Software Requirements Specification for Sayyara: Progressive Web Application for Independent Automotive Repair Shop Industry

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Table 1: Revision History

Date	Developer(s)	Change
September 30, 2022	Leon So	Add purpose of project
September 30, 2022	Joy Xiao	Add stakeholders
September 30, 2022	Leon So	Add functional requirements for authentication
September 30, 2022	Arkin Modi	Add open issues and new problems sections (effects on the current environment)
October 1, 2022	Timothy Choy	Add mandated constraints
October 1, 2022	Arkin Modi	Add user documentation and training, waiting room and ideas for solutions sections
October 1, 2022	Arkin Modi	Add project planning, migration to the new product, risks, and costs sections
October 2, 2022	Leon So	Add current situation and appointment diagram
October 2, 2022	Joy Xiao	Add current situation quote and invitation diagram
October 3, 2022	Leon So	Add current situation work order diagram
October 3, 2022	Leon So	Add functional requirements for employees management
October 3, 2022	Joy Xiao	Add appointment FRs
October 3, 2022	Arkin Modi	Add planning of the development phases and new problems sections
October 3, 2022	Arkin Modi	Add off-the-shelf solutions sections
October 3, 2022	Arkin Modi	Add functional requirements for work orders
October 3, 2022	Timothy Choy	Add functional requirements for shop profile
October 4, 2022	Timothy Choy	Add functional requirements for employee profile
October 4, 2022	Leon So	Add context of work diagram
October 4, 2022	Leon So	Add SRS subtitle
October 4, 2022	Joy Xiao	Add service functional requirements
October 4, 2022	Arkin Modi	Add functional requirements for quotes
October 4, 2022	Joy Xiao	Add non functional requirements
October 5, 2022	Leon So	Add functional requirements for password reset
October 5, 2022	Arkin Modi	Add naming conventions and terminology section
October 5, 2022	Leon So	Add reflection in Appendix
October 5, 2022	Joy Xiao	Add work partitioning
October 5, 2022	Leon So	Add personas
October 5, 2022	Timothy Choy	Add functional requirements for shop lookup
October 5, 2022	Timothy Choy	Add individual product use cases
October 5, 2022	Timothy Choy	Add formal specifications

October 5, 2022	Leon So	Add relevant facts and assumptions
October 5, 2022	Arkin Modi	Add reflection
October 5, 2022	Leon So	Add reflection
October 5, 2022	Timothy Choy	Add reflection
October 5, 2022	Joy Xiao	Add reflection
October 19, 2022	Timothy Choy	Update requirements from Hazard Analysis
March 4, 2023	Timothy Choy	Update Usability and Humanity Nonfunctional Requirements
March 5, 2023	Timothy Choy	Update Performance Nonfunctional Requirement
March 5, 2023	Leon So	Remove Employee Profile requirements & remove Shop Profile update requirements
March 6, 2023	Leon So	Update Functional Requirements for Authentication
March 6, 2023	Leon So	Update Functional Requirements for Employee Management
March 6, 2023	Timothy Choy	Update Functional Requirements for Shop Lookup
March 6, 2023	Joy Xiao	Update services and appointments requirements
March 6, 2023	Arkin Modi	Update Functional Requirements for Quotes
March 6, 2023	Leon So	Update to remove emails for employee sign up
March 7, 2023	Arkin Modi	Update Functional Requirements for Work Orders
March 8, 2023	Timothy Choy	Update Usability Nonfunctional Requirement
March 8, 2023	Joy Xiao	Remove requirements for shop/employee to edit appointment time

This document describes the requirements for Sayyara. The template for the Software Requirements Specification (SRS) is a subset of the Volere template (Robertson and Robertson, 2012). This template has been modified to include personas to represent different user types. It has also been modified to add formal specifications.

1 Project Drivers

1.1 The Purpose of the Project

Independent auto repair shops do not have an efficient way of reaching and interacting with new customers. Currently, many independent shop owners rely on word-of-mouth referrals as a main channel to acquiring new customers. Independent auto repair shops are also spending a significant amount of their time on administrative work such as managing appointments and providing quotes. As a result, independent auto repair shops have a difficult time competing with larger repair shops which have dedicated systems and services in place.

On the other hand, customers do not have an effective way to find and compare auto repair shops. Currently, one of the only ways to compare repair shops is by manually searching or reaching out to repair shops one-by-one. This process can often be repetitive and time-consuming.

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. Vehicle owners can search for auto repair shops and services based on a variety of search filters; request quotes for service; book, view, and manage service appointments. On the application, auto repair shop owners will have full shop management capabilities such as: adding and managing a list of employees; managing a list of service types and corresponding service appointment availabilities; managing store information such as location, hours of operation, and contact information. Auto repair shop owners and employees will be able to manage quotes, service appointments, and work orders from a single application. Ultimately, Sayyara will significantly improve the auto repair experience for both independent auto repair shops and vehicle owners.

1.2 The Stakeholders

1.2.1 The Client

The client of the project is Nabeel Ibrahim. Nabeel will be the point of contact throughout the development of the project.

1.2.2 The Customers

The customers of Sayyara will be independent auto repair shop owners, shop employees, and vehicle owners who are looking for a vehicle repair or maintenance service.

1.2.3 Other Stakeholders

Other stakeholders of the project are the developers, Tiny Coders, who are designing and implementing the project.

1.3 Personas

1. Albert Lee is a 25 year old professional working in the accounting industry from Markham, Ontario. He has a wife and three children. Mr. Lee's family two cars: a silver 2005 Toyota Prius LE and a black 2014 Honda CRV. He commutes to Vaughan, Ontario for work. On his way to work each morning, he drops off his children at school. He prefers to drive the Prius for his work commute to save on gas. However, on weekend road trips, grocery shopping, and driving his kids to soccer practice, he prefers to drive the CRV. This is because the car is more spacious and can fit more cargo. Albert has a busy schedule, but he is adamant in making sure his cars are regularly maintained. This is because he believes that safety is important, and keeping his vehicles well-maintained will allow his vehicles to have a longer useful-life. Albert is also very cost-conscious and likes to make sure that he is getting the best value for anything he pays for.

2. David Jones is a 60 year old independent auto repair shop owner in Hamilton, Ontario. He has been operating his repair shop for over 35 years. David currently has 3 employees working for him: one receptionist, and one mechanic, and one apprentice. David splits his time working on administrative tasks, servicing cars, and overlooking the work of his employees. He is a very organized individual and expects the same from his employees. David also believes that customer service is very important, and only by providing the best value and service, can he compete with larger auto repair and maintenance franchises.

3. Alice Stark is a 22 year old Uber driver. She enjoys working for the platform due to the flexible schedule. Alice drives a 2016 Chevy Cruze. On Uber, she delivers food and provides rides to passengers. The service she offers depends on the time of day. During lunch and dinner hours, she prefers to deliver food through Uber Eats due to the higher volume of orders. She also loves interacting with people and customers, and hearing about their unique life stories. When she is not working, she enjoys spending her time meeting her friends at restaurants, hiking, and playing sports. Her car is very important to her, and it is an important part of her everyday. When she needs auto repairs or maintenance, she likes to find high quality services which use OEM parts. She does not mind paying more for quality work and parts because of how important her car is in her daily life. However, since she has a very busy day and her work depends on her car, she also cares about the service speed. It is important that her car can be repaired and fixed promptly.

4. Alex Snow is a 42 year old auto repair mechanic working at a local repair shop in Burlington, Ontario. Alex graduated as a mechanical engineer from the University of Waterloo 20 years ago. Since graduating, he decided to dedicate his time to his passion of fixing cars. He likes to maximize his time working on cars. Alex takes a lot of pride in his work, and wants to ensure that each customer is satisfied with

his work. Alex specializes in more advance repairs such as changing transmissions, engine replacements, replacing cylinder blocks, and much more. He rarely spends time on simpler services such as oil changes, brake replacement, and tire changes. These are the most common repairs the shops sees, but are usually delegated to less experienced employees in the shop.

1.4 Mandated Constraints

1.4.1 Solution Constraints

Description: The product shall be built as a Progressive Web Application (PWA)
Rationale: The supervisor wants the application to be a PWA
Fit Criterion: The product shall be written using the Next.js PWA plugin

Description: The product shall be able to function on a variety of devices, such as on a computer, on tablets and on most modern phones
Rationale: Users will be accessing this product in a variety of scenarios, and will have access to different devices
Fit Criterion: The product shall be tested to function properly on Chrome's device toolbar, which includes the following devices:

- iPhone SE
- iPhone XR
- iPhone 12 Pro
- Pixel 5
- Samsung Galaxy S8+
- Samsung Galaxy S20 Ultra
- iPad Air
- iPad Mini
- Surface Pro 7
- Surface Duo
- Galaxy Fold
- Samsung Galaxy A51/71
- Nest Hub
- Nest Hub Max

However, due to timing constraints, testing will only be run on the most popular cases, which would include the iPhone, Pixel and Samsung phones, as well as iPad and Galaxy tablets.

1.4.2 Implementation Environment of the Current System

In the current design of the product, the product shall be implemented in a cloud hosted serverless environment. In this specific case, it shall be AWS Lambda. The product itself shall also be able to function properly with any web browser and operating system.

1.4.3 Partner or Collaborative Applications

In the current design of the product, there are no partner or collaborative applications that will work along with the product. Therefore, there are no partner or collaborative constraints.

1.4.4 Off-the-Shelf Software

The following off-the-shelf software will be utilized:

- Next.js (and Next PWA)

1.4.5 Anticipated Workplace Environment

The anticipated workplace environment will be very broad. The product can be used from anywhere the user has access to a device and internet to run the application.

1.4.6 Schedule Constraints

As stated in the SFWRENG 4G06 course outline, the schedule constraints are as follows:

Table 2: Schedule Constraints

Date	**Deliverable**
Oct 19, 2022	Hazard Analysis
Nov 2, 2022	Verification and Validation Plan
Nov 14-25, 2022	Proof of Concept Demo
Jan 18, 2023	Design Document
Feb 6-17, 2023	Revision 0 Demo
Mar 8, 2023	Verification and Validation Report
Mar 20-31, 2023	Final Demo (Rev 1)
Apr 5, 2023	Final Documentation

1.4.7 Budget Constraints

The project has no monetary budget. If there are any necessary purchases for development, the cost shall be paid by the project members and reimbursed by the supervisor. Furthermore, these purchases may not exceed $750.

1.4.8 Enterprise Constraints

The project will require authentication in the form of users logging in. The current implementation of the project will require users to authenticate with a username and password. In the future, SSO may be used.

1.5 Naming Conventions and Terminology

Table 3: Naming Conventions and Terminology

Term	Definition
Progressive Web Application (PWA)	Progress Web Application use web-platform features to give users an experience on par with native applications. These features include: being installable, native notification, and offline capabilities.
Amazon Web Services (AWS)	Amazon Web Services is a cloud computing provider.
Amazon Web Services (AWS) Lambda	Amazon Web Services' serverless compute unit.
Chrome	Google Chrome is a cross-platform web browser developed by Google.
Sayyara	Sayyara is the name of the company the project supervisor operates runs and the name of the application.
Vehicle Identification Number (VIN)	A Vehicle Identification Number is an alphanumeric string containing the exact details about a car's make, model and manufacturing
Original Equipment Manufacturer (OEM)	An Original Equipment Manufacturer is the original manufacturer of a component or product.
Next.js	A React based framework.
NextAuth.js	A React based authentication library for Next.js.
React	A JavaScript library for building user interfaces.
Node.js	An open-source, cross-platform, back-end JavaScript runtime environment.

1.6 Relevant Facts and Assumptions

1.6.1 Users

1. It is assumed that users have a valid email address.
2. It is assumed that the user will have internet connection when using the application.
3. It is assumed that the user is located in Canada.

Vehicle Owners

1. It is assumed that users looking for auto repair or maintenance own at least one vehicle.

Auto Repair Shop Owners

1. For the initial version of Sayyara, there can only be one owner account per auto repair shop.
2. It is assumed that the auto repair shop is located in Canada.

Auto Repair Shop Employees

1. It is assumed that employees are only employed at one auto repair shop.

1.6.2 Services

1. It is assumed that only auto repair shop owners can add and edit the list of services.

1.6.3 Employee Management

1. For the initial version of the application, employees can only sign up using a shop ID provided by the shop owner.
2. For the initial version of the application, only auto repair shop owners can access the shop ID.
3. It is assumed that only the auto repair shop owner can edit and remove employees.

1.6.4 Other

1. For the initial version of the application, Sayyara will not process any payment transactions.

2 Functional Requirements

2.1 The Scope of the Work and the Product

2.1.1 The Current Situation

The current interactions between independent auto repair shop owners, employees, and customers (i.e., vehicle owners), are often a manual process. Outlined below are models for interactions between the independent auto repair shop owners, employees, customers, and the proposed system.

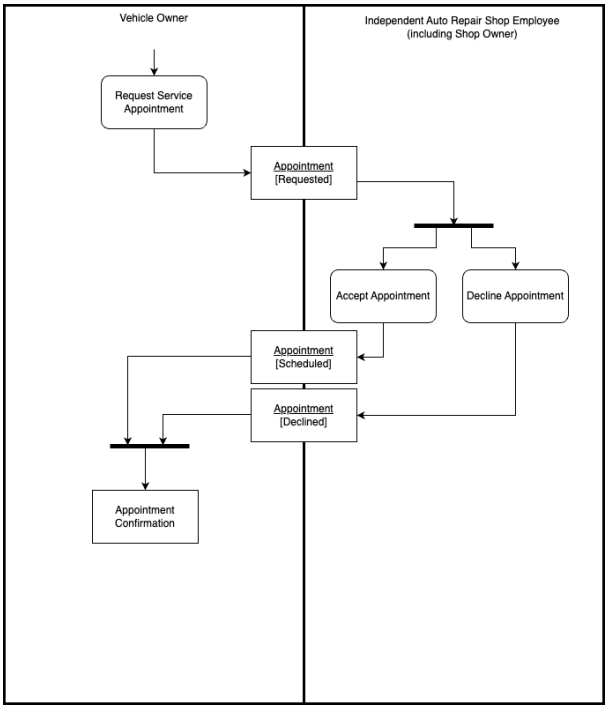

Figure 1: Service Appointments

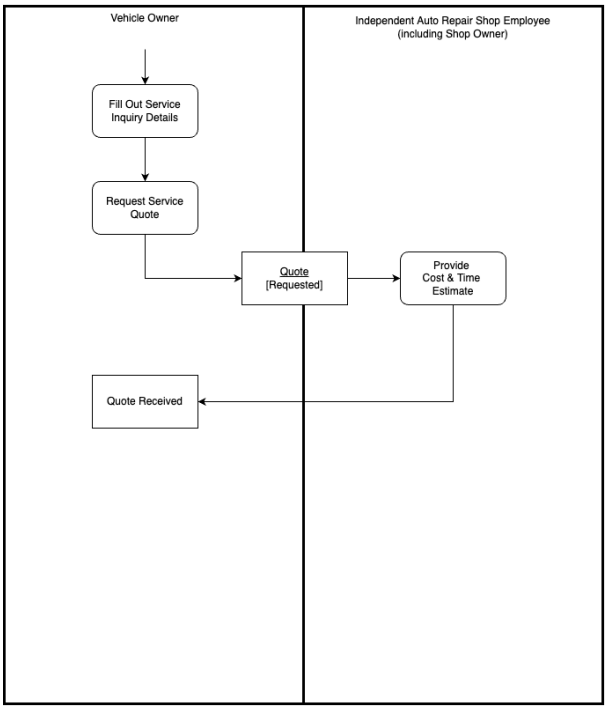

Figure 2: Service Quotes

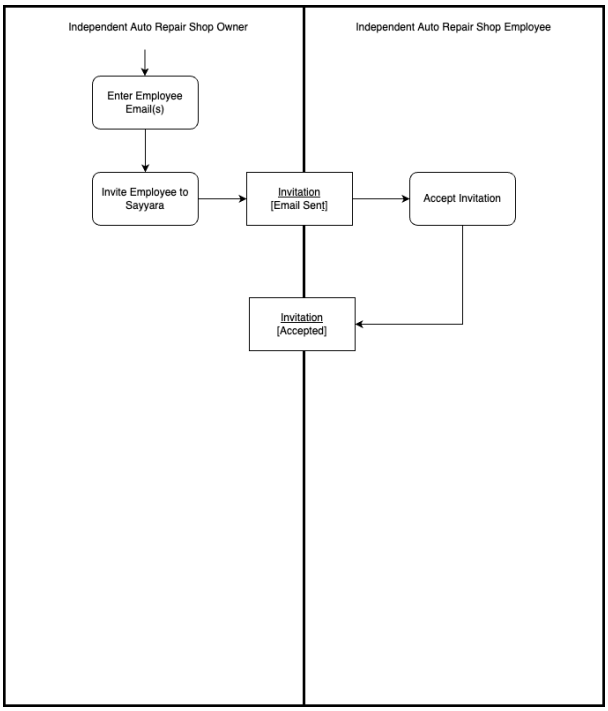

Figure 3: Employee Invitation to Join Auto Repair Shop

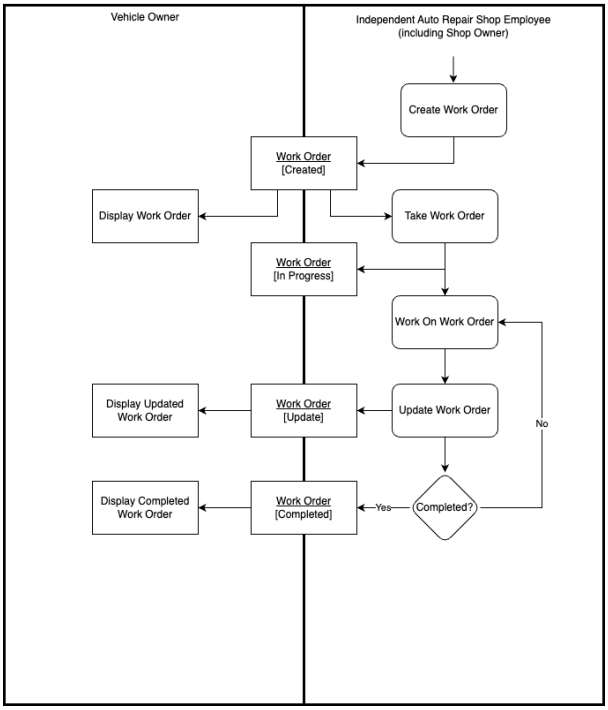

Figure 4: Work Orders

2.1.2 Context of the Work

The context diagram depicted below illustrates the interactions of the system with adjacent external systems and services.

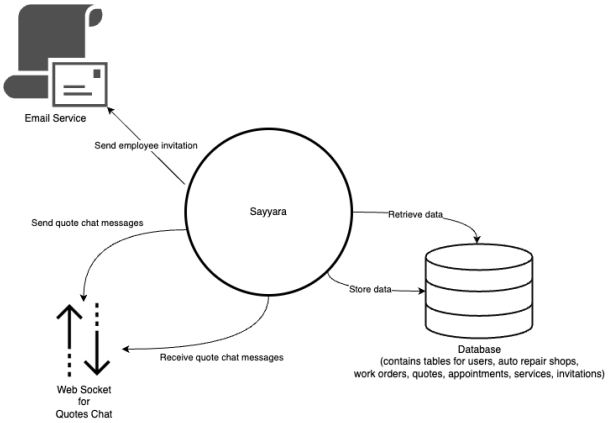

Figure 5: Context Diagram (Sayyara)

2.1.3 Work Partitioning

Table 4: Work Partitioning Events

Event Number	Event Name	Input	Output
1	Sign up for account	User	Database
2	Login to account	User	Database
3	Book appointment	Database	Database
4	Edit appointment	Database	Database
5	Cancel appointment	Database	Database
6	Set appointment availability	Database	Database
7	View past quotes	User	Database
8	View quote details	User	Database
9	Request a quote	Web Socket	Database
10	Cancel quote request	User	Database
11	Update quote request	User	Database/Websocket
12	Copy a quote request	Database	Database/Websocket
13	Respond to quote request	Websocket	Database
14	Accept quote response	Websocket	Database
15	Request additional information	Websocket	Database
16	Appointment scheduled	User	Database
17	Appointment cancelled	User	Database
18	Search for work order	User	Database

Table 5: Work Partitioning Events Continued

Event Number	Event Name	Input	Output
20	View past work orders	User	Database
21	Update work order	User	Database
22	Work order payment	User	Database/Email service
23	View work order details	User	Database
24	Invite employee to shop	User	Database/Email service
25	Search for employee	User	Database
26	View list of employees	User	Database
27	Remove employee from shop	User	Database
28	Add shop services to shop profile	User	Database
29	Search for service	User	Database
30	Edit service type	User	Database
31	Delete service type	User	Database

2.1.4 Individual Product Use Cases

Text marked in **bold** are additional information added from the Revision 0 Hazard Analysis.

Title: Creating an account for an auto repair shop
Trigger: Auto repair shop owner adds their shop to Sayyara
Pre-condition: The physical auto repair shop exists
Outcome:

1. User creates an account with a username and password
2. System registers user as a shop and prompts additional information, such as shop name, location and phone numbers
3. User enters additional information if necessary, such as services offered
4. System finalizes account with additional details and creates a new shop

Title: Creating an employee account
Trigger: Employee signs up for an account
Pre-condition: Auto repair shop account exists on Sayyara
Outcome:

1. User creates an employee account with the following fields: first and last name, phone number, email, username, password, and shop ID

2. System creates an employee account with the information

Title: Logging into Sayyara
Trigger: User launches application and selects employee login
Pre-condition: Employee/shop account exists
Outcome:

1. User enters their credentials (username and password)
2. System checks if the username and password match an account
3. If successful, system allows user to authenticate
4. If unsuccessful, system rejects authentication and shows an error message

Title: Creating a service
Trigger: Auto repair shop owner adds a service to the shop
Pre-condition: Auto repair shop account exists
Outcome:

1. User enters the service name, either from a list or manually
2. User enters a description
3. User enters the estimated time to complete the service
4. User enters the parts required or used in the service
5. System creates a service for the shop using the information provided above

Title: Viewing services
Trigger: User selects services for a particular shop
Pre-condition: Auto repair shop exists
Outcome:

1. System shows a list of services that have been registered with the selected shop
2. If no services exist, a list of default services will be displayed
3. User clicks on specific service
4. System shows additional details of the service, including the description and estimated time to completion

Title: Editing a service
Trigger: Auto repair shop owner edits a service
Pre-condition: Auto repair shop and service exist
Outcome:

1. User updates a field in the service
2. System takes the updated field and updates the service

Title: Deleting a service
Trigger: Auto repair shop owner deletes a service

Pre-condition: Auto repair shop and service exist
Outcome:

1. User selects delete on a service
2. System prompts user if they want to delete the service
3. User selects delete
4. System removes the service from the list of services for the specific shop

Title: Viewing an shop profile
Trigger: User navigates to a shop
Pre-condition: Auto repair shop exists
Outcome:

1. System displays information about the shop, such as the shop's name, address, phone number and email

Title: Creating appointment availabilities
Trigger: Auto repair shop owner navigates to the availabilities section
Pre-condition: Auto repair shop exists
Outcome:

1. System presents user with a calendar
2. User marks time slots for availabilities
3. System updates the shop with updated time slots for availabilities

Title: Creating a quote
Trigger: User navigates to their quotes and selects a new quote
Pre-condition: Sayyara is installed
Outcome:

1. User enters the customer's information (name, phone number, email)
2. User enters the car's information (year, make, model, VIN, license)
3. User enters description of work to be done
4. User enters preference on parts (e.g., new/used, OEM/aftermarket)
5. User attaches photos of vehicle
6. System compiles the information into a quote and sends it to auto repair shops

Title: Viewing quotes
Trigger: User navigates to their quotes
Pre-condition: Quote exists, auto repair shops exist
Outcome:

1. System displays quote details, including car and customer information, description of issue
2. System displays a list of auto repair shops and their quotes for the service

3. System displays a method to chat with the auto repair shops

Title: Updating a quote
Trigger: User navigates to existing quote and selects edit
Pre-condition: Quote exists
Outcome:

1. User edits fields in the quote, such as customer information or car information
2. User edits fields as shown in creating a quote
3. System updates the fields for the quote
4. System sends the updated quote to auto repair shops

Title: Cancelling a quote
Trigger: User navigates to existing quote and selects cancel
Pre-condition: Quote exists
Outcome:

1. System prompts user if they want to cancel the quote
2. User selects cancel
3. System cancels the quote and removes it from all auto repair shops

Title: Creating an appointment
Trigger: User navigates to a shop and creates an appointment for a service
Pre-condition: Auto repair shop exists, service exists, selected time slot is available
Outcome:

1. User creates a customer bio, which includes the customer's name, phone number, email
2. User enters the year, make, model, VIN, license of the car
3. User selects a service or attaches a quote
4. System present user with a list of time slots for the appointment
5. User selects a time slot
6. **Shop owner or employee accepts the appointment**
7. System creates a work order based off of the appointment
8. Auto repair shop owner assigns an employee to the work order

Title: Viewing appointments
Trigger: User navigates to list of appointments
Pre-condition: Account and appointments exist
Outcome:

1. System displays a list of appointments

Title: Editing/updating appointments
Trigger: User navigates to existing appointment and selects edit
Pre-condition: Auto repair shop exists, service exists, appointment exists, selected time slot is available
Outcome:

1. User changes fields related to the existing appointment, such as time slot or service type
2. System updates the appointment with new information
3. System notifies the auto shop owner and employee assigned to the appointment about the changes

Title: Deleting an appointment
Trigger: User navigates to an existing appointment and selects delete
Pre-condition: Auto repair shop exists, appointment exists **Outcome:**

1. System prompts user if they want to delete the appointment
2. User selects delete
3. System deletes appointment, and updates the availabilities to match
4. System deletes related work order
5. System notifies auto shop owner and employee about the deletion of an appointment

Title: Viewing a work order
Trigger: User navigates to work orders
Pre-condition: Work order exists
Outcome:

1. System displays shop details
2. System displays services to do, the rate and time required and the total price for the service
3. System displays a list of parts needed and the price per part
4. System displays the odometer reading for before and after the service
5. System displays the customer information, car information and employee assigned
6. System displays any discounts applied and sums up all the costs to provide a grand total
7. System displays a notes section for any additional notes from the shop

2.2 Functional Requirements

2.2.1 Authentication

BE1. The user wants to sign up for an account

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to enter an email and password

ii. The system shall allow the user to enter their name

iii. The system shall allow the user to enter their phone number

iv. The system shall allow the user to enter vehicle information

v. The system shall transition to the vehicle owner landing page after the registration process is complete and successful

vi. The system shall allow the user to cancel and exit the registration process

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to enter an email and password

ii. The system shall allow the user to enter their name

iii. The system shall allow the user to enter their phone number

iv. The system shall allow the user to enter the shop name

v. The system shall allow the user to enter the shop address

vi. The system shall allow the user to enter the shop phone number

vii. The system shall allow the user to enter the shop email

viii. The system shall transition to the shop owner landing page after the registration process is complete and successful

ix. The system shall allow the user to cancel and exit the registration process

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall allow the user to enter an email and password

ii. The system shall allow the user to enter their name

iii. The system shall allow the user to enter their phone number

iv. The system shall allow the user to enter a shop ID

v. The system shall transition to the employee landing page after the registration process is complete and successful

vi. The system shall allow the user to cancel and exit the registration process

BE2. The user wants to login to their account

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to enter their email and password

ii. The system shall transition to the vehicle owner landing page after the login process is complete and successful

iii. The system shall allow the user to cancel and exit the login process

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to enter their email and password

ii. The system shall transition to the shop owner landing page after the login process is complete and successful

iii. The system shall allow the user to cancel and exit the login process

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall allow the user to enter their email and password

ii. The system shall transition to the employee landing page after the login process is complete and successful

iii. The system shall allow the user to cancel and exit the login process

BE3. The user wants to logout

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to logout

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to logout

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall allow the user to logout

2.2.2 Appointments

BE4. The user wants to book an appointment

VP1. Viewpoint: Vehicle Owner

i. The system shall populate the service request information from the quote

ii. The system shall populate the service request information from the if a canned job is selected

iii. The system shall allow the user to filter available appointments times

iv. The system shall display dates and times where appointments are available

v. The system shall allow the user to select an appointment time slot to book

vi. The system shall transition to the view appointments page

vii. The system shall allow the user to cancel and exit the appointment process

VP2. Viewpoint: Auto Repair Shop Owner

N/A

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE5. The user wants to edit an appointment

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to select a scheduled appointment

ii. The system shall allow the user to select another available time slot

VP2. Viewpoint: Auto Repair Shop Owner

N/A

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE6. The user wants to cancel an appointment

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to select a scheduled appointment

ii. The system shall allow the user to cancel the appointment

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to select a scheduled appointment

ii. The system shall allow the user to cancel the appointment

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall allow the user to select a scheduled appointment

ii. The system shall allow the user to cancel the appointment

BE7. The user wants to set appointment availability

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to set the days that appointments can be made

ii. The system shall allow the user to set the hours that appointments can be made

VP3. Viewpoint: Auto Repair Shop Employee

N/A

2.2.3 Quotes

BE8. The user wants to view all quotes

VP1. Viewpoint: Vehicle Owner

i. The system shall list all quotes

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall list all quotes

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall list all quotes

BE9. The user wants to request a quote

VP1. Viewpoint: Vehicle Owner

i. The system shall automatically populate car details and contact details in the user's profile

ii. The system shall confirm to the user that the request has been submitted

iii. The system shall generate a quote ID and assign it to the newly created quote

VP2. Viewpoint: Auto Repair Shop Owner

N/A

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE10. The user wants view chat history about a quote

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to view all chat messages sent within the quote

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to view all chat messages sent within the quote

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall allow the user to view all chat messages sent within the quote

BE11. The user wants to send a chat message in the quote

VP1. Viewpoint: Vehicle Owner

i. The system shall list active quotes

ii. The system shall allow the user to send a chat message within a quote

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall list active quotes

ii. The system shall allow the user to send a chat message within a quote

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall list active quotes

ii. The system shall allow the user to send a chat message within a quote

BE12. The user wants to create an appointment invitation from a quote request

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to enter the estimated price, the estimated time, and a description of the service being performed

ii. The system shall send the appointment invitation to the customer

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall allow the user to enter the estimated price, the estimated time, and a description of the service being performed

ii. The system shall send the appointment invitation to the customer

BE13. The user would like to accept an appointment invitation from a quote

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to accept an appointment invitation

ii. The system shall navigate the user to the appointment booking process

VP2. Viewpoint: Auto Repair Shop Owner

N/A

VP3. Viewpoint: Auto Repair Shop Employee

N/A

2.2.4 Work Orders

BE14. An appointment has been scheduled

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall create a work order

ii. The system shall populate the customer data and vehicle data from the quote

iii. The system shall populate the customer data and vehicle data from the appointment if the quote is not available

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall create a work order

ii. The system shall populate the customer data and vehicle data from the quote

iii. The system shall populate the customer data and vehicle data from the appointment if the quote is not available

BE15. The user wants to view past work orders

VP1. Viewpoint: Vehicle Owner

i. The system shall list the past work orders

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall list the past work orders

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall list the past work orders

BE16. The user wants to update a work order

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall list the open work orders

ii. The system shall allow the user to edit the employee assigned, appointment status, work order title, and work order body

iii. The system shall update the work order with the entered values

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall list the open work orders

ii. The system shall allow the user to edit the employee assigned, appointment status, work order title, and work order body

iii. The system shall update the work order with the entered values

2.2.5 Employee Management

BE17. The shop owner wants to invite an employee to their shop

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the shop owner to retrieve their shop ID to invite their employee

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE18. The shop owner wants to search for an employee

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to enter search text to search for an employee

ii. The system shall display a list of employees whose name or email matches the search text

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE19. The shop owner wants to view the list of employees

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall display a list of employees

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE20. The shop owner wants to remove an employee

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to remove an employee

ii. The system shall revoke the removed employee's access to the auto repair shop employee controls

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall revoke the removed employee's access to the auto repair shop employee controls

2.2.6 Services

BE21. The user wants to add available auto shop services to the shop profile

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to enter the name of the service

ii. The system shall allow the user to enter a description for the service

iii. The system shall allow the user to enter the estimated time for the service

iv. The system shall allow the user to enter the parts used for the service including quantity, condition (new or used), build (OEM or aftermarket), and cost per part (before tax cost)

v. The system shall allow the user to enter the total price for the service (before tax price)

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE22. The user wants to search for a service on their shop profile

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall display the service details

ii. The system shall allow the user to search by service name

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall display the service details

ii. The system shall allow the user to search by service name

BE23. The user wants to edit a service

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to update the details of a particular service

VP3. Viewpoint: Auto Repair Shop Employee

N/A

BE24. The user wants to delete a service

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to delete the service from their shop page if there are no scheduled appointments for that service

VP3. Viewpoint: Auto Repair Shop Employee

N/A

2.2.7 Shop Lookup

BE25. The user wants to search for auto repair shops

VP1. Viewpoint: Vehicle Owner

i. The system shall allow the user to enter a shop name or service name

ii. The system shall allow the user to filter by part type and part condition used in the service

iii. The system shall display all auto repair shops that match the filters selected above

iv. The system shall provide a method to quickly contact the shop

v. The system shall allow the user to access additional information about a specific shop

vi. The system shall allow a method to quickly refresh the results list for the latest availability

VP2. Viewpoint: Auto Repair Shop Owner

N/A

VP3. Viewpoint: Auto Repair Shop Employee

N/A

2.2.8 Shop Profile

BE26. The user wants to view their shop's profile

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall show the user the shop's address

ii. The system shall show the user the shop's phone number

iii. The system shall show the user the shop's email

iv. The system shall show the user the shop's hours of operations (if any)

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall show the user the shop's address

ii. The system shall show the user the shop's phone number

iii. The system shall show the user the shop's email

iv. The system shall show the user the shop's hours of operations (if any)

BE27. The user wants to view a shop's profile

VP1. Viewpoint: Vehicle Owner

i. The system shall show the user the shop's address

ii. The system shall show the user the shop's phone number

iii. The system shall show the user the shop's email

iv. The system shall show the user the shop's hours of operations (if any)

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall show the user the shop's address

ii. The system shall show the user the shop's phone number

iii. The system shall show the user the shop's email

iv. The system shall show the user the shop's hours of operations (if any)

VP3. Viewpoint: Auto Repair Shop Employee

i. The system shall show the user the shop's address

ii. The system shall show the user the shop's phone number

iii. The system shall show the user the shop's email

iv. The system shall show the user the shop's hours of operations (if any)

BE28. The user wants to add or update hours of operations to their shop profile

VP1. Viewpoint: Vehicle Owner

N/A

VP2. Viewpoint: Auto Repair Shop Owner

i. The system shall allow the user to add or update the shop's hour of operations

VP3. Viewpoint: Auto Repair Shop Employee

N/A

2.3 Formal Specifications

In regards to identifying roles of users:

$(\exists a, b \in \text{users} \land a.\text{role}, b.\text{role} \in \text{employee} | a \neq b \bullet a.\text{view}(b.\text{profile}) \Rightarrow false)$
Employees cannot view one another's profiles

$(\exists a \in \text{users} \land a.\text{role}, b.\text{role} \in \text{employee} | a \neq b \bullet a.\text{edit}(b) \Rightarrow false)$
Employees cannot modify or edit another user

$(\exists a \in \text{users} \land a.\text{role} \in \text{owner} | \forall x \in \text{users} | x.\text{shop} = a.\text{shop} \bullet a.\text{edit}(x) \land a.\text{view}(x.\text{profile}) \Rightarrow true)$
Owners can view and modify all other employees that work under them

3 Non-functional Requirements

The requirements in **bold** are additional requirements from the Revision 0 Hazard Analysis.

3.1 Look and Feel Requirements

LF1. The system shall adjust and scale to fit the physical screen size

LF2. The system shall have fonts and colours that will allow users to easily read the text

LF3. The system shall display dollar amounts rounded to two decimal places

3.2 Usability and Humanity Requirements

UH1. The system shall accessible by any desktop or mobile device and any operating system

UH2. The system shall be accessible through the web browser and when the device is connected to internet

UH3. **The system shall notify the user if there is no network connection**

UH4. The system shall be easy to navigate through by a user

3.3 Performance Requirements

PR1. The system shall respond to the user's interactions in a timely manner by following good web standards as stated here.

3.4 Operational and Environmental Requirements

OE1. The system shall be able to operate on desktops and mobile devices

3.5 Maintainability and Support Requirements

MS1. The system shall be well documented

3.6 Security Requirements

SR1. The system shall keep user's data private

SR2. The system shall limit the data shown to user's on a needs to know basis

3.7 Cultural Requirements

CR1. The system shall not use any text or images that will offend anyone that will use it

CR2. The system will use Canadian English

3.8 Legal Requirements

LR1. The system shall not contain any assets which infringe on copyright claims

3.9 Health and Safety Requirements

N/A

4 Project Issues

4.1 Open Issues

There are currently no known open issues that may lead to significant change to the product or its design.

4.2 Off-the-Shelf Solutions

4.2.1 Ready-Made Products

There are existing services that solve many of the problems that this application aims to address. These include AutoLeap (https://autoleap.com), Sayaaraa (https://sayaaraa.com), and KUKUI (https://www.kukui.com). These are all paid services and most offer a trial period. Additional, these app only address the shop management aspect of the problem. Openbay (https://app.openbay.com) is an existing application that focuses on vehicle owner's needs. This application exclusively operates in the United States of America.

4.2.2 Resuable Components

There are many libraries and frameworks available that can be reused to accelerate the building process of the application. Next.js can be used to provide a framework to build the application. Next.js comes with many out-of-box solutions for common website development problems. NextAuth.js is a library designed to help simplify the authentication process. Prisma is a library designed to help simplify the communication between the application and the database. Next-PWA is a library designed to quickly bootstrap a Next.js application into a progressive web application.

A runtime and ecosystem that is available to use is Node.js. This runtime comes with a large ecosystem of packages that can be reused and leveraged for common application components, including the libraries listed previously.

All components listed above are free to use for private and commercial use.

4.2.3 Products That Can Be Copied

There are no known products available that can be legally copied for use in this application.

4.3 New Problems

4.3.1 Effects on the Current Environment

This application will change the way certain processes are preformed and these changes will impact the users.

Work Orders

The work order system will affect the way automotive mechanics document their work. The data will be inputted into the application therefore any failures can result in data loss.

Appointments

The appointments system will affect the way that both the customers and the employees schedule appointments. The application will track daily appointment schedules and report time conflicts. The application shall not lock the employee out of overriding the schedule.

Quotes

The quotes system will affect the way that both the customers and automotive repair shops communicate in the service quotation process. The quotes will now be communicated partially or completely through the application instead of completely in-person. Failure in this system may lead to a loss in data.

4.3.2 Effects on the Installed Systems

The application will be completely stand alone and will not be interfacing with any existing systems. The existing system may continue to coexist with the application at

the user's discretion.

4.3.3 Potential User Problems

Any potential adverse reactions related to using the device in which application is being launched on (e.g., computer, mobile device, tablet, etc.) would extend to the use of this application. The application will not introduce any new adverse reactions to the user.

4.3.4 Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

The database is not able to sustain the number of connections to serve all requests.

4.3.5 Follow-Up Problems

Any failures or downtime of third-party integrations may impact the overall availability and operation of the application. These integrations include the database service provider, the email server, and websocket provider. Additionally, this application will be dealing with user data. As privacy laws around the world are getting stricter, there is a possibility application violates these future laws that do not currently exist.

4.4 Tasks

4.4.1 Project Planning

The project schedule will follow the deadline for the deliverables outlined in the SFWRENG 4G06 course outline.

Table 6: Project Tasks

Phase	**Task**	**Due Date**
Phase 1	Hazard Analysis	October 19, 2022
	Verification and Validation Plan	November 2, 2022
	Proof of Concept Demonstration	November 14, 2022
	Design Documentation	January 18, 2023
	Revision 0 Demonstration	February 6 — 17, 2023
Phase 2	Verification and Validation Report	March 8, 2023
	Final Demonstration	March 20 — 31, 2023
	Final Documentation	April 5, 2023

4.4.2 Planning of the Development Phases

The development of the project will be conducted in two phases:

1. Initial development of application and documentation
2. Refinement of application and documentation

Phase 1 is where the bulk of the application will be designed and implemented. The design of both the components of the application and how the components will interact will de developed. Additional, Phase 1 is where most of the documentation and report will be written. Phase 1 will end with the Revision 0 Demonstration. Here the stakeholders will see the application implementation and be able to provide feedback.

Phase 2 will be focused on refining the application and the documentation. There is expected to be no new major feature development and instead, all efforts will be focused on incorporating the stakeholders' feedback into the application.

4.5 Migration to the New Product

4.5.1 Requirements for Migration to the New Product

There are no requirements for migrating to the new product.

4.5.2 Data That Has to Be Modified or Translated for the New System

No data needs to be modified or translated to the new system.

4.6 Risks

- Failures in the work orders and quotes workflow may lead to data loss.
- Failures in the appointments workflow may lead to a loss in appointment or conflicting appointments.
- Failure to meet deadlines will cause setbacks in project's timeline. In the event of this, lower priority requirements may need to be dropped.

4.7 Costs

There are no financial costs associated with the development of this application. All software and cloud infrastructure used are free to use. There will be about six months of development time required.

4.8 User Documentation and Training

4.8.1 User Documentation Requirements

The application will feature a "Getting Started" guide, where it shall guide the user through the most common use cases. For vehicle owners, the use cases will include: searching for shops, requesting quotes, and scheduling appointments. For automotive shops, the use cases include: setting shop details, managing appointments, managing employees, responding to quotes, and managing work orders.

4.8.2 Training Requirements

Knowledge of how to navigate a website will be required. Documentation concerning detailed usage of the website's user flows will be provided to the user.

4.9 Waiting Room

There are currently no requirements that are not part of the initial release.

4.10 Ideas for Solutions

During the requirements collection and understanding phase, there were also ideas on how to implement the solution.

- Form
  - With the constraint that this application to be a PWA, the idea of using a React-based framework, specifically Next.js.
- Authentication
  - To handle authentication, using emails and passwords, with the package NextAuth.js.
  - Creating a dedicated endpoint in the backend for looking up user information.

References

James Robertson and Suzanne Robertson. *Volere Requirements Specification Template*. Atlantic Systems Guild Limited, 16 edition, 2012.

5 Appendix

5.1 Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Lifelong Learning. Please answer the following questions:

1. **What knowledge and skills will the team collectively need to acquire to successfully complete this capstone project? Examples of possible knowledge to acquire include domain specific knowledge from the domain of your application, or software engineering knowledge, mechatronics knowledge or computer science knowledge. Skills may be related to technology, or writing, or presentation, or team management, etc. You should look to identify at least one item for each team member.**

   The team members will need to collectively acquire a set of unique skills to complete and succeed in this capstone project. Some skills and knowledge outlined below are critical not only for the delivery of the course deliverables and project milestones, but also in the individual team member's success moving forward in their software engineering careers. Some skills and knowledge will be necessary specifically for the implementation, development, and deployment of application.

   1. Domain knowledge and skills specific to the development and deployment of PWAs
   2. Writing and documentation in software engineering processes and software lifecycle
   3. Presentation skills relevant for the McMaster Software Engineering Capstone Expo
   4. Testing of PWAs and related technologies to be used in this project
   5. Team management including time management, work distribution, and collaboration
   6. Communication skills with key stakeholders
   7. Statefully managing front-end components
   8. Framework specific knowledge such as Next.js, React

2. **For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? Of the identified approaches, which will each team member pursue, and why did they make this choice?**

   For acquiring the relevant skills, the team members will reference various resources available such as course and educational content, online resource, industry resources and papers. For technology-specific domain knowledge and skills, team members

can refer to online resources such as reading official documentation (for e.g., published by React, Next.js, etc.), YouTube tutorials, and various other tutorials. For soft skills such as communication, time management, and presentation skills, team members can leverage LinkedIn Learning as a platform for educational courses in these areas. Team members can also take advantage of workshops and resources provided by McMaster University. For writing skills and documentation, team members can refer to past examples provided by the course, past coursework, online resources, and course material. All the above skills can also be developed through hands-on experience throughout the course of the capstone project.

Listed below under each team member's name is a list of skills which the team member will focus on for the duration of this project.

Arkin Modi

Chosen Skills: 2., 4., 5., 6., 8.

Soft skills are important for any project, and are something that is continually improved upon. This is why Arkin has identified 5 and 6 as skill he would like to focus on. Documentation is a large portion of the capstone project and with Arkin having taken a year off for co-op, reviewing the details on how to write the reports will prove to be a valuable skill. Technical skills 4 and 5, were chosen based on areas of interest. Testing and taking advantage of built-in framework tools are going proving important in completing the capstone in a complete and progressional manner. These are Arkin's reasons for choosing these skills to focus on improving.

For soft team skills (5 and 6), Arkin will be utilizing YouTube tutorials and online articles. These were chosen due to Arkin's familiarity with learning in a destructured and focused style. These approaches allow for solving problem directly faced in the capstone. For technical writing (2), Arkin will refer to past work from previously taken courses. As the capstone is a culmination of the program, past course work is highly relevant. Arkin will also reference online articles discussing best practices and industry standards for documentation. For technical skills (4 and 8), Arkin will rely on learning from YouTube tutorials and official documentation. This approach is based on experience as this is how Arkin has started learn the majority of his development skills. These are approaches Arkin will use and his rational on why.

Joy Xiao

Chosen Skills: 2., 3., 4., 5., 7.

I chose these parts because I think it would be very important for our project. Writing and Documentation is very important because a lot of our deliverables are writing documents. I will also need to work on my presentation skills for the capstone expo. I will also have to learn how to do testing on PWAs and for the front end. This can be done through looking at online resources such as youtube videos and looking at online resources such as StackOverflow. I will learn testing skills through watching some youtube videos. After trying to test by myself I will consult StackOverflow if I run into any issues. Communication is very important

also especially communicating with the stakeholders of the project. I will also be learning Next.js and React for this project and will learn this through watching online tutorials and doing React online lessons. I will choose doing lessons to learn React because it is less time consuming than finding and watching tutorials. Online lessons will also have more hands on work to help me learn React.

Leon So

Chosen Skills: 1., 2., 3., 5., 8.

Leon has chosen to improve and develop skills related to the technologies used such as PWAs and Next.js, because these skills are crucial to the success of the project. These skills will also be useful for future industry work experiences. He has also chosen to improve on documentation and writing skills as this is again an important skill to have in industry. This skill be highly applicable to the project and capstone deliverables. Leon also chose to improve on presentation skills because this has been a self-identified weakness which he has continually worked on improving. Leon will take this opportunity to further improve on presentation skills in preparation for the expo. This skill will also help him success in his later career. All the above skills were chosen strategically, to not only improve on the skills necessary to succeed in this project, but also for personal and professional growth and development.

To gain domain specific knowledge related to PWAs, Next.js, and other relevant technologies, Leon will refer to official documentation, online resources, and tutorials. These approaches align well with methods to gain knowledge and skills in industry. For documentation, Leon will refer to course material and industry standards. This will ensure that the documentation Leon produces will meet the standards and expectations of the industry and educational system. To improve on presentation skills, communication skills, team management skills, and time management skills, Leon will leverage LinkedIn Learning as a platform to gain knowledge in this area. LinkedIn Learning is a great platform to learn such skills as many courses provide exercises and quizzes to reinforce learning. LinkedIn Learning also has a wide selection of resources and material, many of which is developed by professionals in the relevant fields.

Timothy Choy

Chosen Skills: 2., 5., 6., 7., 8.

Timothy will focus his efforts on non-technical skills such as team management and communication, as well as technical skills such as writing and documentation, statefully managing front-end components, and learning framework-specific knowledge. Timothy believes that the soft skills are universally beneficial for his professional career, regardless of what software he decides to create. Regarding the technical skills, Timothy would like to expand his front-end toolbox to be able to more effectively create and build applications. Next.js and stateful React will be important tools that will complement what Timothy already knows.

The approach that Timothy will take for developing his soft skills will be through working on the current course work, and taking up positions in the the team that will

allow him to improve on his leadership and management skills. Timothy believes that his best method of learning and growth is through action, and he will not hesitate to take this opportunity during this capstone. He will also complement learning through the capstone with other managerial courses taken this semester (the Engineering and Management capstone). The approach that Timothy will take for developing his technical skills will be through reading official documentation and informational videos, usually through Youtube. This choice was made because Timothy learns best through looking at examples and finding ways to apply these examples in his own code.

5.2 Symbolic Parameters