product shall work on latest versions of Chrome, Firefox, Edge, and Safari browsers as a website.
Priority: High

10.3.5 Maintainability and Support Requirements

MSR1. The product shall have to be updated to work with latest versions of Chrome, Firefox, Edge, and Safari.
Priority: High

10.3.6 Security Requirements

SR1. The product shall securely store user information including passwords, and addresses using encryption.
Priority: High

SR2. The product shall only allow the creator of a data node (shop, appointment, etc) to delete it.
Priority: High

SR3. The product shall only allow a certain number of a specific database operation (sign-in attempt, chat message, create an appointment, etc) by a user every 15 seconds before the system will spawn a temporary timeout to avoid spamming attacks.
Priority: High

10.3.7 Cultural and Political Requirements

CPR1. The product shall not use any language that could be offensive to some cultures.
Priority: High

CPR2. The product shall have functionality support for multiple languages if other languages than English are added to the translation configuration.
Priority: Low

CPR3. The product shall have a profanity filter for the chat system.
Priority: Low

10.3.8 Compliance Requirements

CR1. The product shall clearly state that Sayyara is not responsible for anything that occurs during the chat, appointment, or work order process.
Priority: Medium

10.4 Likely Changes to Requirements

LC1. The product may not always continue to support browsers like Firefox.

LC2. The product may switch to relying on an authentication system instead of an access token on mobile devices for vehicle owners.

LC3. The product may require more maintenance periods in the future.

LC4. The product may add other languagage translation configurations for support.

10.5 Unlikely Changes to Requirements

UC1. The application will be a PWA and must run on both desktop and mobile devices and this requirement will not change.

UC2. The application is meant to be designed for users who are not very tech savvy, so features will be simplistic and easy to navigate.

UC3. The intended users of the application are unlikely to change; the application is designed for autmotive shop owners, their employees, and their potential customers.

UC4. It is intended for the application to have a monthly subscription service for shop owners to host their shop and its services on the website.

11 Project Issues

11.1 Open Issues

- Uncertainty in scope
  A potential issue is the uncertainty in project scope with respect to the limited development time. In the initial meeting, the client envisioned an expansive system with three main views to include the functionalities for the three user groups: shop owners, employees, and customers. The main functions in each component were assigned priority based on their inclusion in the MVP. However, the team determined that the completion of all currently labelled MVP functionality may be difficult due to the time constraint of the February deadline. Further discussions will be conducted with the client to adjust the MVP scope to adapt to this timeline.

- Payment system
  A subscription-based payment system is required for the commercial distribution of the product. No payment options have been explored, and the client is responsible for setting up the required banking and payment routing. Whether the payment system or a mock-up of one should be implemented in the MVP will be a topic of discussion with the client.

11.2 Off-the-Shelf Solutions

11.2.1 Ready-Made Products

A number of existing software offer scheduling, billing, and communication tools for auto service shops, covering some but not all of the client requirements.

- Shop-Ware (www.shop-ware.com)
  Shop-Ware is a cloud-based auto shop management software with features such as service analytics, quote generation, employee management, inventory tracking, and digital vehicle inspection. The primary users are shop owners and employees, and as such offers little utility to customers.

- AutoLeap (www.autoleap.com)
  Similar to Shop-Ware, AutoLeap markets itself as an auto shop workflow optimization software, focusing on features such as inspection report, estimates, invoice generation. It also provides customer-facing features including automated scheduling and Google reviews. However, it is shop-specific and does not feature a centralized hub for customers to contact multiple service providers.

- Setmore (www.setmore.com/industries/automotive) Setmore is a free auto service scheduling tool. Focusing primarily on booking appointments, Setmore offers APIs to display a scheduling calendar on auto shops' own websites, with additional features such as automated mobile reminders.

11.2.2 Reusable Components

- Front end components and styling can be built on top of existing frameworks such as Bootstrap or MUI.
- Google Calendar API can be the basis of the scheduling functionality.
- Mobile text notification can be accomplished using available tools such as Twilio API.

11.3 New Problems

While switching auto service-related interactions from the traditional in-person or phone methods to a centralized online platform will reduce overall effort by the customers, its use requires access to mobile or computer devices with Internet connections, as well as the basic knowledge of operating such devices. While these basic technological experiences have become near ubiquitous, it can still potentially preclude some users such as older employees or customers.

Shop owners and employees may also require time for the initial training or practice for using the application. The myriad of shop-facing functions imply that, even with an intuitive, user-friendly design, some acclimatization may still be required.

Additionally, the platform is only as responsive as the shops that it hosts. The asynchronous options of online communication may result in tardiness in shop-customer communications compared to traditional contact methods.

11.4 Tasks

- Architectural design of the full application is expected to be completed by October 20, 2022.
- The full team will work on the customer, employee, and shop owner views concurrently, with feature-based tasks assigned to individual members according to expertise. Please refer to the Development Plan for a detailed breakdown of the feature-branch workflow.
- A few core functions for each view will be implemented in a mock-up back end, to be displayed on skeletal front end designs for the POC demonstration by November 13.
- Additional features corresponding to the requirements are to be implemented before February 3, 2023.
- Unit testing is carried out during the development of each feature. While systematic testing is conducted monthly.
- Updates to the requirements and implementation are to be discussed and formulated based on regular weekly meetings between the development team and the client.

11.5 Migration to the New Product

The initial setup of the software requires the shop owners to register an account or profile for their shop, and perform owner-specific configurations such as granting access permissions to employees. The employees are required to install the software on their devices, and familiarize with use cases such as responding to scheduling requests, and preparing online service reports. The software is expected to work in tandem with traditional real time contact methods, and so does not replace phone or in-person contacts in the foreseeable future.

11.6 Risks

- Due to limited time, the team will focus primarily on developing the main features rather than application security. As such, the MVP may have little protection against malicious security exploits.
- The development build will use mock data provided by the client. There is a risk that the system may not scale up readily to accommodate high-volume real traffic and data, as traffic-stress testing is beyond purview of the MVP.
- The team consists of six developers of varying levels of experience and areas of expertise. Consequently there exists the risk of stylistic differences in different components of the application as a side effect of the feature-branch workflow. Coding standards and the pull request review process will alleviate some of the differences but full consistency may be difficult to achieve during the short development period.

11.7 Costs

The permitted budget for the project is $750. Being an entirely software project, the development cost of the project is expected to be small. The team plans to use free or low-cost hosting services to deploy the development build. The available budget may be used to purchase commercial framework or library to assist in the development.

Moreover, there is heavy emphasis on deploying and testing locally to further save on testing costs. These cost savings do not transfer to deployment when real customers start using the product, therefore the following estimates are highly variable and prone to noise.

11.8 User Documentation and Training

N/A

Service	Cost
Database Storage	$0/month during development, Bundled in the server hosting costs
Server Hosting	variable depending on usage, starts at $10/month
Website Domain Name	$20/year

Table 8: Costs

11.9 Waiting Room

- Auto service features that requires domain-specific knowledge such as onboard diagnostic report are valuable extensions to the tool that can be developed post-MVP.
- Customer and employee account features such as configurations and customization are not a part of the MVP but should be included in future builds.
- Artificial intelligence integration should be explored for features such as quote generation, scheduling, and analytics.

11.10 Ideas for Solutions

N/A

12 Traceablity Matrices and Graphs

	G1	G2	G3	G4	G5	G6	G7	G8	G9
UC1		X							X
UC2				X					
UC3			X	X				X	
UC4							X		
UC5				X		X			
UC6					X	X		X	
UC7	X	X			X	X			
UC8	X	X							
UC9				X		X			X
UC10				X		X			
UC11				X		X			X
UC12	X	X		X	X				
UC13						X			X
UC14						X			X
UC15	X	X		X					
UC16		X							
UC17	X	X					X		X
UC18	X	X							X
UC19			X						X
UC20		X	X						X

Table 9: Traceability Matrix between Goals and Use Cases

	UC1	UC2	UC3	UC4	UC5	UC6	UC7	UC8	UC9	UC10	UC11	UC12	UC13	UC14	UC15	UC16	UC17	UC18	UC19	UC20
AuR1	X															X				
AuR2	X															X				
AuR3	X															X				
SR1								X			X	X								
SR2								X			X	X								
SR3																				
PAR1								X												
PAR2								X												
PAR3				X											X	X				
PAR4				X				X												
PAR5																				
PAR6																				
PAR7															X					
PAR8																				
PAR9	X															X				
PAR10													X	X						
PAR11													X	X						
ApR1						X	X	X												
ApR2					X	X	X													
ApR3					X	X														
QR1				X																
QR2			X																	
SLR1																	X			
SLR2																		X		
SLR3																			X	
SLR4																				X
SLR5																				X
SLR6																		X		

Table 10: Traceability Matrix between Use Cases and Functional Requirements

	G1	G2	G3	G4	G5	G6	G7	G8	G9
LFR1		X							X
LFR2									X
LFR3		X							X
LFR4		X							X
LFR5									X
UHR1		X					X		X
UHR2	X			X			X		X
UHR3									X
UHR4									X
UHR5	X	X		X		X		X	X
PR1	X	X					X		X
PR2									X
PR3		X							X
OER1	X	X		X	X				X
OER2	X						X		X
OER3	X		X				X		X
MSR1									X
SR1		X		X				X	X
SR2				X				X	X
SR3									X
CPR1	X		X						X
CPR2	X			X			X	X	X
CPR3							X		X
CR1									

Table 11: Traceability Matrix between Goals and Non-Functional Requirements

Appendix — Reflection

The team will collectively need to acquire and hone a variety of skills, technical and otherwise, in order to successfully complete this project. The implementation of the full stack application will require fluency in languages such as Python, Javascript, HTML, and CSS, as well as applicable packages and frameworks such as NodeJS, ReactJS, and databases. For a commercially marketable product, the team will also need to practice concepts such as user-centered design in UI/UX.

Beyond technical skills, the team will learn to work together on a strict timeline through project management, communication, and constructive feedback. Such communication can include writing project documents, annotating the code, and providing or receiving feedback at regular meetings. The delivery of the final product arguably depends more on successful and consistent teamwork rather than individual technical skills.

- Alyssa Tunney
  During my work term I had the opportunity to learn about full stack web development. During this time, I developed front end skills using JavaScript and the React framework. I also had the opportunity to extensively work with Python for both the back end of the web application and also had the opportunity to use it to automate tasks to triage a continuous integration system. One aspect of full stack web development that I would like to acquire more experience and knowledge in is database management. A lot of databases I was working with were already created so I just needed to write simple SELECT queries and so I would like to acquire more knowledge in the creation of databases and the relationships between them. These databases were SQL-based, so learning more about no-SQL databases is something I am interested in as well. I plan to research side-projects that incorporate a database management system. I also plan to research online courses that can teach me more about databases. Since I learn best by doing, I plan to pursue a side-project that incorporates a database management system so I can get hands-on experience that will be memorable and beneficial to this capstone project.

- Kai Zhu
  I have worked in full stack development and currently have experience in web technologies such as Node, React as well as other application designs using C# and Python. An avid believer of learning-by-doing, I am interested to gain additional familiarity in industry development environment by working on this project using practices such as CI/CD and the feature-branch workflow.

- Christopher Andrade
  I currently have skills in front-end development using JavaScript, HTML, CSS, and frameworks like React, Redux, Sass, and more. Mostly, my skills pertain to user interface design. I now plan on learning Python back end skills to create a web server with authentication, and query data in a database, as these skills will be required for the project. These are things I haven't done much before. In order to do this, I will

reach out to colleagues of mine who are familiar in Python back end and database management, and I will also be doing tiny small projects/challenges on the side with the help of online video tutorials to learn more. The latter will be what I pursue, because in the past I learned the basics of JavaScript needed to make a front end app using that method.

- Harsh Gupta
  I have had experience in building and deploying high performance webapps at Tesla during my previous internship, where I leveraged NextJS and Python to create highly configurable static website generator with online content search functionality. Moreover, I have had experience in front-end development with TypeScript and React. This is especially important as the future platform of web is being build with frameworks like React. I plan on writing more applications around the recent breakthrough of LLM's(Large Language Models) and diffusion networks.

- Ethan Vince-Budan
  I currently do not have any experience with full stack development, although I do have some experience with languages and frameworks which may come in handy during this project. I have in the past worked on many standalone projects written in Python, Java, C, and some Lua. These projects are generally hosted on platforms which make use of git, which I have used for version control, issue tracking and a limited amount of CI/CD. Evidently I have a lot to learn about front-end development using React, which I intend to learn through online courses and forums such as Stack Overflow as I enjoy self-directed learning and experimentation. I predict that the back end workflow will be easier for me to adapt to as I have way more experience with related tech.

- Collin Kan
  I have had a lot of experience with full stack development. My experience started when I joined the DeltaHacks club here at McMaster as part of the technical team.. I was on the team for just shy of 2 years. I had to use Vue.Js, TypeScript, and Firebase (NoSQL) as part of the tech stack. I also had spent some time there designing easy to use interfaces as there would be hundreds af applicants using the application we were creating and maintaining. I also gained a good deal of experience working with the back end as part of my 12 month co-op. I used Go in order to create new APIs as well as update old, existing ones. During my 3 month co-op at Amazon, I was using TypeScript exclusively and had experience eliciting requirements, creating and writing design documents, as well as building an internal tool from he ground up using cloud (AWS) technologies, namely Lambda, DynamoDB, Step Functions, and CloudWatch/EventBridge. Outside of all this, I already had experience with Python while doing personal projects, coursework, and is my preferred programming language. Overall, I think I am well equipped with the necessary skillset in order to successfully complete this capstone project.