

## Dublin City University - School of Computing



BSc in Enterprise Computing  
4<sup>th</sup> year Midterm Delivery (CA472)  
2024

Student name	Student Number
Arvind Rawat	20368773
Matthew Mahon	20410582

### Project Title:

RoadReady – A driving test route app

### Date:

27/12/2023

## Table of Contents

<b>Revised Project Summary .....</b>	<b>3</b>
<b>Value Propositions .....</b>	<b>3</b>
Commitment to Learner Success .....	3
Innovation in Navigation.....	3
Empowerment through Open-Source .....	4
<b>Customer Segment.....</b>	<b>4</b>
<b>Business Model Canvas.....</b>	<b>4</b>
<b>Market Research .....</b>	<b>4</b>
<b>Revenue Streams .....</b>	<b>5</b>
<b>Functional Requirements .....</b>	<b>6</b>
<b>User Characteristics and Objectives .....</b>	<b>7</b>
<b>Operational Scenario .....</b>	<b>7</b>
<b>Constraints .....</b>	<b>8</b>
<b>Functional Requirements (In Depth).....</b>	<b>8</b>
<b>System Architecture.....</b>	<b>12</b>
<b>High Level Design.....</b>	<b>13</b>
<b>Proposed Timeline.....</b>	<b>14</b>
Deliverables and Iterations .....	14
Assigning Tasks .....	14
Error Planning.....	15

## **Revised Project Summary**

Our objective is to design the app “RoadReady” that transforms the way people learn to drive and prepare them for their driving test. By incorporating real-time data, interactive maps and user focused design principles, our primary aim is to enhance the skills and knowledge of learner drivers enabling them to pass their driving test.

The driving test route app will serve as an all-in-one solution for learner drivers, offering them several features to improve their preparation for their driving test. Our app will provide real-time navigation for test routes so that learners become familiar with their area and can drive in various roads such as intersections, roundabouts, and junctions. They will be able to design their own routes or use the predefined routes. Our app will include a set of theory questions covering topics like road rules, regulations, and road signs, to ensure learners have a firm understanding of theory questions. This will enable them to recognise what to do if they come across these elements on the road, encouraging safer driving habits and lowering the risk of accidents. In addition, learners will have the opportunity to take mock theory tests, monitor their progress and receive feedback on their responses. We also intend to provide interactive learning tools to reinforce key driving knowledge by including educational videos, animations and interactive tutorials that cover a range of driving topics such as, parking techniques, manoeuvres, and hazard perception and vehicle control. Whilst the learners are driving, they will also be monitored for speed which will let them know if they are speeding according to the speed limit on the road.

Furthermore, we will adjust to the requirements of learners. We will do this by creating customisable learning paths, allowing learners to concentrate on areas they wish to improve. By adopting this approach, it ensures individuals receive tailored guidance and support.

## **Value Propositions**

### **Commitment to Learner Success**

Our app offers a comprehensive list of driving test routes from different test centres across Ireland, ensuring users are well-prepared for their driving test no matter where they are situated. We host a wide range of information about road regulations and examples of different driving scenarios to instil confidence in learners through a better understanding of the road. Unlike the current market where learners receive information about road regulations through the Rules of the Road booklet, our app allows learners to always have access to this information with additional tips. Our App provides a list of driving routes in the free version, setting us apart from our competitors who offer this as a premium feature. Furthermore, we integrate different learning features such as questionnaires, progress tracking, interactive lessons, and a wide range of road regulations and scenarios all in one application. This holistic approach enhances the learner’s journey throughout the driving examinations, making it efficient and effective by saving time, money, and storage.

### **Innovation in Navigation**

Our advanced satellite navigation system, developed by our talented team, provides real-time guidance and assistance through traffic updates, adaptive route planning, live feedback, and route correction. This ensures a stress-free learning environment and allows both the learner and instructor to focus on driving and observation. In the current market where there is only a basic navigation system for learners, our app stands out through traffic

updates, adaptive route planning, and live feedback. We've prioritized user experience by delivering a well-designed, user-friendly interface with extensive functionality. Our app is easy to navigate and offers a smooth learning process. The app comes with a responsive screen allowing the same experience no matter what device the app is used with. Our app has extensive functionality through small features such as daily tips, and bigger features such as adaptive feedback.

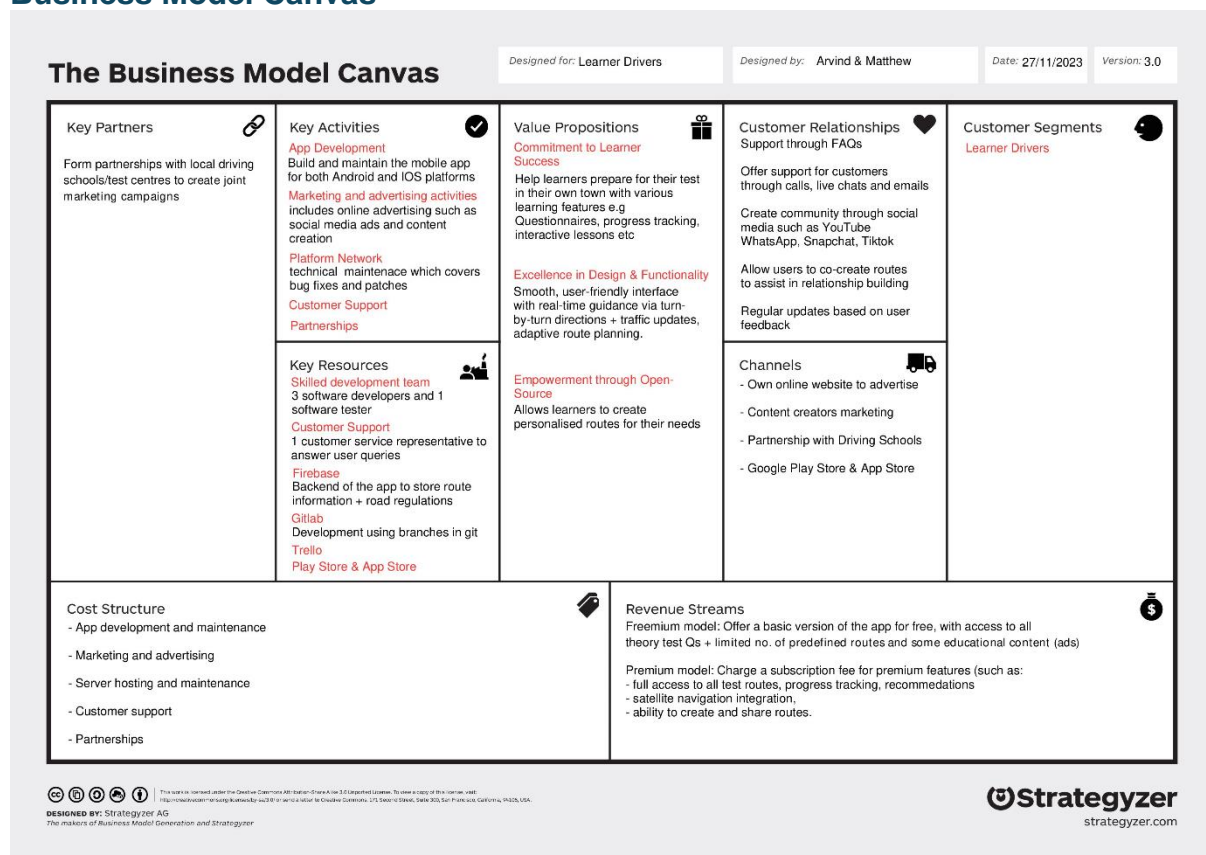
### Empowerment through Open-Source

Our app provides an open-sourced test route creator mode, which empowers learners to create personalized routes to tailor their practice to their needs. This also allows learners to practice without an instructor's assistance to prepare for ongoing lessons. This feature sets us apart by creating a competitive environment where the best routes are refined and shared with the community, promoting collaborative learning.

### Customer Segment

Our customer segment is only the Learner Drivers who would be using our app to prepare for their driving test.

### Business Model Canvas



### Market Research

We did some market research to find the amount of smartphone users in Ireland, the no. of theory tests conducted in a year and the amount of people with learner permits. Based on our research, we found that as of 2023 there are 3.99 million smartphone users in Ireland [1]. In 2021, 201,915 tests were conducted by the driver theory testing service, with a pass rate of 74%. In 2016, there were 249,647 drivers holding only learner permit licenses [2].

60,000 of those are waiting for their driving test this year [3]. Based on this we got  $\approx 450,000$  Total Addressable Market.

Considering the users with smartphones, we assume 90% of the users will have a smartphone [4]. Therefore, Serviceable Available Market (SAM) =  $450,000 \times 0.9 \approx 405,000$  users.

Since we interviewed 3 people and Both of those confirmed that they would use our app to practice for their Driving test and 12/16 confirmed that they would use our app if it was on the market. Therefore 75% of 405,000 would most likely use app. Although this may not be the most accurate analysis, they are the only figures we can use.  $405,000 \times 0.75 = 300,000$  potential users

<b>Total Addressable Market</b>	Total potential users (those that completed their theory test, drivers holding learner permits/those waiting for their driving test).	TAM = No. of Learner Drivers = 201915 + 249647 = 451,562 <b><math>\approx 450,000</math></b>
<b>Served Available Market</b>	The people that have access to the resource i.e. mobile phones that can access apps	SAM = TAM * percentage of adults with smartphones = $450,000 \times 0.90$ <b><math>\approx 405,000</math></b>
<b>Target Market</b>	Those most likely to use our app are	TM = SAM * % of users willing to use our app. = $405,000 \times 0.75$ <b><math>\approx 300,000</math></b>

## Revenue Streams

- In-app purchases:  
firstly, we will have a **freemium model** which will be used to attract the users and allow them to experience the value it provides. The free version will include access to all theory questions, a limited number of predefined routes and a subset of educational content with some ads. We will have a **premium model** which will be subscription based. It will include access to all the feature and a seamless ad-free experience. For this subscription the user will be able to choose between monthly (€4), quarterly (€10), and annual subscription (€35) to provide flexibility for users. A **free trial** for 2 weeks will also be available for all new users to help them understand the value of the app and in turn increase their likelihood of subscribing after the end of the trial period.
- Advertising revenue:  
To gain revenue from within our app, we will display dynamic ads at the top or bottom of the screen. The ads will be related to driving, automotive industry, or road safety. There will also be some video ads for users that use the app for an extended period. We will however ensure that the ads are non-intrusive and do not disrupt the user experience. We could generate from as low as **€0.10** and as high as **€10**, depending on the type of ad and place to advertise. [5]

## **Functional Requirements**

Below is the preliminary list of the product/system functions. The functional requirements of the system are concerned with the core functionality of the system. Only the major points have been listed here. Each system function has its own parameters which we will be discussing in more detail in part 3.

### **User Registration**

Users will have to create an account by providing name, email, username and password

### **User Login**

This allows users to log in using their email address and password. They will also be able to reset their password if they have forgotten it. d

### **User Logout**

Allows users to log out of their account and redirects them to the login page.

### **User Profile Management**

This allows users to update their personal information such as name, email address and password.

### **Test Centre Selection**

Allows users to select their test centre so they can practice their driving test and become familiar with the roads and area.

### **Test Route Selection**

Allows users to select the route they wish to navigate through. They can also select a custom route if they have created one themselves.

### **Test Route Creation**

Allows users to create their own test routes using Open Street Map API.

### **Test Route Navigation**

Allows users to navigate through the pre-defined test routes or from the ones they have created.

### **Theory Questions**

Includes a set of theory questions covering topics like road rules, regulations and road signs to ensure they have a firm understanding of theory questions. They should also be able to monitor their progress and receive feedback on their responses.

### **Find Instructor**

For those that have no driving experience they can find local driving instructors and call them.

### **Speed monitoring**

Monitors the speed of learners while they are driving according to the speed limit on the road.

### **Database management**

We will connect Firebase database to our app to store user information and test route data.

### **User Characteristics and Objectives**

Our app is designed to be user-friendly, with simple and intuitive features that are easy to use. Users will be able to choose from a predefined set of routes to prepare for their driving test and to familiarise themselves with the different roads. They can also create their own test routes using the Open Street Map API and navigation through them. They can take mock theory tests covering topics like road rules, regulations and road signs to ensure they have a firm understanding of the theory aspect of driving. Along with that they should be able to monitor their progress and receive feedback on the responses. Lastly, users can find instructors to start their driving if they haven't already.

The app is designed to be accessible to anyone with intermediate-level computer ability. It will be accessible online and will be ideal for people who want to practice for their driving test and become familiar with the roads and ultimately pass their test.

### **Operational Scenario**

1. If the user is not a member, they can select the "Register" option and provide their name, email, username and password. An email will be sent to them with their login details.
2. If the user is already a member, they can select the "Login" option and enter their login and password. If the login is successful, they will move on to the next set of options. If not, they will receive an error message warning them that their password is incorrect.
3. Upon successful login, the user can select one of the following options:
  - Prepare for driving test.
  - Theory test.
  - Create test routes.
  - Find instructors.
4. Prepare for driving test
  - i. If the user selects "Prepare for driving test" they are redirected to the driving test page where the user must select the test centre where they wish to practice their driving
  - ii. Upon selecting the test centre, the user must select the route they wish to navigate through. They can also select the custom route if they have created one themselves.
5. Theory Test
  - i. If the user selects "Learn theory test", they will answer theory questions covering topics like road rules, regulations, and road signs, to ensure they have a firm understanding of theory questions.

- ii. They should also be able to monitor their progress and receive feedback on their responses in a visual graph.

## 6. Create Test Routes

- i. If the user selects "Create Test Routes" they are redirected to a designer page where they can place pins on a map for all the routes. The pins go in order so placing a pin behind another will be seen as U-turn, however the user will also have tools to assists with the manoeuvres such as "hill start" or "reverse around the corner".

## 7. Find Instructors

- i. If the user selects "find instructors" they are redirected to the instructors page where they can see a list of local instructors based on their location. They then have the option check their details such as name and phone number and a link to their website.

## **Constraints**

Below is a list of constraints that we may consider to successfully complete our project.

### **Time**

Meeting our project deadline for April 19<sup>th</sup>, 2024, whilst studying for exams, completing assignments for other modules would be our main constraints.

### **Knowledge of React Native**

Since we are new to React Native, we are finding it challenging to learn the framework and its concepts. However, with the help of Locofy plugin in Figma our we are able to convert prototype designs into React Native seamlessly. Though we still would need to understand the code.

### **Knowledge of using OpenStreetMap + API**

We need to have a good understanding of the Map API and its concepts. There are many resources available online to help us get started with OpenStreetMap API, such as tutorials, forums etc.

### **Firebase Database**

This is also something we have never used but this seems fairly simple to us as there are great tutorials online and the user interface is very understandable.

## **Functional Requirements (In Depth)**

### **Register**

Description: This function allows users to register for the app by providing their personal information. On the main page of the app the user will have to register their information to be able to use the app. This form will prompt the user for the following mandatory information: email, username, and password.

Criticality: This function is essential to the system as the whole idea behind the functionality of the project is to be able to have members or users who feel the need to use the app.



Therefore, without this function, the project itself is meaningless. We also feel it is important to have this function as it helps us know what types of users we have and also helps improve our app.

Technical issues: The registration form will be designed in React Native and will fit in with the overall layout of the app. The form inputs will be handled using Firebase Authentication, which provides secure authentication and authorization services for your app. Firebase Authentication supports email and password authentication, phone number authentication, and social media authentication such as Google, Facebook, and Twitter. Once completed, this will create an entry for the user in the Firebase Realtime Database. The users table contains a foreign key which links to the user profile table.

Dependencies: This function is not dependent on any other requirements.

### **Login**

Description: This function allows users to log in to the app using their registered email and password.

Criticality: This function is essential to the system as it enables users to access the app's features. Without this function, users cannot use the app.

Technical issues: The login form will be designed in React Native and will fit in with the overall layout of the app. The form inputs will be handled using Firebase Authentication, which provides secure authentication and authorization services for your app. Firebase Authentication supports email and password authentication, phone number authentication, and social media authentication such as Google, Facebook, and Twitter.

Dependencies: This function is dependent on the Register function.

### **Logout**

Description: This function allows users to log out of the app.

Criticality: This function is essential to the system as it enables users to securely exit the app.

Technical issues: The logout button will be designed in React Native and will fit in with the overall layout of the app. The logout action will be handled using Firebase Authentication, which provides secure authentication and authorization services for your app.

Dependencies: This function is not dependent on any other requirements.

### **User Profile Management**

Description: This function allows users to manage their profile information such as name, email, and address.

Criticality: This function is important to the system as it enables users to update their profile information.

Technical issues: The user profile page will be designed in React Native and will fit in with the overall layout of the app. The user profile information will be stored in the Firebase Realtime Database.

Dependencies: This function is dependent on the Login function.

### **Test Centre Selection**

Description: This function allows users to select a test centre where they wish to practice their driving.

Criticality: This function is important to the system as it enables users to choose a test centre that is convenient for them.

Technical issues: The test centre selection page will be designed in React Native and will fit in with the overall layout of the app. The test centre information will be stored in the Firebase Realtime Database.

Dependencies: This function is dependent on the Login function.

### **Test Route Selection**

Description: This function allows users to select a predefined test route or a custom test route that they have created.

Criticality: This function is important to the system as it enables users to practice driving on a specific route.

Technical issues: The test route selection page will be designed in React Native and will fit in with the overall layout of the app. The test route information will be stored in the Firebase Realtime Database.

Dependencies: This function is dependent on the Login function and the Test Centre Selection function.

### **Test Route Creation**

Description: This function allows users to create custom test routes by placing pins on a map.

Criticality: This function is important to the system as it enables users to create custom test routes that suit their needs.

Technical issues: The test route creation page will be designed in React Native and will fit in with the overall layout of the app. The test route information will be stored in the Firebase Realtime Database.

Dependencies: This function is dependent on the Login function.

## **Navigation**

Description: This function allows users to navigate through the selected test route.

Criticality: This function is important to the system as it enables users to practice driving on a specific route.

Technical issues: The navigation page will be designed in React Native and will fit in with the overall layout of the app. The navigation feature will be implemented using the OpenStreetMap API.

Dependencies: This function is dependent on the Login function, Test Centre Selection function, and Test Route Selection function.

## **Theory Questions**

Description: This function allows users to answer theory questions covering topics like road rules, regulations, and road signs.

Criticality: This function is important to the system as it enables users to prepare for the theory test.

Technical issues: The theory questions will be stored in the Firebase Realtime Database. Firebase Analytics will be used to monitor user progress and provide feedback on their responses in a visual graph.

Dependencies: This function is dependent on the Login function.

## **Find Instructor**

Description: This function allows users to find local instructors based on their location. Users can view the details of the instructors such as name, phone number, and address.

Criticality: This function is important to the system as it enables users to find local instructors who can help them prepare for their driving test.

Technical issues: The find instructor page will be designed in React Native and will fit in with the overall layout of the app. The instructor details will be stored in the Firebase Realtime Database.

Dependencies: This function is dependent on the Login function.

## **Speed Monitoring**

Description: This function allows users to monitor the speed of their vehicle while driving.

Criticality: This function is important to the system as it enables users to monitor their speed and ensure they are driving within the speed limit.

Technical issues: The speed monitoring feature will be implemented using the device's GPS sensor. The speed data will be stored in the Firebase Realtime Database.

Dependencies: This function is dependent on the Login function.

## Database Management

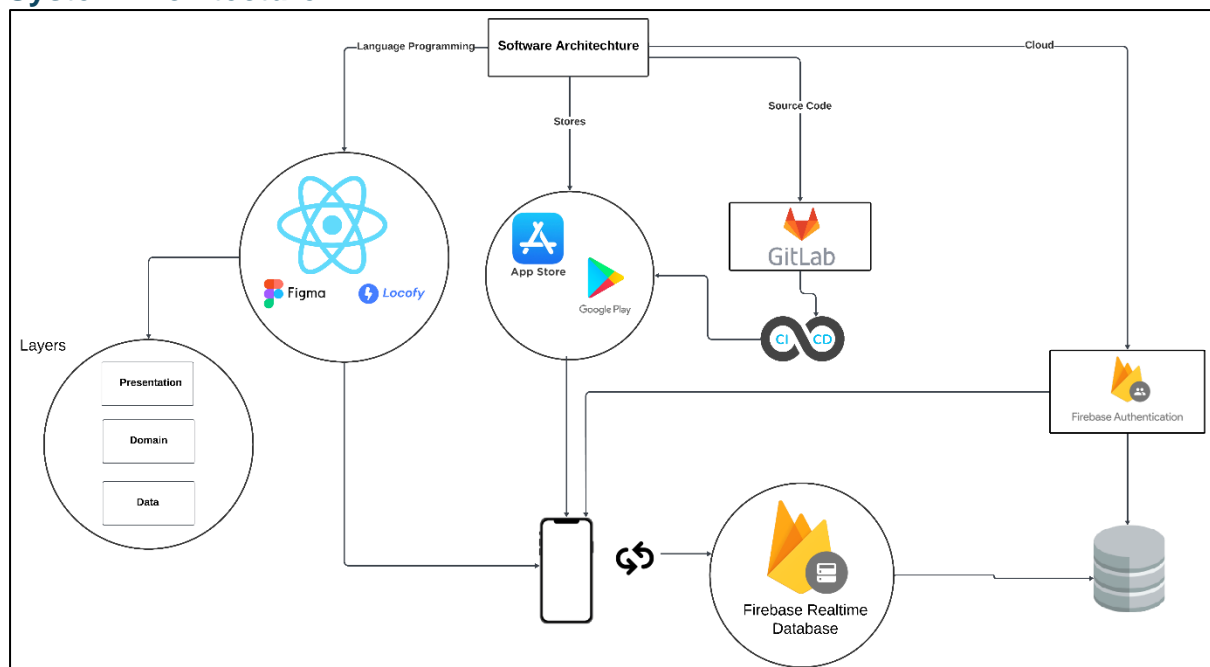
Description: This function allows users to manage the database of the app.

Criticality: This function is important to the system as it enables users to manage the data of the app.

Technical issues: The database management page will be designed in React Native and will fit in with the overall layout of the app. The database management feature will be implemented using Firebase Realtime Database.

Dependencies: This function is dependent on the Login function.

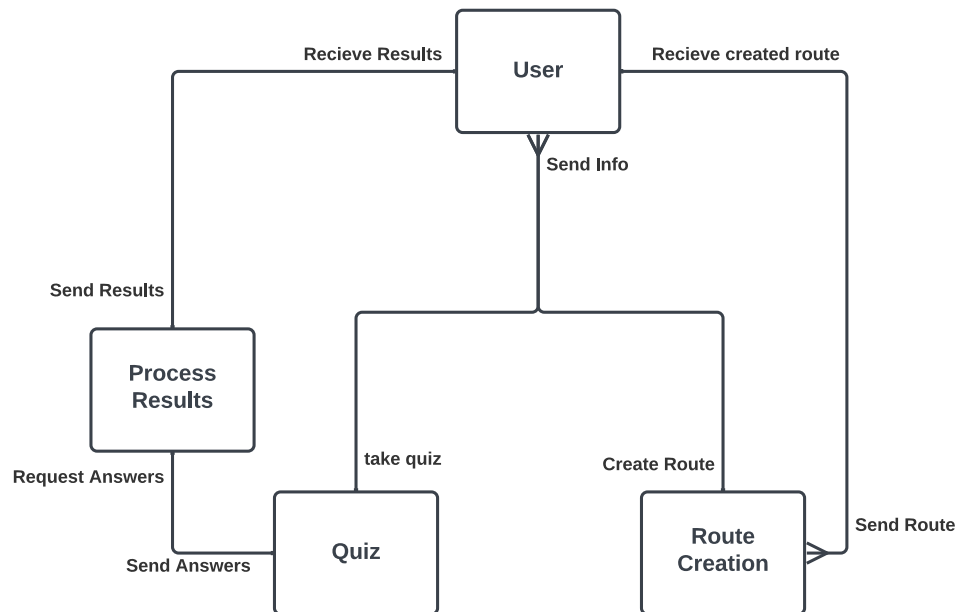
## System Architecture



This diagram shows the different layers of your "RoadReady" app and how they interact with each other. The User Interface layer is responsible for providing a user-friendly interface for the app. The Presentation layer is responsible for presenting the login page to the user. The Data layer is responsible for accessing the Firebase Realtime Database. The Locofy Plugin is used to convert Figma designs into code for React Native. The app stores such as App Store and Google Play are used to distribute the app. The source code is stored in GitLab in a CI/CD. Firebase Authentication is used to authenticate users and store their information in the Firebase Realtime Database.

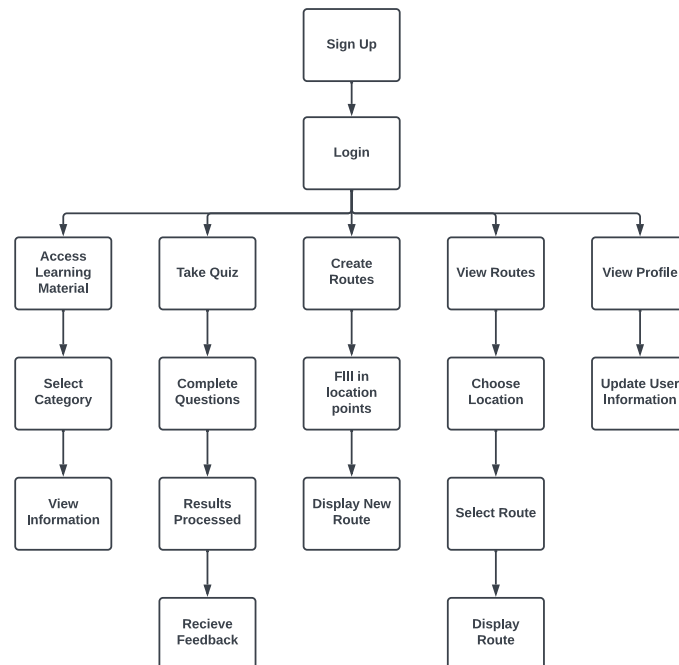
## High Level Design

### Logical Data Model



This diagram shows the structure of data and the relationships between them. This diagram shows the crucial aspect of the application showcasing the interaction between the user and the main features of the application.

## Functional Layout



This diagram lays out the structure of each function of the application. Starting with the first function being the sign up of the user, logging in and then choosing where in the app the user wants to navigate to.

## Proposed Timeline

Our proposed timeline for the “Road Ready App” starts on the 28<sup>th</sup> of September concluding and having the final mock-up of the app ready for the 19<sup>th</sup> of April. This end date is the final deadline for the app meaning all proposed features will need to be implemented by then. We have created a Gantt Chart to plan each iteration we will have to create each feature for our app. Then we have also created a Trello Board to create tasks, assign each task and monitor the progression of each task.

## Deliverables and Iterations

For our app we have 3 deliverables being “Learning Material”, “Theory Quiz”, and “Route Creation”. We have created a Gantt Chart where we have a purposed time to complete each of these deliverables. Each deliverable has iteration named by major tasks that will need to be completed in order to achieve the deliverable. Some deliverables will be harder to achieve and will need more tasks so the time to complete each iteration will be longer. Working on the app in iterations allows us to create tasks as we go and remove tasks later on when we are more familiar in the are and a better solution has been discovered.

## Assigning Tasks

To assign tasks we have created a Trello Board which we will create a backlog of tasks and assign ourselves to each task. Each task will have a due date and a difficulty label assigned to it. The difficulty labels will be colour coded based on time it will take to complete each task.

- Green: The Green label is used for tasks that can be completed in a single day.
- Yellow: The Yellow label is used for tasks that is estimated to be completed within 2 - 4 days.
- Orange: The Orange label is used for tasks that are estimated to take more than a week to complete but less than 2 weeks to complete.
- Red: The Red label is used for any difficult tasks that could take the full iteration to complete.
- Blue: The Blue label is for any research tasks needed to complete other tasks.

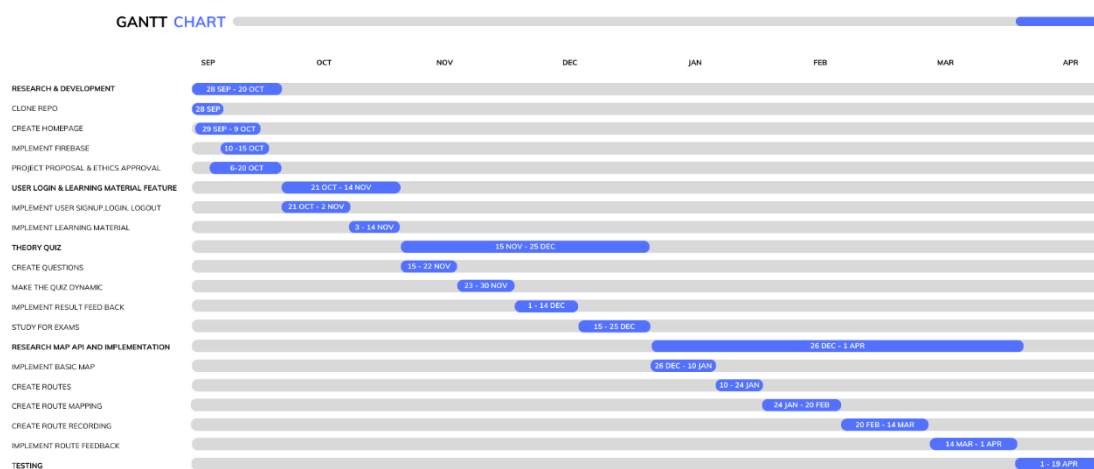
To monitor the progression of each task we have different stages in our Trello Board this allows each member to showcase the progression of each task. This allows us to see which task is falling behind and what focus needs to be placed in order to get the task back on track to meet the desired deliverable time.

- Backlog: Backlog is where we put tasks that are created but not fully complete and more information is needed before we can work on them.
- Research: The Research section is where tasks that needs more practice and research in order to complete. An example of this is learning a new coding language.

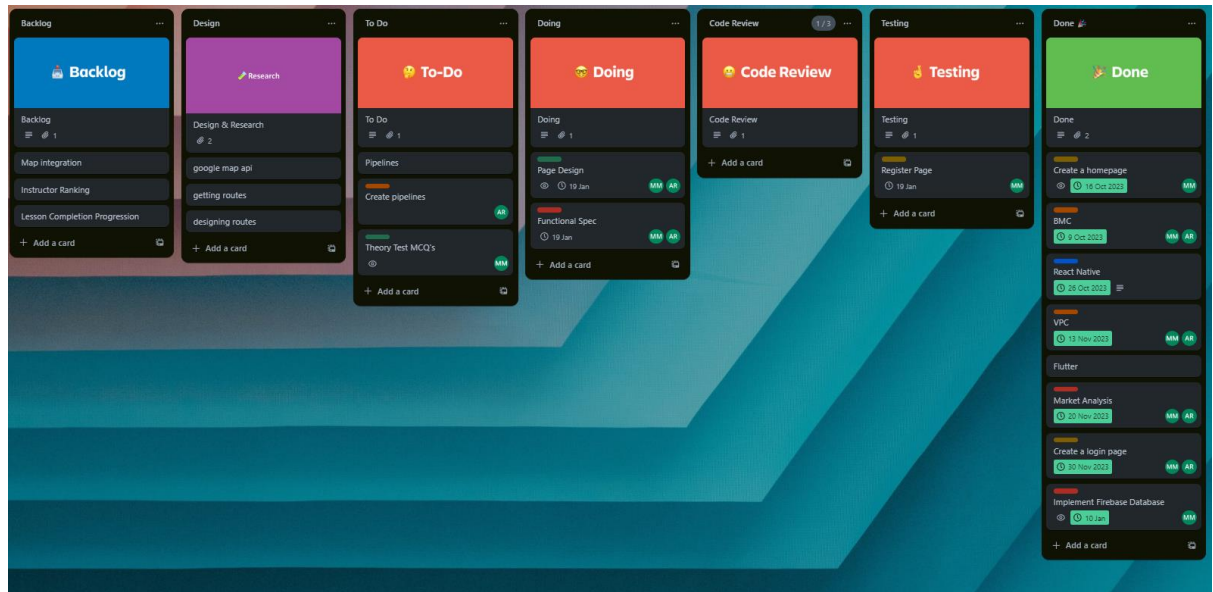
- **To-Do:** The To-Do section is for tasks that has all the information and is ready to be picked up.
- **Doing:** The Doing section is for tasks that have been assigned and are currently being worked on by a team member.
- **Code Review:** The Code Review section is when a task is ready, and a merge request is created but needs another member to look through the code to make sure there is no errors in the code. This section is to allow another perspective to the code before it is pushed to the main repository.
- **Testing:** The Testing Section is for when a task has passed code review and is pushed to the main repository. The new addition needs to be tested to see if any errors are created or other features breaks. If the errors are created the task goes back to the Doing section and the repository is rolled back to the previous version.
- **Done:** The Done section is when the task is done, reviewed and tested with everything working it will be moved to Done. At this point if the member has completed all their tasks early they can pick up a new task from the To-Do section.

## Error Planning

During the timeline of the project, we planned for as much problems that could hinder the development of the application. One of these is in the Gantt Chart we scheduled time for exams and the time it will need to study for them, we scheduled 2 and ½ weeks at the end of the project to allow for more testing and refinement of the application. We assigned coloured labels to allow us to only pick up tasks that we think we could do for each iteration, this will prevent us from randomly picking up tasks and falling behind deadlines. We also have a testing section to catch errors early so they don't appear later and cause us to fix the app and slow down development.



Link to Gantt Chart: <https://www.canva.com/design/DAFxlFO7lk/UCIQM2py4x6jy-MoJDWVeQ/view>



Link to Trello Board <https://trello.com/b/YBMDGjNa/backlog>

## Appendix

[1] O'Dea, S. (2020). Smartphone users in Ireland 2015-2022 | Statista. [online] Statista. Available at: <https://www.statista.com/statistics/494649/smartphone-users-in-ireland/>  
[Accessed 8 Dec. 2023]

[2] White, J. (2023). Almost 60,000 learner drivers face 10-month wait for tests. [online] Irish Examiner. Available at: <https://www.irishexaminer.com/news/arid-41133487.html#:~:text=Up%20to%2060%2C000%20learner%20drivers>  
[Accessed 8 Dec. 2023].

[3] White, J. (2023). Almost 60,000 learner drivers face 10-month wait for tests. [online] Irish Examiner. Available at: <https://www.irishexaminer.com/news/arid-41133487.html#:~:text=Up%20to%2060%2C000%20learner%20drivers>  
[Accessed 8 Dec. 2023]

[4] O'Dea, S. (2020). *Smartphone users in Ireland 2015-2022* | Statista. [online] Statista. Available at: <https://www.statista.com/statistics/494649/smartphone-users-in-ireland/>.  
[Accessed 8 Dec. 2023]

[5] Nechvolod, A. (2022). How do apps make money: popular revenue models explained. [online] Syndicode - Custom Software Development Company. Available at: <https://syndicode.com/blog/how-do-apps-make-money/>  
[Accessed 8 Dec. 2023]