Deliverable #1: Software Requirement Specification (SRS)

SE 3A04: Software Design II – Large System Design

Tutorial Number: T03
Group Number: G8
Group Members: Hashim Bukhtiar, Jaden Moore, James Ariache, Olivia Reich, Omar Abdelhamid

- Hashim Bukhtiar
- Jaden Moore
- James Ariache
- Olivia Reich
- Omar Abdelhamid

IMPORTANT NOTES

- Be sure to include all sections of the template in your document regardless whether you have something to write for each or not
  - If you do not have anything to write in a section, indicate this by the *N/A*, *void*, *none*, etc.
- Uniquely number each of your requirements for easy identification and cross-referencing
- Highlight terms that are defined in Section 1.3 (**Definitions, Acronyms, and Abbreviations**) with **bold**, *italic* or underline
- For Deliverable 1, please highlight, in some fashion, all (you may have more than one) creative and innovative features. Your creative and innovative features will generally be described in Section 2.2 (**Product Functions**), but it will depend on the type of creative or innovative features you are including.

1 Introduction

The SRS is a structured document that outlines the functional and non-functional requirements of the RideRecon software system. It serves as a blueprint for developers, testers, and stakeholders, ensuring a clear understanding of the system to be built. This SRS will provide visibility over software requirements for RideRecon, a taxi rideshare application. This document will discuss the purpose of RideRecon, the scope of the application, user characteristics, product requirements, and use case diagrams.

1.1 Purpose

The document focuses on software requirements, user characteristics, and use cases for RideRecon. The purpose of this SRS is to define the software's objectives, scope, and functionalities. This document is intended for internal RideRecon stakeholders, including but not limited to, project managers, developers, domain experts, and RideRecon team members/investors. No prior readings are required.

1.2 Scope

RideRecon, the car identification application, will allow users to upload an image and text about a vehicle that they want to identify, consulting up to four "Experts" who will use all or some of the user's input to determine the make and model of the car that has been depicted.

Users are required to register an account on RideRecon in order to access the car identification service. The service includes four experts: "RIS", "G8M", "4oE" and "vAI". The "RIS" expert performs a reverse image search with the user's given image to identify the car. The "G8M" expert is a trained machine learning model by the developers that utilizes an optimized database of car images and their corresponding makes and models to identify the user's car. The "4oE" expert is the Large Language Model GPT-4o-mini, accessed through OpenAI's API, which will utilize both the image and the text description to identify the car. Finally, the "vAI" expert is also an LLM, this one hosted on Google Cloud Platform using Vertex AI, specifically the Gemini 1.0 Flash Model, also accessed through its API.

RideRecon's objective is not only to identify users' vehicles, but also to deliver other innovative and creative features. For example, once the car has been identified, 4oE will provide an interesting fact about the car, adding more depth and intrigue to it, as well as provide sources and listings for where to purchase the car, allowing the user to go one step further and save time if they are interested in making that vehicle their own.

One of the goals of the software is to increase users, as more users will lead to more cars being identified and added to the optimized database of G8M, and thus better car identification overall, which is even better for future users. Another goal would be to to monetize its user base by offering premium features like better expert access, exclusive community forums, or partnerships with car-related businesses, thereby creating additional revenue streams beyond the core car identification service. This diversification will improve long-term sustainability and profitability.

1.3 Definitions, Acronyms, and Abbreviations

LLM: Large Language Model. A sophisticated artificial intelligence that can understand, generate, and translate human language, often used for tasks like text generation, question answering, and translation.

RIS: Reverse Image Search. This is the idea of using an image as a search query in a browser to find results, rather than using text as traditional browser searches as performed.

G8M: Group 8 Model. This is the model trained by the developers of RideRecon to identify cars. It will utilize an optimized dataset of car images and makes and models.

4oE: GPT-4o-mini. This is an LLM that uses text and images to determine the make and model of the user's car.

vAI: Vertex AI, Gemini 1.0 Flash. This is the LLM that uses images to determine the make and model of the user's car.

Finalizer: The component of the system that consolidates and finalizes the output, including resolving conflicts between experts and outputting the fun fact about the car and where to purchase it.

1.4 References

- Provide a complete list of all documents referenced elsewhere in the SRS.
- Identify each document by title, report number (if applicable), date, and publishing organization.
- Specify the sources from which the references can be obtained.
- Order this list in some sensible manner (alphabetical by author, or something else that makes more sense).
- `https://play.google.com/store/apps/details?id=ru.egoroffsoft.avtopix&hl=en_CA&pli=1`
- `https://play.google.com/store/apps/details?id=com.mm999.car&hl=en_CA`

1.5 Overview

Section 2 discusses the overall product description talking about the product perspective, product functions, user characteristics, assumptions and dependencies, and apportioning of requirements.

Section 3 contains the Use Case Diagram for the use case scenario of creating a carpool.

Section 4 contains the highlights of functional requirements talking about main business events and viewpoints.

Section 5 contains the Non-Functional Requirements talking about Look and Feel Requirements, Usability and Humanity Requirements, Performance Requirements, Operational and Environmental Requirements, Maintainability and Support Requirements, Security Requirements, Cultural and Political Requirements and Legal Requirements.

Lastly, **Section A** contains the Division of Labour.

2 Overall Product Description

2.1 Product Perspective

RideRecon is a mobile app for car identification that is developed to be compatible with the Android platform.Similar to products such as AvtoPix [insert reference] and CarsSnap [insert reference], it will allow car identification through images while also enhancing search capabilities by also allowing identification through textual descriptions. The product will allow users to create a profile and edit account information linked to that profile. This includes the creation of virtual car collections using car images submitted in the app.

Once an image is selected by the user, the product will have an interface that allows it to interact with different reverse image search technologies. Specifically, it will be able to access a Vertex AI image model and the Reverse Image Search Tool via Google.

If provided textual input by the user, the product will have an interface to interact with Google Search. This interface will also be used to search for relevant car facts that can be returned to the user upon identifying pivotal car identification information.

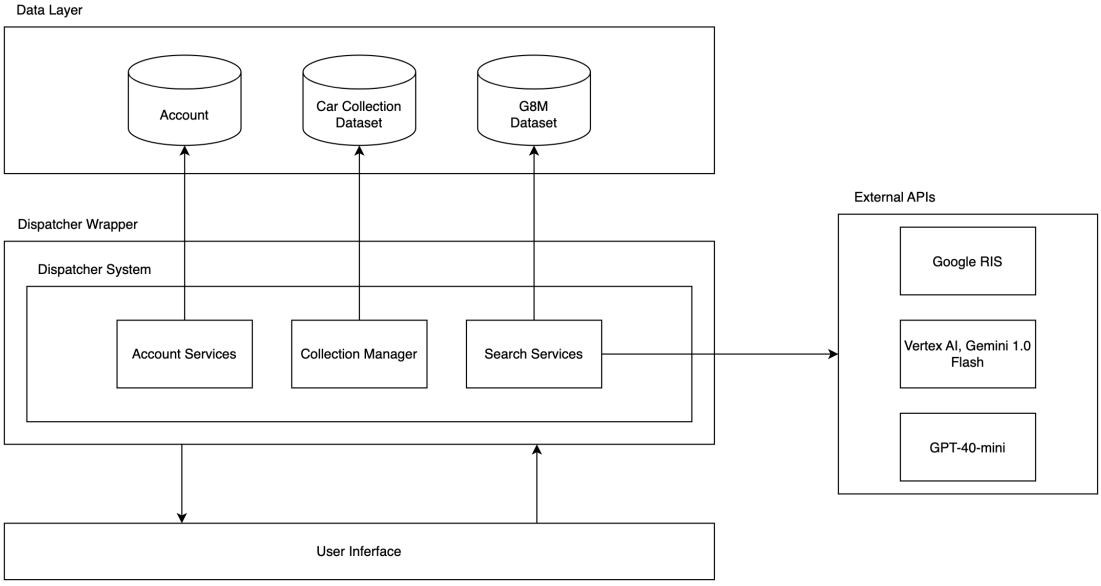


Figure 1. System Diagram

2.2 Product Functions

There will be 3 modules in the product. Each module focuses on different major functions within the product, which have been defined in the table below.

Modules	Functions

Account Services	• Create an account
	• Login and logout of account
	• Update account information
	• Account recovery
	  – allow user to reset password if forgotten
	• Authenticate account
	  – verifies contact information only done during account creation or recovery

Search Services	• Image search
	  – allow user to request car identification through an image
	• Text search
	  – allow user to request car identification through text descriptors
	• Present car information
	  – displays all relevant identification information
	  – displays 'fun fact' information
	• Confirm car identification
	  – allow user to confirm whether the identified information matches the car
	• Add car to collection
	  – allow user to add identified car to specified 'Car Collection'

Collection Manager	• Create new collection
	  – allow user to create new sub-class in their car collection
	• View collection
	  – allow user to select and view a car collection

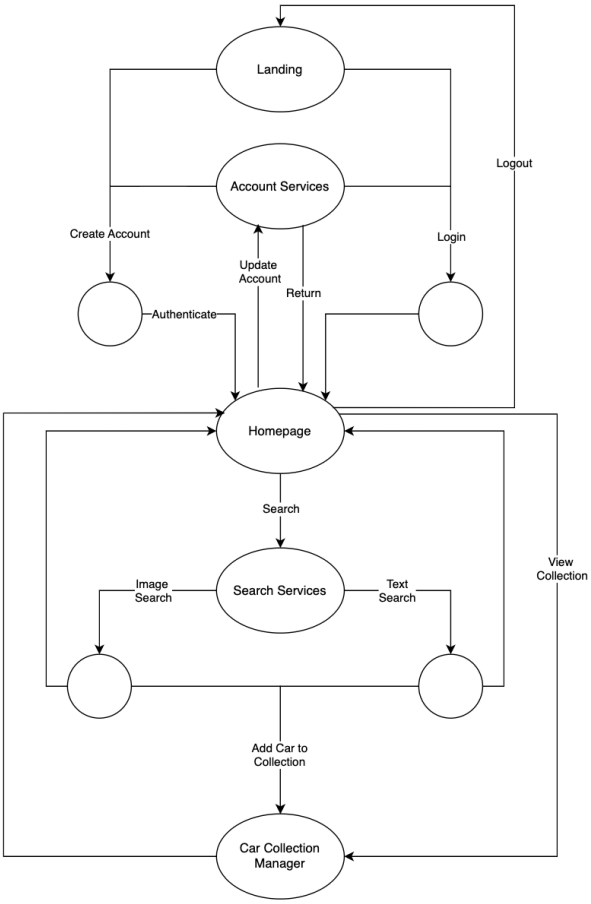


Figure 2. State Diagram

2.3 User Characteristics

- **Educational Level:** Users must have basic literacy skills which includes the fundamental ability to understand information through reading, writing, listening, and speaking.
- **Technical Expertise:** Users should have a basic understanding of how to operate and navigate an Android smartphone, including downloading apps, as this application is designed specifically for the Android platform.
- **Technical Experience:** Users do not require any prior experience or knowledge with cars in order to utilize the app. Aside from the basic technical expertise outlined above, no extra experience will be required to navigate and utilize the features of the app as it will prioritize an intuitive design.

2.4 Constraints

- Provide a general description of any constraints that will limit the developer's options
- The system must have an active **internet connection** to perform car identification.
- The app must be compatible with **Android 8.0 (Oreo) and above**.
- The device must have at least **2GB of RAM** for smooth operation.
- Captured images must have a **minimum resolution of 720p** to ensure accurate car identification.
- The AI model may not recognize **damaged or heavily modified cars** accurately.

- The system must comply with **privacy laws** regarding the storage and processing of user-uploaded images.

2.5 Assumptions and Dependencies

- List any assumptions you made in interpreting what the software being developed is aiming to achieve
- List any other assumptions you made that, if it fails to hold, could require you to change the requirements
  - **Example**: An assumption may be that a specific operating system will be available on the hardware designated for the software product. If, in fact, the operating system is not available, the SRS would then have to change accordingly.
- **Assumptions:**
  - Users will have stable internet access while using the app.
  - The AI model can identify most common car brands and models.
  - Dealerships will provide accurate and up-to-date pricing.
- **Dependencies:**
  - The AI model relies on an external **machine learning API** to process images.
  - The system depends on a third-party **reverse image search API** (e.g., Google Lens, TinEye) for validation.
  - Pricing and specifications are sourced from **external dealership databases**.

2.6 Apportioning of Requirements

- Identify requirements that may be delayed until future versions of the system
- **Offline Mode**: The app currently requires internet access; an offline model will be explored in future versions.
- **Multiple Car Detection**: Initially, the app will support one car per image; future updates may allow multiple cars.
- **Personalized Car Recommendations**: The first version won't suggest similar cars, but this may be added later.

3 Use Case Diagram

- Provide the use case diagram for the system being developed.
- You do not need to provide the textual description of any of the use cases here (these will be specified under "Highlights of Functional Requirements").

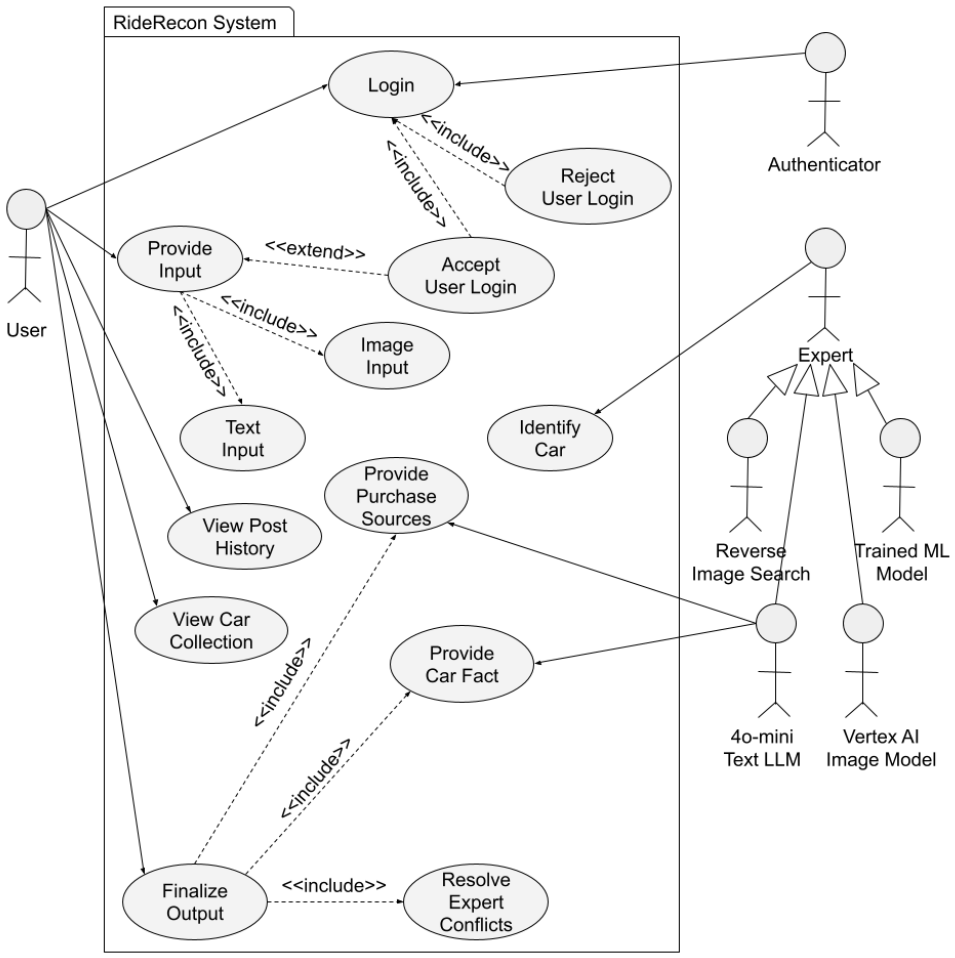


Figure 3. Use Case Diagram

4 Highlights of Functional Requirements

- Specify all use cases (or other scenarios triggered by other events), organized by Business Event.
- For each Business Event, show the scenario from every Viewpoint. You should have the same set of Viewpoints across all Business Events. If a Viewpoint doesn't participate, write N/A so we know you considered it still. You can choose how to present this - keep in mind it should be easy to follow.
- At the end, combine them all into a Global Scenario.
- Your focus should be on what the system needs to do, not how to do it. Specify it in enough detail that it clearly specifies what needs to be accomplished, but not so detailed that you start programming or making design decisions.
- Keep the length of each use case (Global Scenario) manageable. If it's getting too long, split into sub-cases.
- You are *not* specifying a complete and consistent set of functional requirements here. (i.e. you are providing them in the form of use cases/global scenarios, not a refined list). For the purpose of this project, you do not need to reduce them to a list; the global scenarios format is all you need.
- Red text below is just to highlight where you need to insert a scenario - don't actually write it all in red.

Main Business Events: List out all the main business events you are presenting. If you sub-divided into smaller ones, you don't need to include the smaller ones in this list.

- BE1. Create Account
- BE2. Authenticate User
- BE3. Upload Text and/or Image as Input
- BE4. Compare Expert Answers
- BE5. Present Final Output With Identification Information
- BE6. Add to or Remove From Car Collection

Viewpoints: List out all the viewpoints you will be considering.

- VP1. Users
- VP2. Customer Support (RideRecon)
- VP3. Marketing (RideRecon)
- VP4. Accounting (RideRecon)
- VP5. Dealership

Interpretation: Specify any liberties you took in interpreting business events, if necessary.

- NA.

BE1. Create Account #1

VP1. Users #1
Insert Scenario Here

VP2. Customer Support (RideRecon) #2
Insert Scenario Here

VP3. Marketing (RideRecon) #3
Insert Scenario Here

VP4. Accounting (RideRecon) #4
Insert Scenario Here

VP5. Dealership #5
Insert Scenario Here

Global Scenario:
Insert Scenario Here

BE2. Authenticate User #2

VP1. Users #1
Insert Scenario Here

VP2. Customer Support (RideRecon) #2
Insert Scenario Here

VP3. Marketing (RideRecon) #3
Insert Scenario Here

VP4. Accounting (RideRecon) #4
Insert Scenario Here

VP5. Dealership #5
Insert Scenario Here

Global Scenario:
Insert Scenario Here

BE3. Upload Text and/or Image as Input #3
Pre-Condition: The user must be authenticated in the system and must have an active internet connection. The user must either provide an image of the car or enter a textual description. If using an image, the device must have a functioning camera or access to stored images.

VP1. Users #1
Main Success Scenario
1. The user selects an image OR enters text describing a car.
2. If an image is provided, the system checks its quality: If acceptable, the system processes the image. If blurry, the system prompts the user to retake the photo.
3. If text is provided, the system extracts key information and performs a database search.
4. The system provides instant feedback while processing.
5. The user receives results, including car specifications and pricing (if available).
6. The system sends the input data to the Experts for processing.

Secondary Scenario
6i. User provides an image, but it is blurry or unclear.
6ii. System detects poor image quality and prompts the user to re-upload a clearer image.
6iii. User does not have an image and enters text instead.
6iv. System prompts the user to refine their text description if it is too vague.
6v. The Experts detect that the provided image and text do not match the same car model.
6vi. System prompts the user to confirm or edit the text description to match the uploaded image.

VP2. Customer Support (RideRecon) #2
NA

VP3. Marketing (RideRecon) #3
NA

VP4. Accounting (RideRecon) #4
NA

VP5. Dealership #5
9i. The system determines that the dealership database lacks a match for the provided input.
9ii. The dealership can request to update the system database to ensure their listings appear in future searches.

Global Scenario:
Main Success Scenario
1. User opens the RideRecon app on their device.
2. System requires the user to log in and displays the login fields.
3. User enters login credentials.
4. System authenticates the user.
5. System prompts the user to upload an image or enter a text description of the car they want to identify.
6. User uploads an image or enters a text description.
7. System verifies the uploaded image quality and processes it.
8. System processes the text description using language processing and matches potential vehicles.
9. System sends the input data to the Experts for processing.

Secondary Scenario
6i. User provides an image, but it is blurry or unclear.
6ii. System detects poor image quality and prompts the user to re-upload a clearer image.
6iii. User does not have an image and enters text instead.
6iv. System prompts the user to refine their text description if it is too vague.
9i. The Experts detect that the provided image and text do not match the same car model.
9ii. System prompts the user to confirm or edit the text description to match the uploaded image.

BE4. Compare Expert Answers #4

VP1. Users #1
Insert Scenario Here

VP2. Customer Support (RideRecon) #2
Insert Scenario Here

VP3. Marketing (RideRecon) #3
Insert Scenario Here

VP4. Accounting (RideRecon) #4
Insert Scenario Here

VP5. Dealership #5
Insert Scenario Here

Global Scenario:
Insert Scenario Here

BE5. Finalize and Present Output With Identification Information #5
Pre-Condition: All experts have processed input and obtained their final answer for the make and model of the car.

VP1. Users #1
Main Success Scenario
1. User opens the RideRecon app on their device.
2. System requires the user to log in and displays the login fields.
3. User enters login credentials.
4. System authenticates the user.
5. System prompts the user to upload an image and text description of the car they want to identify.
6. User uploads an image with some text description of their car.
7. The input data is sent to the Experts for processing.
8. All Experts come to the same conclusion about the make and model of the car.
9. The Finalizer displays the make and model of the car, as well as the fun fact and where to purchase the car.
Secondary Scenario
6i. User doesn't have both forms of input.
6ii. System prompts the user to provide the missing form of input.
6iii. Available form of input is given to the Expderts which will do their best to determine the car.
8i. The Experts come to different conclusions about the make and model of the car.
9i. The Finalizer displays all Expert answers, with a recommendation on which is most likely based on how many Experts came to the same conclusion.
9ii. The Finalizer also obtains fun facts and purchase information about ALL cars that the Experts concluded on.

VP2. Customer Support (RideRecon) #2
NA

VP3. Marketing (RideRecon) #3
NA

VP4. Accounting (RideRecon) #4
NA

VP5. Dealership #5
9i. The given dealership was not chosen as a source of purchase.
9ii. They can contact RideRecon to ensure that they are more likely to be chosen as the preferred purchase source.

Global Scenario:
Main Success Scenario
1. User opens the RideRecon app on their device.
2. System requires the user to log in and displays the login fields.
3. User enters login credentials.
4. System authenticates the user.
5. System prompts the user to upload an image and text description of the car they want to identify.
6. User uploads an image with some text description of their car.
7. The input data is sent to the Experts for processing.
8. All Experts come to the same conclusion about the make and model of the car.
9. The Finalizer displays the make and model of the car, as well as the fun fact and where to purchase the car.

Secondary Scenario
6i. User doesn't have both forms of input.
6ii. System prompts the user to provide the missing form of input.
6iii. Available form of input is given to the Expderts which will do their best to determine the car.
8i. The Experts come to different conclusions about the make and model of the car.
9i. The Finalizer displays all Expert answers, with a recommendation on which is most likely based on how many Experts came to the same conclusion.
9ii. The Finalizer also obtains fun facts and purchase information about ALL cars that the Experts concluded on.

BE6. Add to Car Collection #6
Pre-Condition: The user must be logged into their account.

VP1. Users #1
Main Success Scenario
1. User accesses their car collections through the icon on the homepage.
2. User chooses the add to car collection icon.
3. System prompts the user to choose a car from their past identification history.
4. User selected an identified car.
5. System prompts the user to choose a car collection.
6. User selects an existing car collection to add the identified car to.
7. The input data is sent to the Experts for processing.
8. System provides a review of changes to car collection and prompts the user for verification.
9. User verifies changes and returns to homepage.

Secondary Scenario
1i. User chooses to add a car to a collection immediately after identification. Skip VP1.2 & VP1.3.
2i. No past identified car. Return to homepage.
8i. User declines changes. No modification made to car collection and return to homepage.

VP2. Customer Support (RideRecon) #2
NA

VP3. Marketing (RideRecon) #3
NA

VP4. Accounting (RideRecon) #4
NA

VP5. Dealership #5
NA

Global Scenario:
Main Success Scenario
1. User accesses their car collections through the icon on the homepage.
2. User chooses the add to car collection icon.
3. System prompts the user to choose a car from their past identification history.
4. User selected an identified car.
5. System prompts the user to choose a car collection.
6. User selects an existing car collection to add the identified car to.
7. The input data is sent to the Experts for processing.
8. System provides a review of changes to car collection and prompts the user for verification.
9. User verifies changes and returns to homepage.

Secondary Scenario
1i. User chooses to add a car to a collection immediately after identification. Skip VP1.2 & VP1.3.
2i. No past identified car. Return to homepage.
8i. User declines changes. No modification made to car collection and return to homepage.

5 Non-Functional Requirements

- For each non-functional requirement, provide a justification/rationale for it.
  Example:
  SC1. *The device should not explode in a customer's pocket.*
  Rationale: Other companies have had issues with the batteries they used in their phones randomly exploding [insert citation]. This causes a safety issue, as the phone is often carried in a person's hand or pocket.
- If you need to make a guess because you couldn't really talk to stakeholders, you can say "We imagined stakeholders would want...because..."
- Each requirement should have a unique label/number for it.
- In the list below, if a particular section doesn't apply, just write N/A so we know you considered it.

5.1 Look and Feel Requirements

5.1.1 Appearance Requirements

LF-A1.

5.1.2 Style Requirements

LF-S1.

5.2 Usability and Humanity Requirements

5.2.1 Ease of Use Requirements

UH-EOU1.

5.2.2 Personalization and Internationalization Requirements

UH-PI1.

5.2.3 Learning Requirements

UH-L1.

5.2.4 Understandability and Politeness Requirements

UH-UP1.

5.2.5 Accessibility Requirements

UH-A1.

5.3 Performance Requirements

5.3.1 Speed and Latency Requirements

PR-SL1.

5.3.2 Safety-Critical Requirements

PR-SC1.

5.3.3 Precision or Accuracy Requirements

PR-PA1.

5.3.4 Reliability and Availability Requirements

PR-RA1.

5.3.5 Robustness or Fault-Tolerance Requirements

PR-RFT1.

5.3.6 Capacity Requirements

PR-C1.

5.3.7 Scalability or Extensibility Requirements

PR-SE1.

5.3.8 Longevity Requirements

PR-L1.

5.4 Operational and Environmental Requirements

5.4.1 Expected Physical Environment

OE-EPE1.

5.4.2 Requirements for Interfacing with Adjacent Systems

OE-IA1.

5.4.3 Productization Requirements

OE-P1.

5.4.4 Release Requirements

OE-R1.

5.5 Maintainability and Support Requirements

5.5.1 Maintenance Requirements

MS-M1.

5.5.2 Supportability Requirements

MS-S1.

5.5.3 Adaptability Requirements

MS-A1.

5.6 Security Requirements

5.6.1 Access Requirements

SR-AC1.

5.6.2 Integrity Requirements

SR-INT1.

5.6.3 Privacy Requirements

SR-P1.

5.6.4 Audit Requirements

SR-AU1.

5.6.5 Immunity Requirements

SR-IM1.

5.7 Cultural and Political Requirements

5.7.1 Cultural Requirements

CP-C1.

5.7.2 Political Requirements

CP-P1.

5.8 Legal Requirements

5.8.1 Compliance Requirements

LR-COMP1.

5.8.2 Standards Requirements

LR-STD1.

A Division of Labour

Include a Division of Labour sheet which indicates the contributions of each team member. This sheet must be signed by all team members.

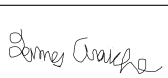
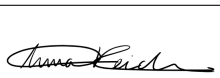
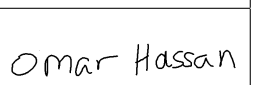
Hashim Bukhtiar	Jaden Moore	James Ariache	Olivia Reich	Omar Abdelhamid
1.1, 1.2, 1.3, 1.4, 1.5 Section 3 BE5 in Section 4	5.3, 5.4, 5.5, 5.8 BE2 in Section 4	5.1, 5.2, 5.6, 5.7 BE1 in Section 4 BE4 in Section 4	2.1, 2.2, 2.3 BE6 in Section 4	2.4, 2.5, 2.6 BE3 in Section 4
				

Table 1: Division of Labour