University of Windsor

School of Computer Science

https://cs.uwindsor.ca

Master of Applied Computing

COMP-8117

Advanced Software Engineering Topics

FINAL REPORT

For

WinAssist

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Table of Contents

1. Introduction

1.1 Project Overview

The main objective of WinAssist is to assist the people of Windsor. WinAssist is a web-based mobile application that can benefit the people in Windsor and the new immigrants.
Therefore, the application will help people to explore the city and feel welcomed. As of phase one, WinAssists provides a tour of the University of Windsor followed by information about SIN and GIC for international students.

1.2 Purpose and Scope

The application WinAssist serves the following features:

1. Helping students, residents, or any individual to get information about the places by using a simple AR marker. The international students can simply go to a particular place and scan the AR marker. The useful information will appear on the AR screen.
2. The application provides information about the GIC and SIN to the international student to make the process easy for them.

When the team members of WinAssist landed in Canada, the university was working online. There were not many people to help. To get the information on Leddy Library and CAW center we needed to ask for assistance. To avoid this, we can simply now scan the AR marker with the help of WinAssist.
The University of Windsor already uses a tablet to scan the covid QR code to check the status of self-assessment for a particular student. The same tablet can be extended to use the AR marker that can provide information about the particular place. This further signifies the proof of concept that it can work.

1.3 Team WinAssist Roles and Responsibilities

The Project WinAssist has 4 teams responsible for various tasks. Each team member was assigned a team and had to complete the tasks for the particular team while remaining in contact with all other teams. The teams were as follows:

1. **Research and Development Team**

The Research and Development team is mainly responsible for research on the customer needs and the market. This helps to improve the quality of the product and make it in accordance with the customer's needs. In WinAssist, the Research and development team consisted of 4 members and they were responsible for the research done to create the application and then provide information throughout the project.

The team members are :

1. Pawan Shukla
2. Abinaya Elanchezhian
3. Mehardeep Singh
4. Ashmi Mary Joseph

2. Design Team

The design team is responsible for creating the user interface of the application and focuses on the user experience. We need to create a design that fulfills all the needs of the client and it is easy for them to use. In WinAssist, the Design Team consisted of 2 members and they were responsible for creating a design for a user-friendly application.

The team members are :

1. Faiza Iqbal
2. Tanisha Chhabra

3. Development Team

The development team is responsible for creating the application and developing the entire application. They are responsible for building a suitable product using the appropriate tech stack while considering given constraints. In WinAssist, the development team was in constant interaction with all the other teams to build the product according to the requirements.

The team members are :

1. Mehardeep Singh
2. Ashmi Mary Joseph
3. Jatin Bindra

4. **Quality Assurance**

   The quality assurance team is responsible for exploring the information related to the common issues and bugs. New test cases were updated periodically as the development of the project continued. In WinAssist, we had a team of one person who was responsible for the quality assurance of the project.

   The team member is:

   1. Abinaya Elanchezhian

5. **Scrum Master**

   A scrim master is responsible to guide the team together for the continuous progress of the product, organize and conduct scrum calls.

   The scrum master for WinAssist is Ashmi Mary Joseph.

1.4 Requirements/Needs

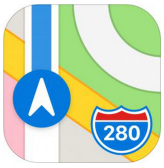
After analysis and discussions about the current models, the outlined needs are;

- An open platform where new immigrants can just step in without contact information barriers.
- A one-stop platform for all location-specific needs (nearby banks for GIC, Car rentals, Medical facilities/pharmacies, hotspots in and around the university, etc.) of a new student in the Windsor region.
- A new student needs accurate and correct contact or information of the places they have to visit.

1.5 Market Study

The market study was done in the initial stages of project development during sprint 1. All the members of the WinAssist team were extensively involved in the process. We researched several applications on the play store and research papers on the internet. We critically analyzed the merits and the demerits of the various applications available.

The below table depicts the outcome of our market study.

S.NO	APP	PROS	CONS
1	Street Food Vancouver 	• Distances are not specified in the metric system. So it's a little confusing for new users. • Does not contain information about the food joint's website or other contact details.	• Last updated 7 yrs ago. • Fewer food trucks are using the app.
2	MapQuest 	• Offers multiple routes to choose from. • Allows you to book hotel and restaurant reservations. • Shows the various options for best gas prices on the way. • Works on both iOS & Android.	• Not available offline. • Too many ads. • The Map version is a little small to view the tiny details.
3	Mapfactor Navigator 	• Maps are up to date and the database is huge due to OpenStreetMap data. • Has current maps for most countries in the world.	• Only for Android. • Doesn't give up-to-date traffic information. • Features like alternate routes require a yearly subscription.
4	Street view Map 360 	• Easily find hotels, restaurants, banks, etc. • Includes panoramic images and live view features.	• Cannot help students getting GIC and SIN. • Requires subscription, not free to use.
5	Algo app 	• Wide range of services for medicines • Stores user-health history	• Doesn't help with navigation to a pharmacy • Requires registration and signup

2. Project Management Plan

2.1 Project Organization

WinAssist has used the Scrum-Agile framework for the Development of the project. We chose it so that we could quickly adapt to the changing requirements as well as it would be more manageable for the team to focus on definite functionalities of each sprint.
At the beginning of each sprint, tasks were assigned to each team member on the JIRA Software board. After the objective of the sprint was clear, each member worked on their tasks and reported their progress on the scrum calls. We also discussed the blockers that teams faced in scrum calls that helped develop a better feasible product.
In each sprint, all the members of the design team, development Team, Rnd Team, and QA team had their roles and responsibilities. Therefore, we were able to develop our product in an organized and structured manner.

2.2 Development Lifecycle Method

2.2.1 Introduction

Software Development Lifecycle involves a series of steps and processes for the development and maintenance of a software product. This model covers detailed plans for acquiring requirements from the client or customer, development of the software based on the business ideas and requirements, followed by operational software maintenance.

Therefore, we must choose the right SDLC methodology based on our requirements for the project, delivery timelines, company management hierarchy, and team members.

The various SDLC models include the Waterfall model, V-shaped model, Spiral Method, Agile model to name a few. Each one of the models has its advantages and disadvantages, and it is crucial to know which one suits our project context in the best possible manner.

Keeping our use case scenarios and end-user products in mind, we know the requirements and solutions may evolve throughout the development process timelines. Hence, Scrum Agile Model would be our way to achieve a successful software product.

2.2.2 Agile Methodology Framework - SCRUM

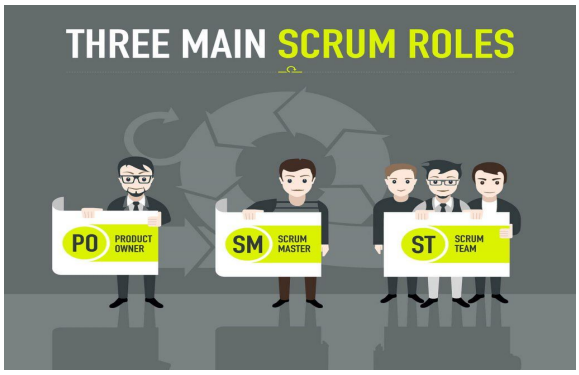
1. Scrum - Agile Model is an iterative and incremental process where there is flexibility to adapt changes on developing the product.
2. The result is a satisfied customer with a high-quality product.

3. In this approach there is transparency in communication, each person is well aware of his/her tasks and there will be continuous progress on the product.

2.2.3 Roles in SCRUM

The roles in a scrum includes :

1. A **PRODUCT OWNER (PO)** is the representative for the customer or end-user, who will be using our product. It is the responsibility of the PO to create the product vision and translate this vision to the team. The PO breaks down his vision into a set of user stories. These user stories are also reviewed by the team members so that they are aware of what is being asked of them.
2. A **SCRUM MASTER (SM)** is responsible for keeping the scrum up to date. It is the SM's job to guide the team together for the continuous progress of the product. For our team, Ms. Ashmi acted as the scrum master.
3. The **SCRUM TEAM** is the professional team members which include software developers, designers, quality assurance engineers, and analysts. They together work on the development of the product by carrying out the user stories in each sprint

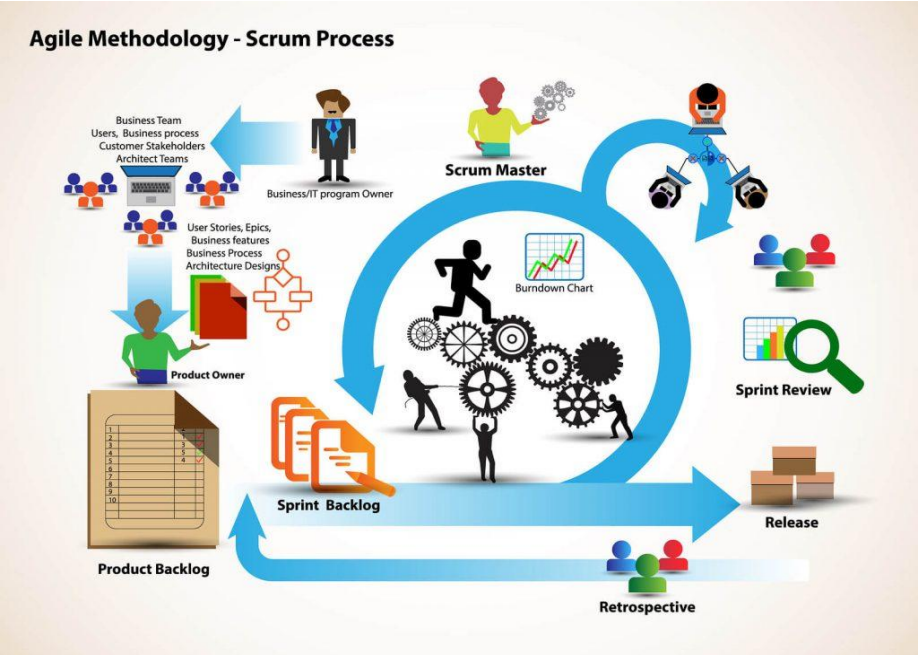


Roles is Scrum

2.2.4 SCRUM Process

1. When we follow the Scrum-Agile methodology for software development, the product is delivered to the client/customer in regular intervals.
2. The product owner takes feedback and suggestions from customers and stakeholders. As per the feedback, the PO creates a list of features that should be added to the product. This list will be the Product Backlog.
3. The scrum team or development team will take up features from the product backlog and add those to the product. This process will keep repeating to make the product better.

4. Scrum adds some additional processes throughout the development phase of the software. The person who helps in facilitating these processes is the Scrum Master.
5. A scrum team works in sprints, which in case of WinAssist was 2 weeks.
6. Sprint planning is conducted at the very beginning of each sprint. This meeting is attended by the scrum team, and scrum master. Together they will pick out features from the product backlog so that it can be delivered in one sprint. This list of selected features is known as sprint backlog.



Scrum-Agile Process

7. Each team will work on the sprint backlog throughout the ongoing sprint. During the sprint, daily or twice a week scrum meetings will be held to discuss the status of the tasks assigned to them.
8. The outcome of each sprint will get the team closer to the final product.
9. Post the sprint, there will be two rituals - Sprint Review and Sprint Retrospection.
   Sprint Review - the scrum team will showcase what was the outcome of the sprint (more like a demo of added features)
   Sprint Retrospection - the team contemplates what went well and the areas to improve in the next sprint.

2.3 Project Planning

2.3.1 Provisional Planning

WinAssist project has its own goals and deliverables. For the desired end product, we require detailed project planning and management. Since we are using Scrum Agile Model, our action plan is to have a sprint of 2 weeks each. With each sprint, we as a team would pick up a set of tasks from the product backlog and work towards the completion of those tasks.

Following is detailed provisional planning of the WinAssist Project. There are a total of 5 iterations or sprints, starting from September 20, 2021, to November 26, 2021; along with 2 mandatory milestones meetings. The provisional planning provides a clear direction to the project.

- **ITERATION 1 -** [Sep 20, 2021 - Oct 3, 2021]

Provisional Tasks	Provisional Assignee
1. Implementation of Project Proposal	Entire Team
2. Setting up tasks in JIRA for each sprint	Ashmi
3. Initial prototype and features of the end product	Faiza, Tanisha
4. Setting up project structure in GITHUB	Pawan, Mehardeep, Jatin
5. First Screen - Animation-based Welcome Screen	Mehardeep, Jatin, Ashmi
6. Market Study	Abinaya

- **ITERATION 2 -** [Oct 4, 2021 - Oct 9, 2021]

Provisional Tasks	Provisional Assignee
1. Research on the Windsor Tour for WinAssist	Pawan

2. Run POC for a map view of the application	Ashmi
3. Explore AR libraries	Jatin, Mehardeep
4. Initial Test case scenarios	Abinaya
5. Determine different screens for WinAssist	Faiza, Tanisha

- **ITERATION 3 -** [Oct 19, 2021 - Oct 29, 2021]

Provisional Tasks	Provisional Assignee
1. Update QA report for the new scenarios	Abinaya
2. Design screens for WinAssist	Faiza, Tanisha
3. Implement AR features	Jatin, Mehardeep, Ashmi
4. Categorizing Windsor Tour Places	Pawan

- **ITERATION 4 -** [Nov 1, 2021 - Nov 12, 2021]

Provisional Tasks	Provisional Assignee
1. Design screens for SIN and GIC	Faiza, Tanisha
2. Integrate AR features	Jatin, Mehardeep, Ashmi
3. Final Report Documentation	Pawan
4. Charts and diagrams for project	Abinaya

- **ITERATION 5 -** [Nov 15, 2021 - Nov 26, 2021]

Provisional Tasks	Provisional Assignee

1. Final design changes	Faiza, Tanisha
2. Integrate all screens and features	Jatin, Mehardeep, Ashmi
3. Quality Assurance Plan	Abinaya
4. Final Report structure content plan	Pawan

2.3.2 Effective Planning

Based on the provisional planning for WinAssist, tasks were planned accordingly for each sprint to meet the requirements and the scenario given to us. Following is the effective planning of each sprint with the help of JIRA Software.

- **ITERATION 1 -** [Sep 20, 2021 - Oct 3, 2021]

Tasks	Assignee
1. Project Proposal Description - Create a project proposal to define the use cases and discuss the market study, technology to be used, cost analysis and risk analysis of WinAssist.	Abinaya, Ashmi, Faiza, Jatin, Meherdeep, Pawan, Tanisha
2. Setup JIRA Software for WinAssist team members Description - Add tasks in JIRA software in product backlog and give JIRA access to all team members.	Ashmi
3. Initial prototype and features of the end product Description - Create a design mock of the application as per the scenarios	Faiza, Tanisha
4. Setting up project structure in GITHUB Description - Create the skeleton of the project in React and give access to all team	Jatin, Mehardeep, Pawan

members to the public repository. Add a README file as well	
5. Market Study Description - Research on the existing navigation based products and analyse the merits, demerits and features in them.	Abinaya

- **ITERATION 2 -** [Oct 4, 2021 - Oct 9, 2021]

Tasks	Assignee
1. Shortlist places for UWindsor Tour Description - Combine a list of places that will be included in the university of Windsor tour. The places finalized should be one of the most visited by the university students or a hotspot or an emerging one.	Pawan
2. Determine facts on the shortlisted places of UWindsor Tour Description - Once the places are shortlisted, collect facts about the places that can be added in the Ar screen.	Pawan
3. Document initial test cases of the WinAssist as per the known scenarios Description - Create a sheet and all possible scenarios that should be checked in the project	Abinaya
6. Determine different scenarios of WinAssist and design screens for them Description - Create a mock of all the screens and decide the color scheme of the application	Faiza, Tanisha
7. POC for map view with users current location	Ashmi

Description - Verify if the implementation of adding users current location in the google map is possible	
8. Explore AR Libraries Description - Determine the library that can used in WinAssist	Jatin, Mehardeep

- **ITERATION 3 -** [Oct 19, 2021 - Oct 29, 2021]

Tasks	Assignee
1. Final Report Documentation Structure	Abinaya
2. Create a list of hotspots in Windsor which are 200m apart from each other	Pawan
3. Show different location information on AR screen when user is in the location	Ashmi
4. The user should be navigated to AR Screen if his current location matches with the location of the tour place	Jatin
5. Create a AR marker so that on scanning that we get the content on AR screen	Mehardeep
6. User design for SIN and GIC tasks	Faiza, Tanisha
7. Update the test case sheet based on new scenarios	Abinaya
8. Initial project deployment	Jatin
9. Categorize the list of places for UWindsor Tour	Pawan
10. Create content for SIN and GIC screens	Abinaya

11. Develop UI screen for Windsor Tour	Ashmi
12. Develop UI screen for main screen	Jatin
13. Navigate to the required AR screen	Ashmi

- **ITERATION 4 -** [Nov 1, 2021 - Nov 12, 2021]

Tasks	Assignee
1. Final Report Content structure	Pawan, Tanisha
2. Create the Gantt charts for first 3 sprints	Abinaya
3. Use case models for WinAssist	Faiza
4. Integration of the main screen, Windsor Tour and AR screen	Jatin, Mehardeep, Ashmi

- **ITERATION 5 -** [Nov 15, 2021 - Nov 26, 2021]

Tasks	Assignee
1. Develop UI screens for SIN and GIC	Jatin, Mehardeep
2. Integrate the features for newcommers to canada; Add alert popup before redirection to AR screen	Ashmi
3. Gantt chart for Sprint 4; Project Management Plan	Abinaya
4. Final Report documentation structure	Faiza, Tanisha, Pawan

2.3.3 Cumulative Flow Diagram

The cumulative flow diagram shows the status of the project WinAssist from Sep 20, 2021 to Nov 26, 2021 in JIRA Software Board.

Cumulative Diagram

2.3.4 Gantt Diagrams

Gantt chart is a chart in which a series of horizontal lines shows the amount of work done or production completed in specific periods to the amount tasks planned for those periods.

- **Sprint - 1 :**

	Task Name	Start	Finish	Assignee	% Complete
1	Sprint 1	09/20/21	10/03/21		100%
2	Setting up JIRA	09/28/21	10/03/21	Ashmi	100%
3	Project Proposal part 1	09/28/21	09/29/21	Abinaya	100%
4	Project Proposal part 2	09/28/21	09/29/21	Pawan	100%
5	Initial prototype part 1	09/28/21	10/01/21	Faiza	100%
6	Initial prototype part 2	09/28/21	10/01/21	Tanisha	100%
7	Github proj structure part 1	09/28/21	10/04/21	Jatin	100%
8	Github proj strucute part 2	09/28/21	10/04/21	Mehardeep	100%

Sprint 1: Gantt Chart Diagram

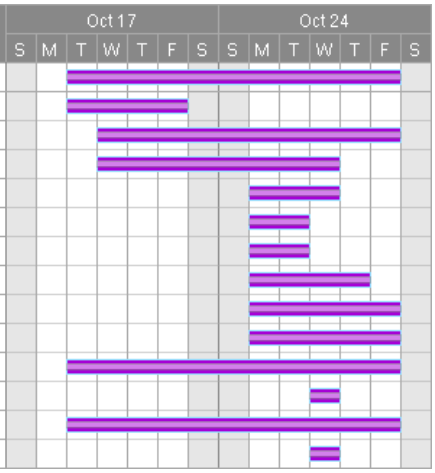
- **Sprint - 2 :**

	Task Name	Start	Finish	Assignee	% Complete
1	Sprint 2	10/04/21	10/09/21		100%
2	Shortlist places Windsor tour	10/04/21	10/08/21	Pawan	100%
3	Determine fun places in tour	10/04/21	10/08/21	Pawan	100%
4	Create UWidsor tour map	10/04/21	10/08/21	Pawan	100%
5	Document initial testcases	10/04/21	10/06/21	Abinaya	100%
6	Determine views for Winassist	10/04/21	10/08/21	Faiza	100%
7	Mock design for welcome screen	10/04/21	10/08/21	Tanisha	100%
8	Welcome screen POC	10/04/21	10/08/21	Jatin	100%
9	Show pop up alerts POC	10/04/21	10/08/21	Ashmi	100%
10	Map view of current user location POC	10/04/21	10/08/21	Ashmi	100%
11	Panel for core features POC	10/04/21	10/08/21	Mehardeep	100%

Sprint 2: Gantt Chart Diagram

- **Sprint - 3 :**

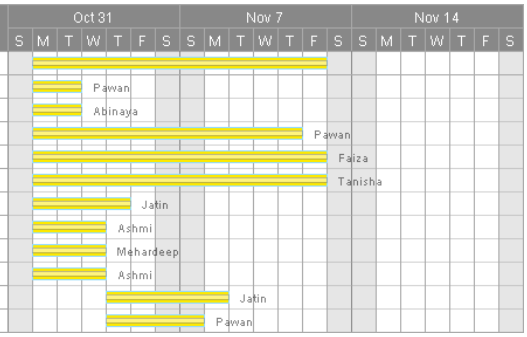
	Task Name	Start	Finish	Assignee	% Complete
1	Sprint 3	10/19/21	10/29/21		100%
2	Update QA report	10/19/21	10/22/21	Abinaya	100%
3	UX for first time user	10/20/21	10/29/21	Faiza, Tanisha	100%
4	Navigation from Ar screen to ap	10/20/21	10/27/21	Mehardeep	100%
5	Initial deployment	10/25/21	10/27/21	Jatin	100%
6	Categorize places in Windsor to	10/25/21	10/26/21	Pawan	100%
7	Create content (SIN,GIC)	10/25/21	10/26/21	Abinaya	100%
8	UI screen Windsor tour	10/25/21	10/28/21	Ashmi	100%
9	UI screen Splash screen	10/25/21	10/29/21	Jatin	100%
10	Visibility only for mobiles	10/25/21	10/29/21	Mehardeep	100%
11	Final Report	10/19/21	10/29/21	Abinaya, Pawan	100%
12	Button to open AR link	10/27/21	10/27/21	Jatin	100%
13	Collaborate for final report	10/19/21	10/29/21	Faiza, Tanisha	100%
14	Add functionality of responsive	10/27/21	10/27/21	Jatin	100%



Sprint 3: Gantt Chart Diagram

- **Sprint - 4 :**

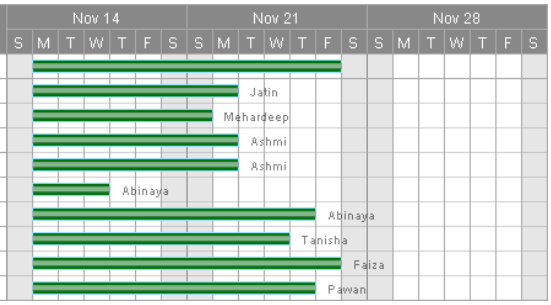
	Task Name	Start	Finish	Assignee	% Complete
1	Sprint - 4	11/01/21	11/12/21		100%
2	Shortlist subheading for final report	11/01/21	11/02/21	Pawan	100%
3	Gantt charts for sprint 1, 2 and 3	11/01/21	11/02/21	Abinaya	100%
4	Research on pert charts	11/01/21	11/11/21	Pawan	100%
5	Create UML for Winassist flows	11/01/21	11/12/21	Faiza	100%
6	Create initial draft of final report	11/01/21	11/12/21	Tanisha	100%
7	Intergrate splash screen with windsor tour	11/01/21	11/04/21	Jatin	100%
8	Integrate Windsor tour with AR screen	11/01/21	11/03/21	Ashmi	100%
9	Integration of back button to w-tour	11/01/21	11/03/21	Mehardeep	100%
10	Adding location checks	11/01/21	11/03/21	Ashmi	100%
11	Deploy web app	11/04/21	11/08/21	Jatin	100%
12	Create map of SIN and GIC locations	11/04/21	11/07/21	Pawan	100%



Sprint 4: Gantt Chart Diagram

- **Sprint - 5 :**

	Task Name	Start	Finish	Assignee	% Complete
1	Sprint 5	11/15/21	11/26/21		100%
2	GIC UI screen	11/15/21	11/22/21	Jatin	100%
3	SIN UI screen	11/15/21	11/21/21	Mehardeep	100%
4	Integrating features	11/15/21	11/22/21	Ashmi	100%
5	Alert Box for redirection	11/15/21	11/22/21	Ashmi	100%
6	Gantt chart sprint4	11/15/21	11/17/21	Abinaya	100%
7	Project Mgmt Plan	11/15/21	11/25/21	Abinaya	100%
8	Draft Final report	11/15/21	11/24/21	Tanisha	100%
9	Final Presentation	11/15/21	11/26/21	Faiza	100%
10	SRS document	11/15/21	11/25/21	Pawan	100%



Sprint 5: Gantt Chart Diagram

2.4 Risk Management

Risk management is a process wherein the team members of a software development project keep track of the risks related. Risk management is an essential part of any software development project.

2.4.1 Steps involved in Risk management

1. Identify the risk - The first step is to identify the risk as soon as it occurs and involve the team members and make them aware.
2. Analyze the risk - The next step is to analyze the risk and measure its severity and impact areas.
3. Prioritize the risk - If there is more than one risk, prioritization should be carried out, and the whole team should proceed accordingly.
4. Treat the risk - After prioritizing, we have to start treating the risk to solve the issues of the product.
5. Monitor the risk - Once you are all set with the treating plan, monitor the risk and treat it according to the plan whenever it occurs.

2.4.2 Risks associated with WinAssist and mitigation plans

1. **AR.js impact**

Our product depends on the AR.js library, and if it changes in the future, then our product will be directly impacted. To mitigate this risk, we have to constantly develop the functionalities of our product to lessen the dependency. It can happen if we follow the software development lifecycle adequately.

2. **Scalability**

Our product is hosted on Netlify, and it cannot handle a huge crowd since it might crash down. It is a risk that exists currently. To mitigate this risk, we need access to pro versions of Netlify or other hosting servers such as AWS. It will help us improve scalability in the long run.

2.5 Impact of the project on individuals and organizations

The project is mainly focussed to help the newly arriving international students by providing various information about obtaining SIN number, GIC activation and other nearby stores. Without such an application providing collective information about the various things on a single click, it will be very hard for the newcomers. This application will greatly reduce the stress of finding various locations, timings and services. It is a boon for anybody visiting Windsor for the very first time. The city has two major educational institutions namely, University of Windsor and St.Clair College. Hence, the number of students newly arriving at Windsor is high. Thereby, the application will never go outdated as students keep arriving at Windsor thrice every year for each intake.

3. Main Features and Elements

3.1 Introduction

Technology has played a vital role in this pandemic. Throughout this pandemic, technology has helped each one of us in our way. From online grocery shopping applications to contact tracing applications and being in touch with people through social media apps. This list is endless. COVID-19 has definitely created new opportunities in the field of technology and has resolved various social and environmental issues. While much progress is still needed, the COVID-19

pandemic has highlighted the importance of technology in these tough times and has improved the traditional approaches as well.

With the world getting back to their routine, so are students returning to schools/colleges/universities. With travel restrictions being eased, many international students are joining in or returning to Windsor. Therefore, the main objective of our product is to help students get comfortable and feel welcomed in the new place.

3.2 Core features

Our focus is to develop a product with features that would help both new and returning students as well as residents in Windsor.

1. Students can easily use this application on their mobile and get updates about various locations and explore the city. The students do not have to log in with any credentials to use this application which makes it more hassle-free.
2. Right after the splash screen, users will be redirected to the main screen where they can either explore the University of Windsor or complete tasks as a newcomer to Canada.
3. The core features include,
   1. A list of most visited places of the University of Windsor and learn various facts about the place.
   2. Helping students find nearest Service Canada and Banks as per their current location for applying their SIN and for GIC activation
4. The future scope of the product will have various tours of the city covering numerous markets, streets, walking trails, and updates on upcoming events. This can be used by people of Windsor as well as tourists.

4. Requirements Specification

4.1 Overall Description

4.1.1 Product Perspective

COVID-19 has certainly changed the way we approach many things now. It has made the world more technology-oriented and has forced people to learn many new things in order to survive. It has made people self-sufficient in many ways. WinAssist is designed while keeping that principle in mind. It allows students to be independent in a new challenging environment and makes sure they do not miss out on important things.

4.1.2 Product Functions

1. Students can easily use this application on their mobile and get real-time updates about their location and explore the UWindsor campus. The students do not have to login with any credentials to use this application which makes it hassle-free.
2. A tour of the University of Windsor which will take them to all the hotspots at the university and learn various fun facts while on tour.
3. Helping students find nearest Service Canada and Banks as per their current location for applying their SIN and for GIC activation.

4.1.3 User Classes and Characteristics

WinAssist is anticipating the majority of its users to be new international students coming to Canada. We have designed the application to be straightforward and easy to use. It does not require any technical expertise. Any person able to operate a smartphone will be able to navigate through the application easily.

4.1.4 Operating Environment

Hardware requirements:

1. Any modern smartphone running Android or iOS operating system.
2. GPS
3. Camera

Software requirements:

1. Any modern browser on a smartphone such as Google Chrome, Safari with webgl and webrtc.

2. AR.js: It is a lightweight library for Augmented Reality on the Web, with features like Image Tracking, Location based AR and Marker tracking.

3. React : It is a javascript library used for building user interfaces.

4.1.5 Design and Implementation Constraints

The major constraint during the development of WinAssist is time. Along with time, there is a lack of expertise on required frameworks and technologies to develop an AR application.

4.1.6 Assumptions and Dependencies

1. The web browser should support webgl and webrtc.
2. The CPU should be fast enough to support image tracking.
3. GPS sensors should be calibrated to be as accurate as possible.

4. The mobile device camera should be accessible.

4.2 External Interface Requirements

4.2.1 Hardware Interfaces

WinAssist is platform-independent. It does not depend upon the operating system of the mobile device. A web browser is enough to allow the application to work as intended. It interfaces with the smartphone’s camera to place 3D objects in the real physical world and uses GPS sensors in the smartphone to determine the user's location.

4.2.2 Communications Interfaces

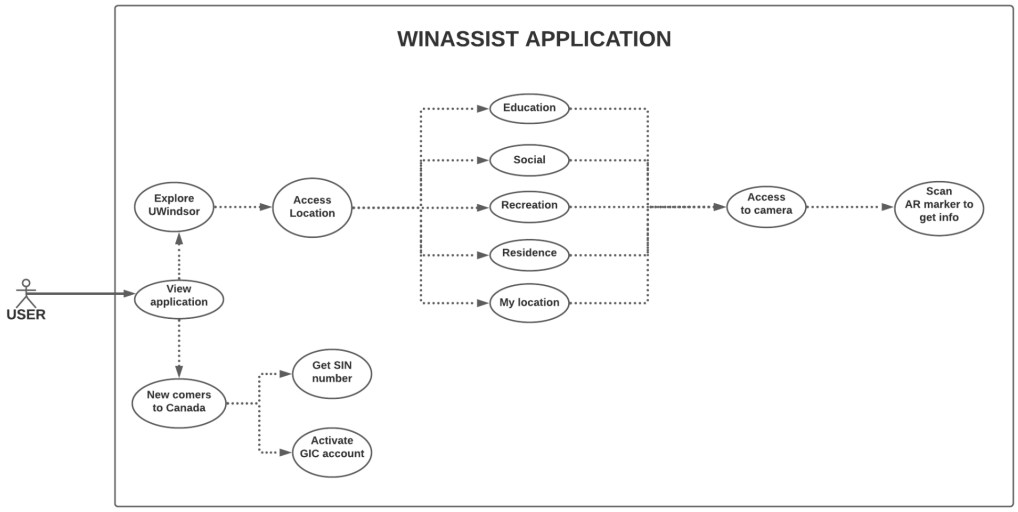
Web browsers such as Google Chrome, Safari allow access to the phone's camera and GPS only when accessing an HTTPS website.

4.3 System Features

The core features of the application are :

- A tour of hotspots within the University of Windsor using AR to display information about the places.
- Location of nearest Service Canada and Scotiabank branches for SIN and GIC activation.

Use Case Model - WinAssist



4.4 Other Nonfunctional Requirements

4.4.1 Performance Requirements

1. The application should be able to detect that the user has reached the place when the user is within 50m radius of the chosen location.
2. The user should be able to see the name of the place and the description when the camera is pointed at that location.
3. The application should have a fluid and intuitive user experience.
4. The application should be stable when accessed by multiple users at the same time.
5. The application should have updated data on SIN and GIC requirements.

4.4.2 Safety Requirements

The user should be careful of his/her surroundings when using the application in the AR mode.

4.4.3 Security Requirements

The application does not have a login system. Therefore, we do not store personal data of the users in our database. All the data pertaining to the application is free and available for public use.

4.4.4 Software Quality Attributes

The quality characteristics of WinAssist are :

1. Availability : WinAssist is deployed on netlify servers which according to the service level agreement provides an uptime of 99.99 %.
2. Correctness : The application will display the AR content on screen when GPS coordinates are accurate up to 10 m distance.Inaccurate real time coordinates of the user may not trigger the application to detect that the user has reached the destination. This can be mitigated by re-calibrating the GPS sensor in the mobile phone before using the application so that the coordinates are as accurate as possible.
3. Interoperability : Since the application is accessed through a web browser, it can run on any mobile device which has supported browsers installed.
4. Maintainability : Since we are hosting the application using a cloud service provider, the service level agreement states that all maintenance of backend infrastructure is the responsibility of the cloud service provider.
5. Reliability : The application can support a few thousand users at a time when hosted on netlify servers.

5. Tools Used

The following tools are used in the project for different purposes during the complete project life cycle starting from designing to deployment.

PURPOSE	**TOOL**
Prototype Designing	Figma
Frontend Framework	React JS
AR Library	AR.js
Documentation	Google Docx
Communication Channels	Microsoft Team, Outlook, WhatsApp
Project Version Control	GitHub
Project Management	JIRA Software
Gantt Chart Designing	Smartsheet
Use case diagram Designing	Lucidchart

6. Software Design

6.1 Introduction

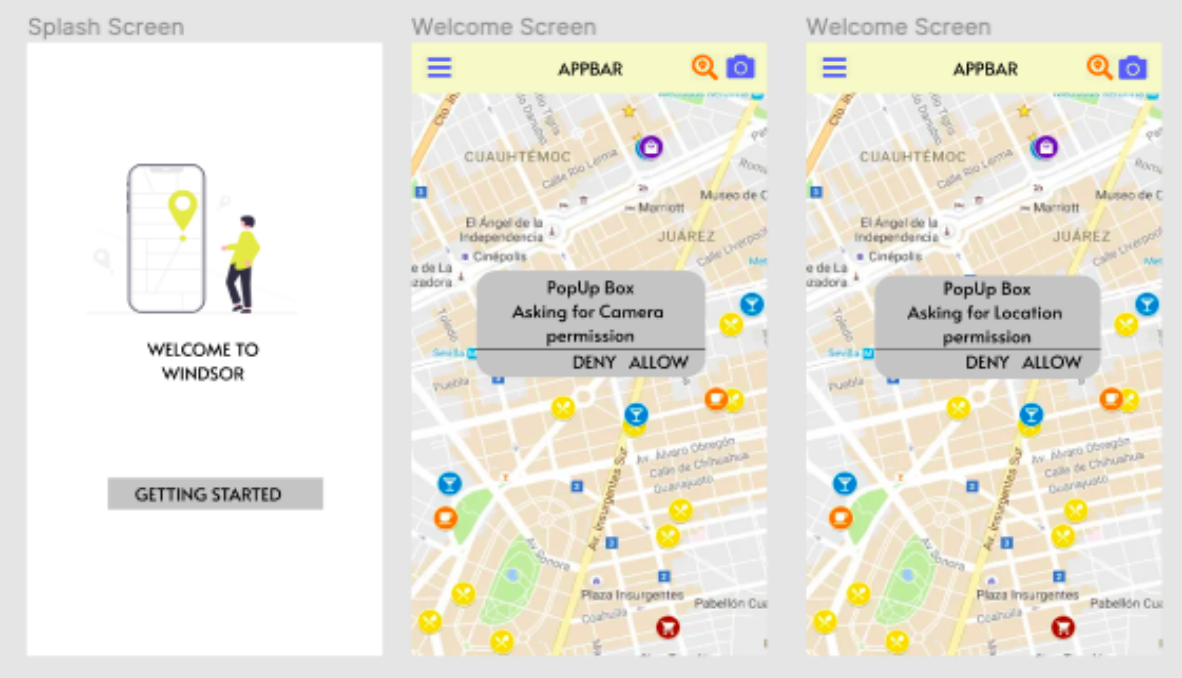
To make the WinAssist design, we used the online UI/UX designing tool Figma. It is an extremely user friendly tool which provides all the features to make a good and feasible design. We can use figma for any software UI design. For WinAssist, our designs kept evolving as the features kept updating.

6.2 Design Software Used

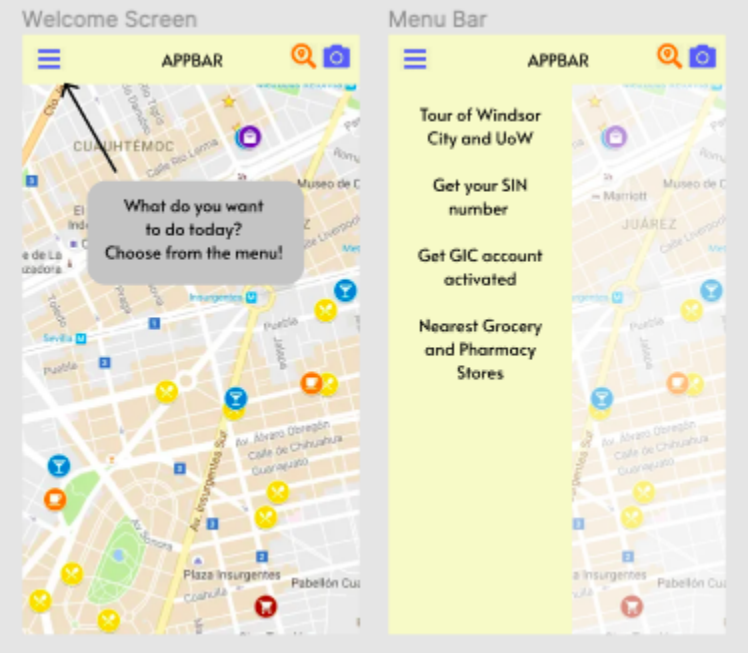
Figma - [1] “Figma is a web-**based graphics editing and user interface design app**. You can use it to do all kinds of graphic design work from wireframing websites, designing mobile app interfaces, prototyping designs, crafting social media posts, and everything in between. Figma is different from other graphics editing tools.”

6.3 Phase - 1 UX Design

This design was made at the initial level of discussion that is the planning phase. The below design is very basic. It consists of the design and architecture of some basic features of WinAssist. This design didn’t have the Augmented Reality feature design.

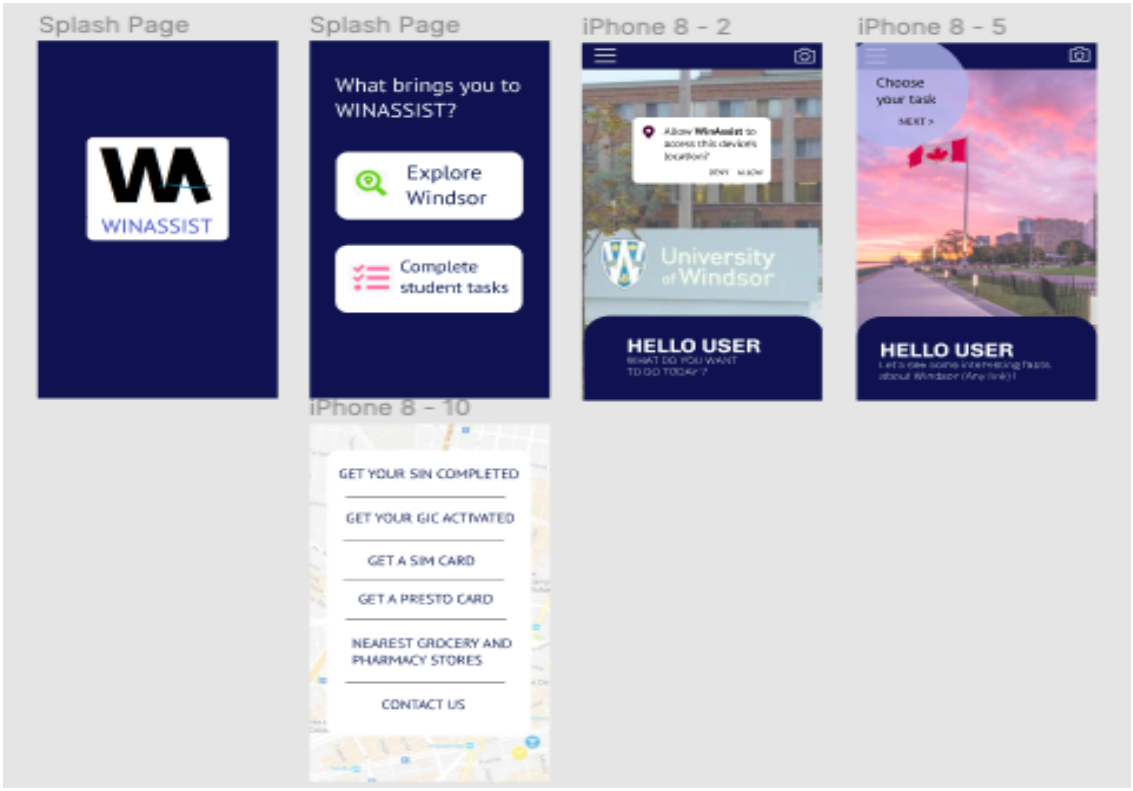


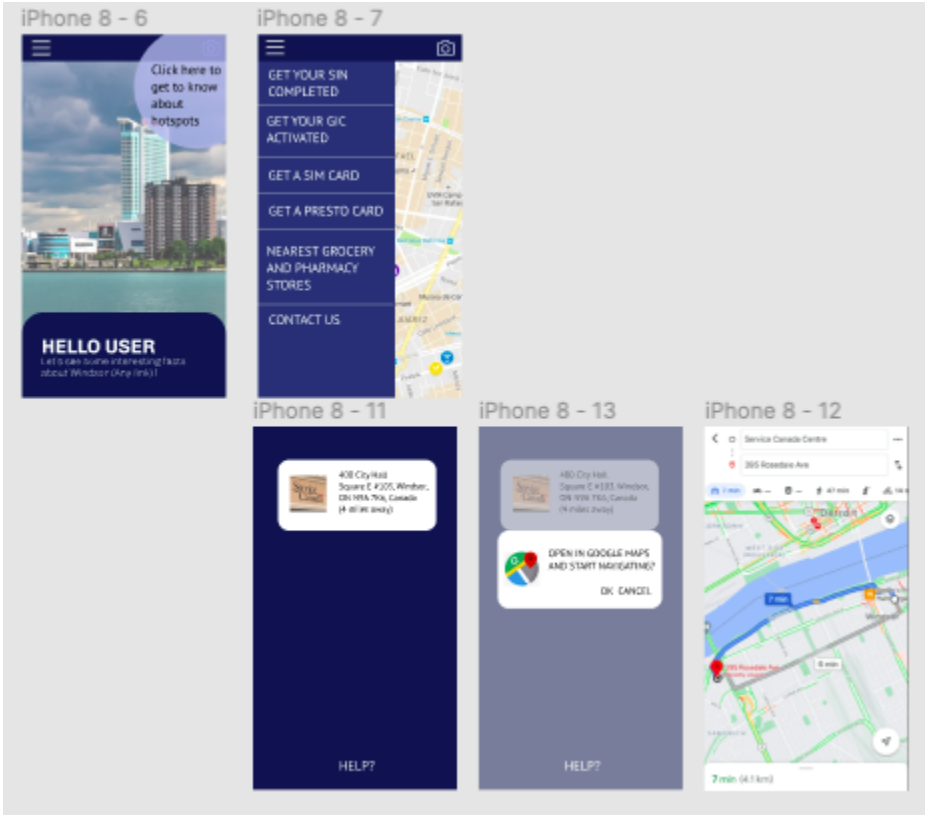
Phase 1 UX Screens



Phase 1 UX Screens

6.4 Phase - 2 UX Design

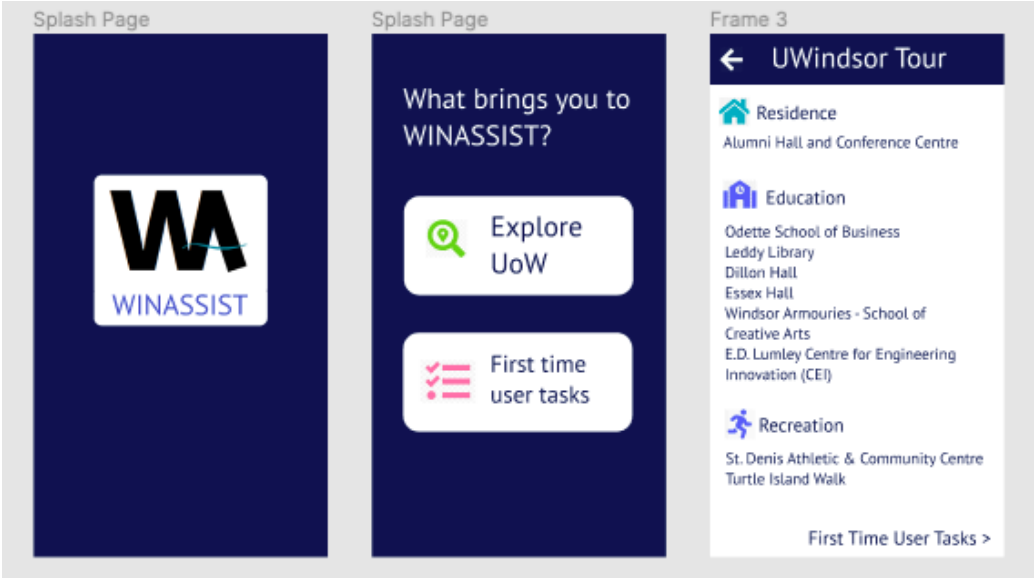


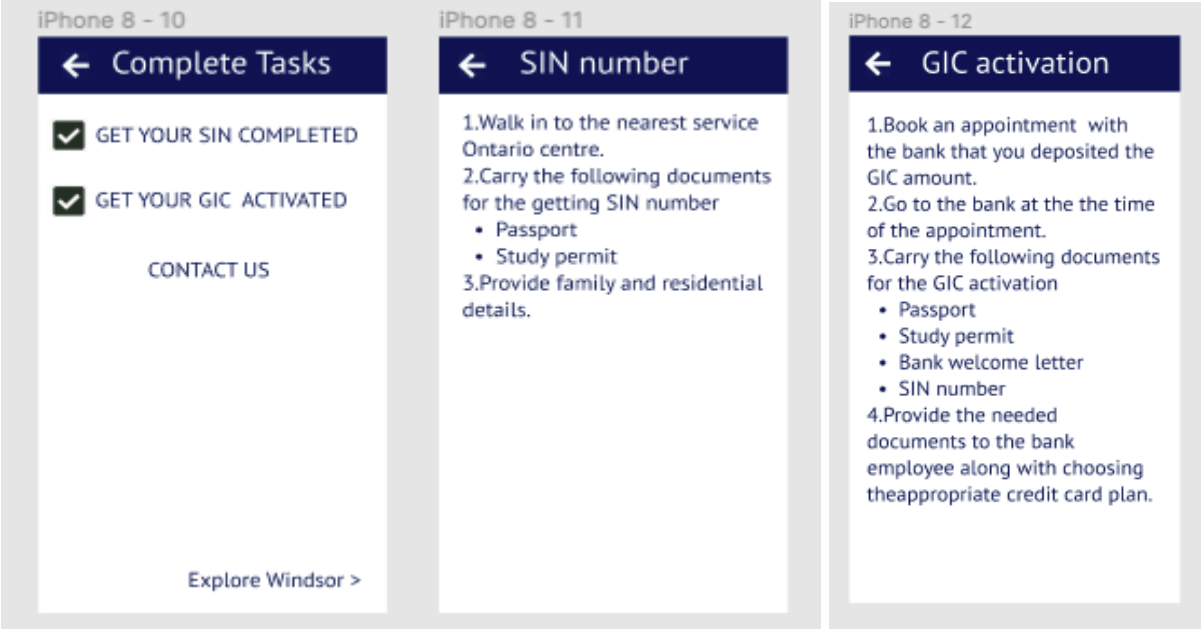


Phase 2 UX Screens

The next design had a changed theme and colour schema. In this phase of the design too we didn't have the AR design. We planned on adding the AR designs at this stage of development.

6.5 Phase-3 UX Design



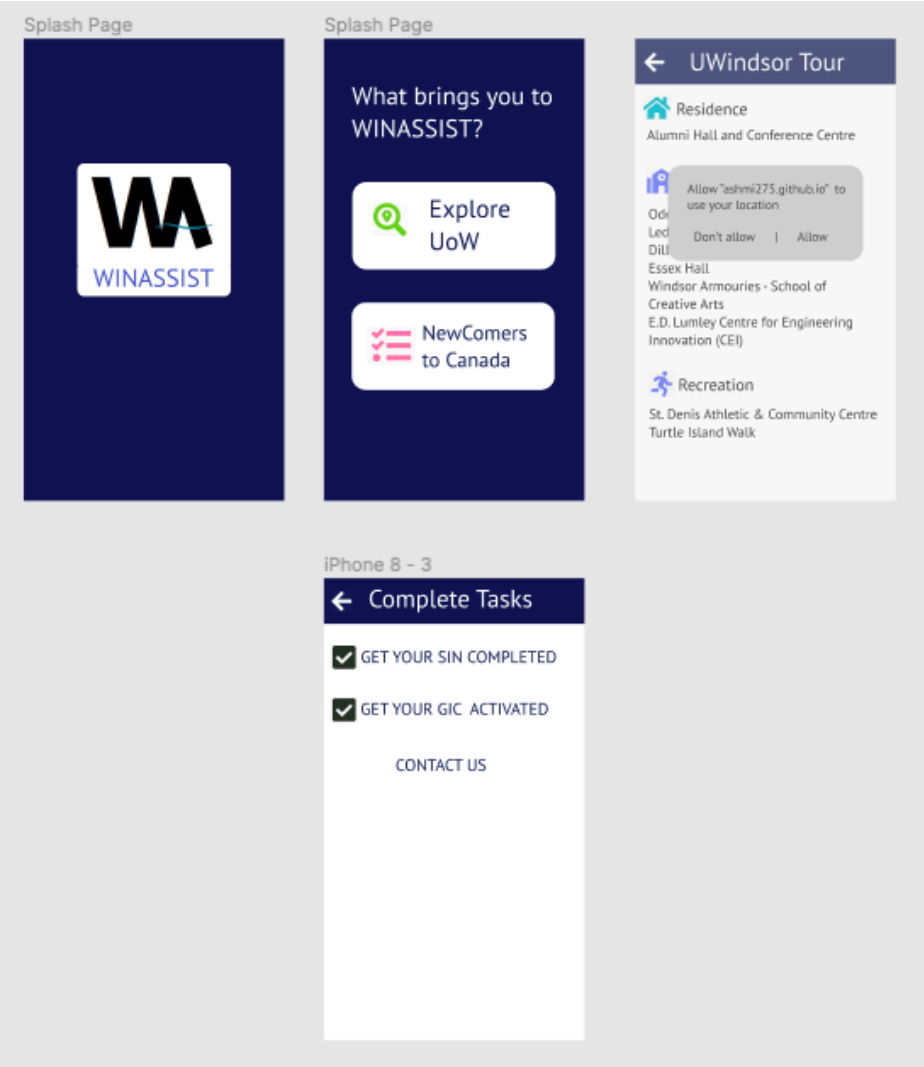


Phase 3 UX Screens

In this design, we separated the categories of tasks and added the addresses of different places in Windsor. We also added the steps to accomplish student tasks.

6.6 Final UX Design

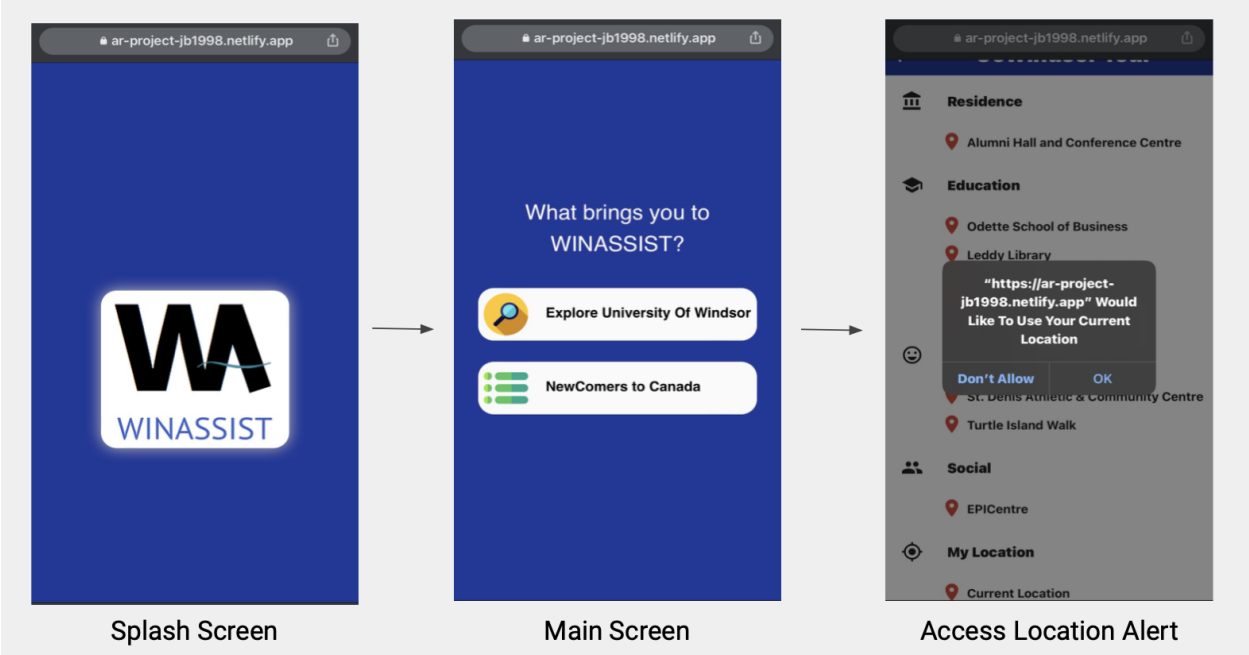
In the final design of WinAssist, we had our augmented reality design in place. The popups ask for the user's locations whenever the AR feature comes into action.



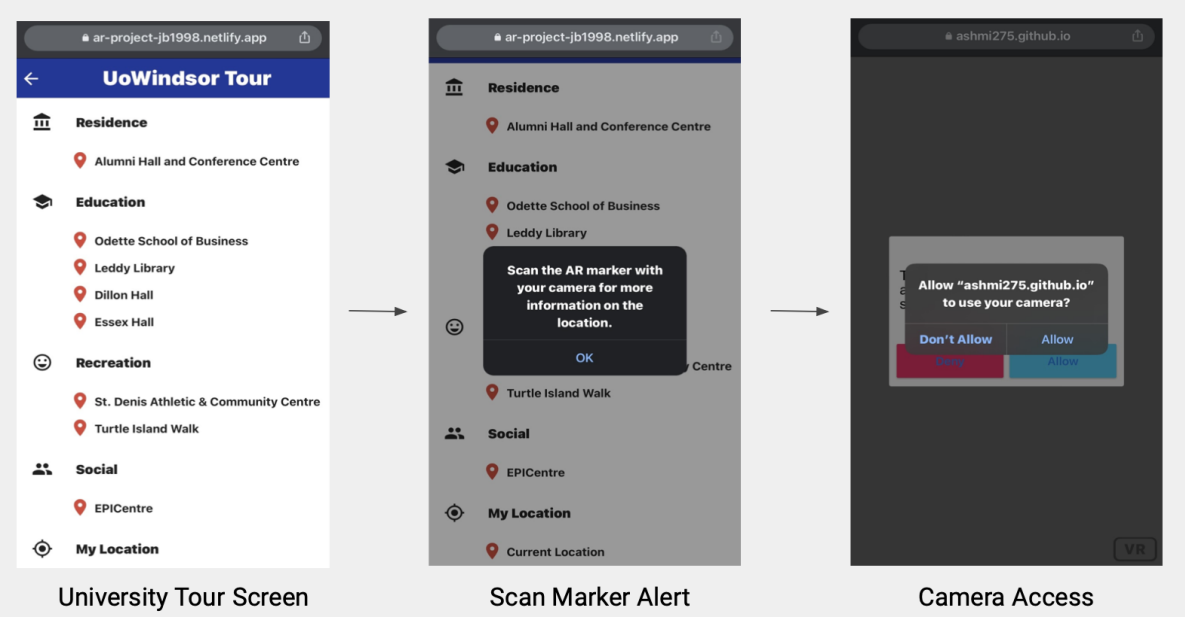
Final Phase UX Screens

Final Phase UX Screens

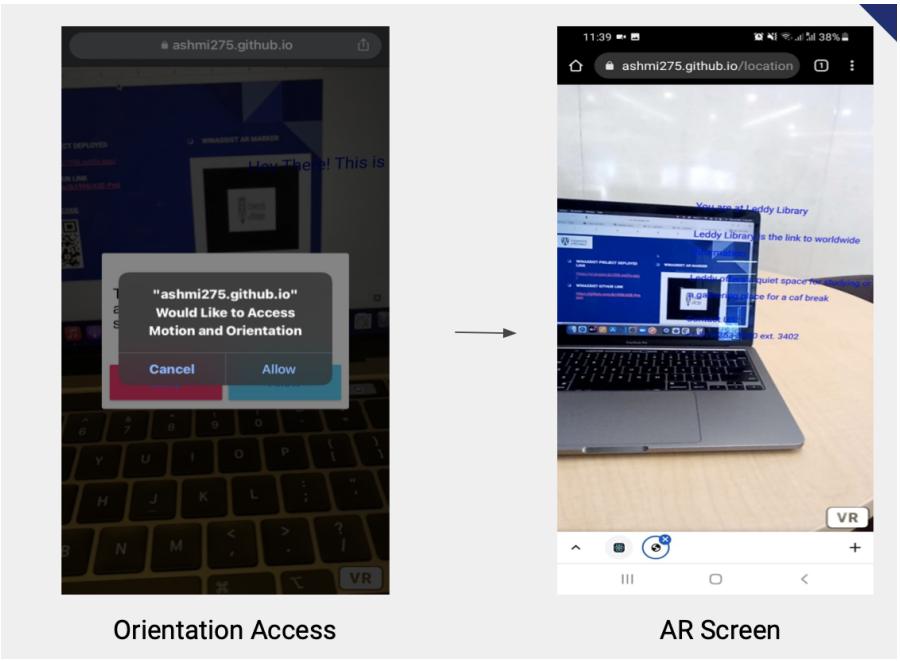
6.6 Deployed WinAssist Designs



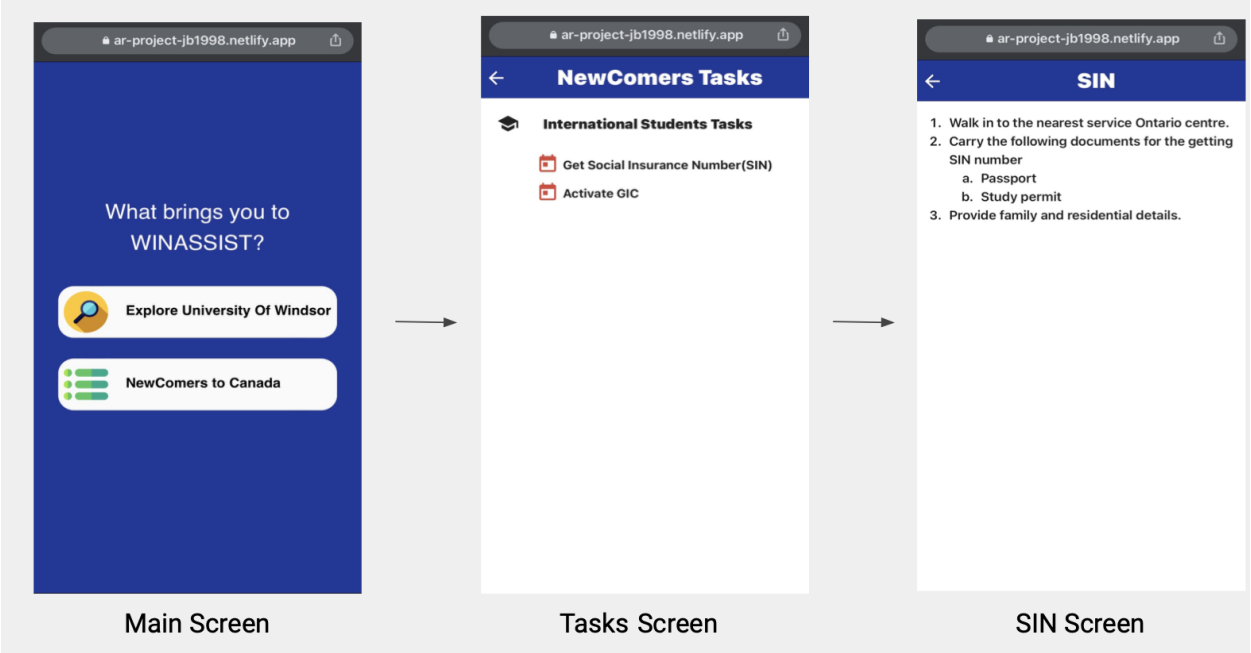
WinAssist Application Developed Screens



WinAssist Application Developed Screens



WinAssist Application Developed Screens



WinAssist Application Developed Screens

7. Project Code

7.1 Introduction

We have used following tech stack for the application:

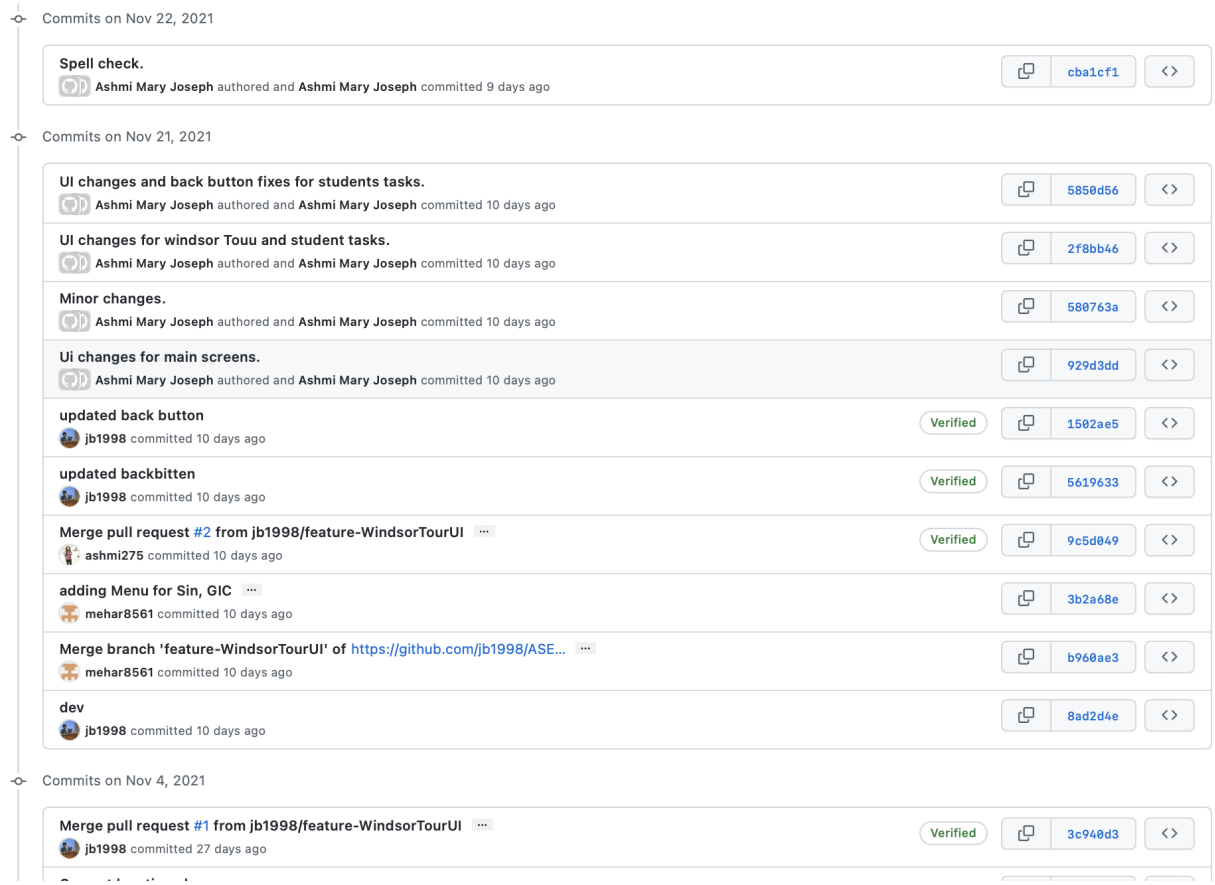
1. **Front-end of the application:**
   The front end of the application was developed using React JS in the development environment of Visual studio code. CSS along with the bootstrap was used for styling purposes. The icons were added from the material icons react.

2. **Augmented Reality**
   The AR feature of the application was developed with the help of a library called AR.js. This library is open sourced and has more than 3,000 stars on github with the active developer support community.

7.2 Code Maintenance Platform

The source code was regularly maintained by using a version control system Git on Github. All the team members were collaborators on github and could push the code, access it, create pull requests or even merge pull requests.

There have been 31 code commits in the github repository from September 29, 2021 to November 22, 2021.
Github project link: https://github.com/jb1998/ASE-Project



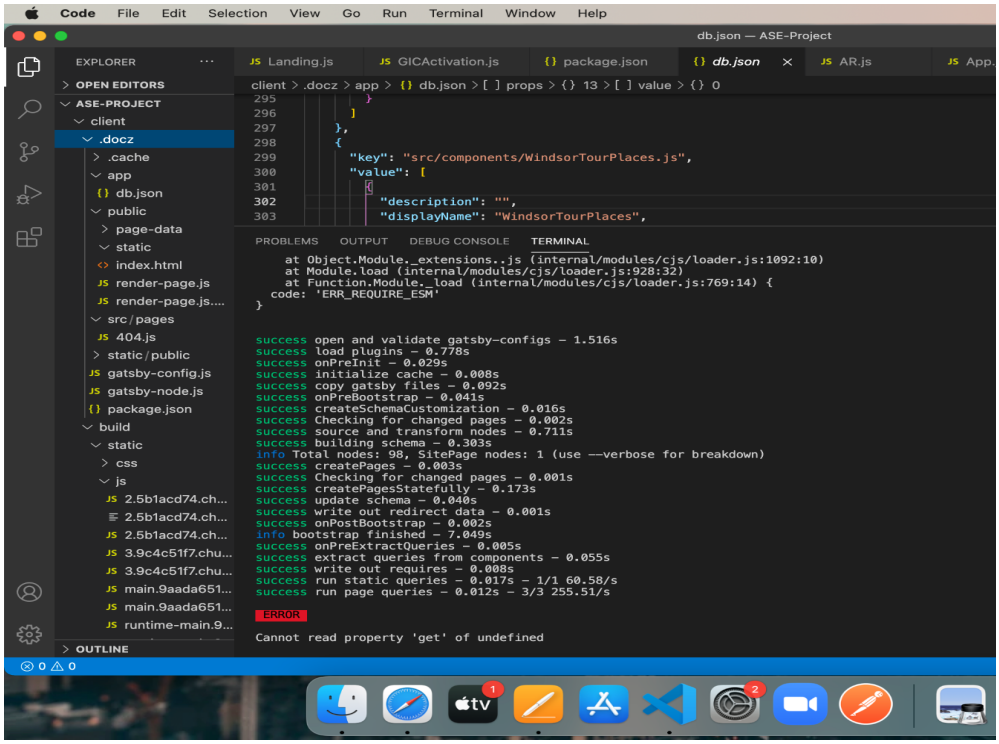
Code commits done on github

7.3 Code Documentation

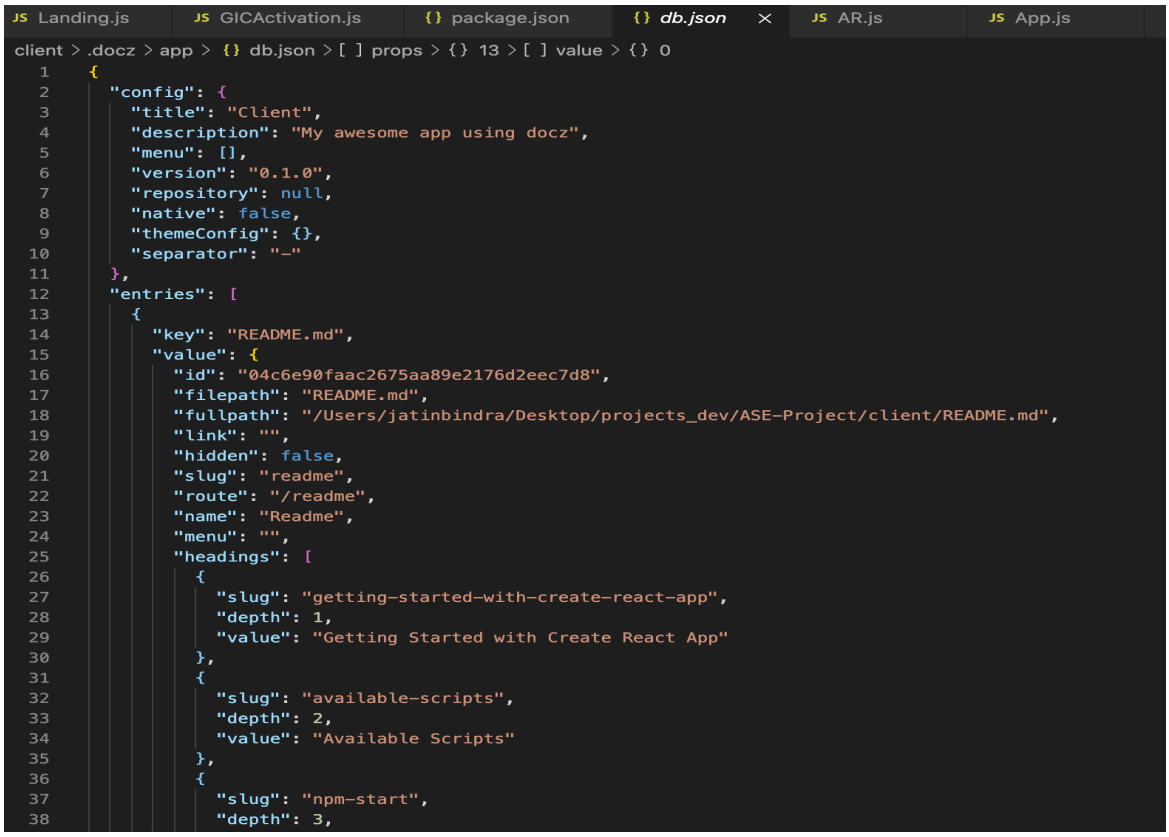
The code documentation was created using the DOCZ tool:
https://www.docz.site/docs/getting-started

The following steps were followed to run the tests:

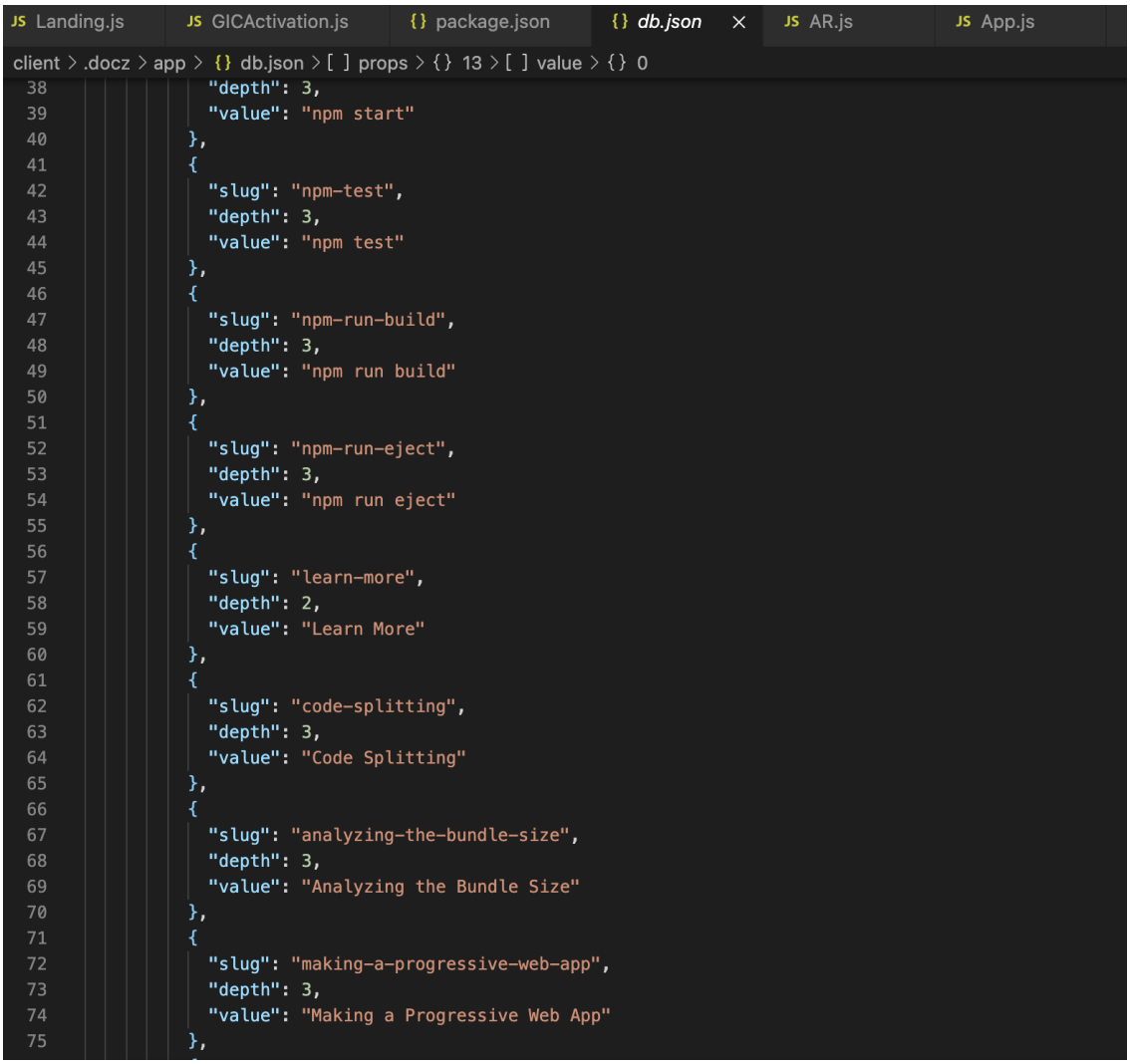
1. The library was installed using “npm install docz # react react-dom”
2. Then the scripts “"docz:dev": "docz dev", "docz:build": "docz build", "docz:serve": "docz build && docz serve" were added into package.json.
3. After this documentation creation code was run using “npm run docz:dev”



Terminal screenshot



The code that created the documentation



The code that created the documentation

- The complete documentation can be found on the github link: https://github.com/jb1998/ASE-Project/blob/main/code%20documentation

- Components Used for WinAssist are as follows:

    1. AR.js
    2. GICActivation.js
    3. GICActivationHeader.js
    4. Landing.js
    5. Navigation.js
    6. SIN.js
    7. SINHeader.js
    8. StudentTask.js

9. StudentTaskHeader.js
10. StudentTaskPlaces.js
11. WindsorTour.js
12. WindsorTourHeader.js
13. WindsorTourPlaces.js

7.4 Deployment Platform

The final release was done using the netlify website. We had a couple of options like the Amazon web service, heroku, and netlify. The reason we selected netlify is because it loads the page faster. It also automatically syncs with the github code. Whenever a change is made in the master branch the same is reflected in the deployed application.

The deployed app link is: https://ar-project-jb1998.netlify.app

The WinAssist application can also be used by scanning the QR code below:

Scan QR Code

The AR marker used in the app for showing the AR functionality is:

Scan the AR marker

8. Test Plan

8.1 Introduction

This section contains the testing plan of the Winassist application, specifying the various types of testing done on the Winassist application along with the schedule and the tools used for the testing process.

8.2 Objectives

The major objective of the testing plan is to ensure that the Winassist application is up and running. It also makes sure that the application gives some output even if there are errors in the user. The testing plan also ensures that the application is user friendly and reliable.

8.3 Testing Strategy

This subsection mentions the various types and strategies used for testing the Winassist application at various stages of development.

8.3.1 Unit Testing

8.3.1.1 Definition

Unit testing is the testing of the smallest piece of code that can be logically isolated. Each feature was tested individually to ensure that it produced the desired output.

8.3.1.2 Methodology

Unit testing was done by the Winassist development team at various stages of development. The test cases and its results were documented by the Winassist Quality Assurance team.

8.3.2 Integration Testing

8.3.2.1 Definition

Integration testing is a phase in software testing in which the individual features or modules are combined together and tested. It is done in order to evaluate the compliance of the system.

8.3.2.2 Methodology

Integration testing was done by the Winassist Development team and the Winassist Quality Assurance team collaboratively. The testing was done using Jenkins tool.

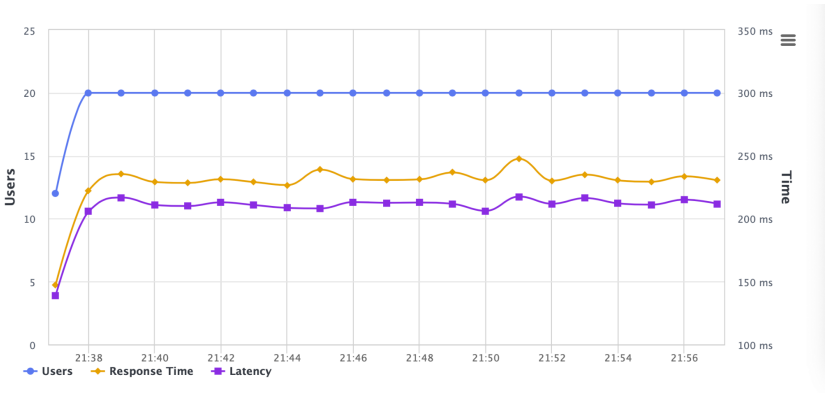
8.3.3 Performance Testing

8.3.3.1 Definition

Performance Testing is a form of testing that calculates an application's speed, response or load time, and robustness.

8.3.3.2 Methodology

The WinAssist web application is deployed on the Netlify server. The performance testing was done to determine how the application responds in terms of speed, stability, and load. Using the Jmeter and Blaze meter, the tests ran for 20 minutes in which the deployed website with the link: https://ar-project-jb1998.netlify.app was undergoing continuous hits, and the response time was noted. A total of 101340 samples of input were tested with an average response time of 230.7ms. The run time of the test was 20 minutes. The error rate comes out to be 0.01%. The graph for concurrent users vs. Response time is shown below:



Graph for concurrent users vs response time

8.3.4 Compatibility Testing

8.3.4.1 Definition

Compatibility testing is a part of non-functional testing conducted on application software to ensure the application's compatibility with different computing environments.

8.3.4.2 Methodology

WinAssist is a web-based mobile application that runs in mobile browsers and is accessible to any user with any mobile device. Therefore, we need to verify the responsiveness of WinAssist in different devices. Team WinAssist has used the LamdaTest tool to perform visual UI testing and check the application's compatibility. In our project - WinAssist, we have performed compatibility testing in the following devices:

1. Google Pixel 3
2. One Plus 6T
3. iPhone XS Max
4. Galaxy S9 Plus

8.3.5 Beta Testing

8.3.5.1 Definition

Beta testing is a type of testing in which real time users get to use the product and report error, bugs or difficulties while using the product.

8.3.5.2 Methodology

Beta testing was done by the members of the Winassist design team, RnD team and the Quality Assurance teams. The Winassist application was used at various locations like Harveys, Scotia Bank, University and Giglio mart to ensure that the application worked in different combinations of latitude and longitude.

8.4 Test Schedule

TESTING	SPRINT	DESCRIPTION
Unit Testing	1, 2 and 3	Each individual feature was tested as and when they were developed.
Integration Testing	3	The individual features were integrated together and tested.
Performance Testing	4	The application's speed and robustness was tested after the development of the product.
Compatibility Testing	4	The testing was done to check if the application was compatible in different computing environments.
Beta Testing	5	The application was used at various locations and checked.

9. Quality Assurance Plan

9.1 Introduction

Our application - WinAssist, is based on Augmented Reality (AR) and is designed in a way users find easy to use. The most important part of the application is the user experience, and it is made in a way to meet the needs and expectations of the user. This document deals with metrics that will ensure the quality of the product. Also, it will ensure that the quality is checked along each and every step of development.

9.1.1 Purpose

The purpose of the Quality assurance plan is to ensure that the product meets the objectives throughout the project lifecycle.

9.1.2 Scope

This Quality Assurance Plan provides a foundation for managing the WinAssist software quality assurance plan.

1. The document will identify the SQA responsibilities of all the members of this project.
2. The document will define the reviews and audits and how to conduct these.
3. The document will list the activities, processes for the Software Quality Assurance consultant to review and audit.

9.1.3 Overview

In this subsection:

1. The management structure will be specified.
2. The Standard and guidelines used will be mentioned.
3. Review and Audit plan will be shown.
4. Figure out the Configuration Management Plan.

9.2 Quality Objectives

For the Software development - process,

1. We will ensure that the software will fulfill all functional and technical requirements.
2. We will ensure that the software maintenance activities will take care of managerial scheduling and budgetary requirements
3. We will be managing activities to increase the efficiency of the software quality assurance activities.

9.3 Standards and Guidelines

9.3.1 Development Case

1. The project should follow Agile Scrum Methodology throughout
2. There must be a separation between the production and development environment build.

9.3.2 User Interface guidelines

1. **Learnability** - The UI should be easy to understand. The UI should be made very user-friendly.
2. **Robustness** - The interface should give proper feedback to the user so that they can understand the system.

9.3.3 Use Case Modelling Guidelines

1. **Level of Detail -** We should always know what has to be done in the product, i.e., the functionality.

Name and Brief Description - The name of our project is WinAssist, and it can be used by new immigrants/students to complete their tasks and explore Windsor.

Outline - The application should assist people coming to Windsor.

2. **The flow of Events -** UML diagrams should explain what the user does and then how the system responds. In our project, the user should see all the tasks, get information regarding them, and explore Windsor.

9.3.4 Design Guidelines

1. It should not suffer from "Tunnel Vision" -

   We need to see that it should not suffer from tunnel syndrome while designing. It means that the product should focus not only on completing the goal but also on other effects. In our project, we should focus on new immigrants, but it should also have additional features. It will not only be helpful to the new immigrants, but anyone can use the exploring part.

2. Degrade gently -

   The product should be designed so that it degrades gracefully, i.e., even if an error comes, it will function as required when it is executed. In our project, pop-ups will show whenever something is not working correctly.

9.3.5 Programming Guidelines

1. React Js and AR.js are the standard development platforms for the application
2. The development team must write the feature code with the following goal in mind:
   - ➔ Maintainability - adaptable to cope with changes
   - ➔ Efficiency
   - ➔ Usability

3. Each code module must contain - The name of the module, brief description of the module and purpose of module
4. Naming conventions must have adhered to
5. Create technical documentation associated with the modules and features

9.3.6 Test Guidelines

1. Each Testing phase should be supported by documentation
2. Identity which features need to be tested and identify the criteria for each item
3. Record issues encountered in testing in JIRA

9.4 Metrics

The following metrics are used to measure the product's performance:

1. The application should detect that the user has reached the place when the user is within a 50m radius of the chosen location.
2. The user should see the name of the place and the description when the camera is pointed at that location.
3. The application should have a fluid and intuitive user experience.
4. The application should be stable when accessed by multiple users at the same time.
5. The application should have updated data on SIN and GIC requirements.

9.5 Review and Audit Plan

9.5.1 Introduction

This section contains the Review and Audit Plan, which specifies the schedule, resources, and methods, and procedures to be used in conducting project reviews and audits. The plan details the various types of reviews and audits to be carried out during the project. It identifies any external agencies expected to approve or regulate the artifacts produced by the project.

9.5.2 Review and Audit Task

The major types of reviews that are carried out to ensure that the project is progressing on the right track are semi-weekly scrum calls and milestone meetings. The subject of the semi-weekly scrum call is each team member’s progress, struggles in their issues, ideas for betterment. The subject of the milestone meeting is to present the project and its various developed features to the professor and obtain their feedback to fine-tune the project's progress in the right direction.

9.5.3 Schedule

Review	Day/Duration
Semi-weekly scrum calls	Monday, Thursday - 10:30 am to 11:00 am
Milestone 1	October 18th, 2021 - 30 Min
Milestone 2	November 17th, 2021 - 30 Min

9.5.4 Organization and Responsibilities

The entire team of Winassist is involved in semi-weekly scrum calls and milestone meetings. Each team member puts forward their progress in the assigned tasks and the various difficulties they face in the implementation of their tasks. All members of the team actively participate in giving innovative ideas to solve the blockers, if any. Also, the milestones meetings are held in the professor's presence for the Advanced Software Engineering Topics course and the teaching assistant. They share their valuable feedback for the improvement of the project.

9.5.5 Tools, Techniques and Methodologies

The Microsoft Teams platform is the foremost tool used to conduct the semi-weekly scrum calls and milestone meetings. The members of the Winassist team also share valuable documents, ideas and are in constant touch with each other regarding the project through Whatsapp group chat and Microsoft Teams chat.

The following set of reviews are carried out before each milestone meeting:

1. Design Review: The members of the Winassist design team present their progress to the others in the team to instigate a progressive discussion about various blockers and solutions.
2. Development Review: The members of the Winassist development team present their progress to the others in the team to instigate a progressive discussion about various blockers and solutions.
3. Research and Development Review: The members of the Winassist R&D team present their progress to the others in the team to instigate a progressive discussion about various blockers and solutions.
4. Quality Assurance Review: The members of the Winassist QA team present their opinions about various quality concerns and projected risks to the others in the team to instigate a progressive discussion about various blockers and solutions.
5. Functional Configuration Audit: The audit is conducted to verify that all requirements of the SRS have been met.
6. Physical Configuration Audit: The audit is conducted to verify that the software and its documentation are complete and ready for delivery.

10. User Manual

10.1 Introduction

The User Manual contains all essential information for the user to make full use of the information system. This manual includes a description of the system functions and capabilities, contingencies and alternate modes of operation, and step-by-step procedures for system access and use. Use graphics where possible iii this manual. The manual format may be altered if another format is more suitable for the particular project.

10.1.1 Purpose and Scope

The purpose of this user manual is to assist end user to use this application. Its scope is limited to residents of Windsor, Ontario, Canada who are aware of locations in the city.

10.1.2 Organization

Team Winassist has organized this User Manual.

10.1.3 Points of Contact

At present there is no points of contact for this product. It can be added once this product scales.

10.1.4 Primary Business Functions

Users' primary tasks includes having an android or an IOS smartphone, ability to operate it and some very basic knowledge on how to work with browsers.

10.2 System Capabilities

This section provides a brief overview of the system and its capabilities.

10.2.1 Purpose

The purpose of our application is described in this section.

10.2.2 General Description

This application is capable to check whether the user is using a mobile phone or a computer, select either of the Windsor city tour or explore tasks for fresh arrivals at the city. If first option is selected, user must click on one among the multiple places and if physically present on the clicked location, user can use AR feature. On second option, users view the steps to activate GIC or SIN.

10.3 Description of System Functions

This section describes each specific function of the system. In this high-level section, describe any conventions to he used in the associated subsections. Each of the subsequent sections should be repeated as often as necessary to describe each function within the system. The term "Function X" in the subsection title is replaced with the name of the function.

10.3.1 Splash Screen

1. Users scan the QR code or opens the URL provided by the team.
2. If using mobile phone, users can get a screen with two buttons.
3. If using desktop, a message a shown asking user to use it in mobile

10.3.2 Selection on the splash

1. User view two button, UWindsor tour and newcomers' tasks on the splash screen.
2. If UoWindsor tour is selected, list of locations is displayed.
3. If newcomers task option is selected, two options related to SIN and GIC are displayed.

10.3.3 UoWindsor Tour feature

1. In the buttons related to location such as Leddy library, Dillon Hall, Essex Hall.
2. If user clicks on button, alert message is shown if not on location other AR screen opens.

10.3.4 AR feature

1. It asks for permission from user from camera.
2. User points camera to the AR marker provided along with the product.
3. Relevant text associated with the marker is displayed.
4. If marker is not scanned properly, the screen stays as it is.

10.3.5 Newcomers task

1. User selects between SIN and activate GIC buttons.
2. On selecting SIN, all relevant steps for creating SIN number are displayed.
3. On selecting activate GIC button, steps related to GIC account activation are shown.

References

[1] https://www.theme-junkie.com/what-is-figma/

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