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<Software Development>

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<Cameron Byrne>

<x19474662>

<x19474662@student.ncirl.ie>

<DiaDaily>

Technical Report

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Executive Summary

In this report I will go over the background and aims of my project DiaDaily. I will explain how my applications functions by outlining the use cases , functional requirements, the design architecture , the evaluation of the application and where I can take this application in the future , to give you an insight on this report and my application that it is based on.

1.0 Introduction

1.1. Background

I undertook this project as I feel there is not enough aid for diabetics that can be easily accessed by anyone , anywhere at almost any time. So, my motivation for this application is to create an all-in-one app for diabetics that they can have on their phone and use in their day-to-day life to keep up with their sugar intake , their calories burned, and blood sugar dropped via exercise and to also remind themselves to take insulin when required.

1.2. Aims

This project aims to be the only application for diabetic aid that will be needed, this app will help in multiple aspects of a diabetic’s life and can be a complete quality of life

improvement over trying to manage it regularly or with multiple other applications. Instead, they will have everything they need to manage Diabetes on a day-to-day basis with my application.

1.3. Technology

The technology I have attempted to use for this project is:

Android Studio:

This is the software where all the code will reside , since I am creating an android application, this makes it so much easier to live test new features inside android studio using their emulator features to imitate running the app on an android phone, this will be especially helpful in testing the notifications feature embedded in my reminders function.

Java:

This is the bulk of the code inside android studio; Java is very handy as it works well with SQLite which I use for my databases, and it also links well with the other technology I put in place for this android application such as the notifications and reminders page.

SQLite:

This is the main technology I will use for my 2 databases, with its create and delete functionality working well inside the application as it allows for a lot of entries to be stored and displayed while also allowing for extra functionality to be implemented as the development progresses.

GoogleML:

GoogleML is the experimental feature I will have implemented in the application, it will be used to select photos inside of your phone with a barcode, the application will scan this barcode and return you the relevant nutritional information for diabetics on the page, making it a-lot easier to enter then into the food database.

1.4. Structure

In Section 1, I will go over the background of the project being that it is an application to help diabetics in their day to day life, why I undertook this project being that I undertook it so I can provide an application that is better than the rest on the market with enough development and features to be the only app needed for a Diabetic, what I plan to do with then project being that I would like to build an application for diabetics that will allow them to monitor their sugar intake and blood sugar levels with a reminder feature for taking insulin and many quality of life implementations and how I will construct the application and the technologies used being that it will be an Android Application

constructed using Android studios and using technologies such as Java, SQLite and Google ML in this app.

In Section 2, I will go over all of the internal workings of the project, with all of the functionalities and requirements , I will go into detail about the architecture and design associated with the project as well as the implementation, GUI and the testing period.

In Section 3, I will go over the Conclusion, which will include the advantages and disadvantages of the project as well as the strengths and weaknesses of the application and where it can be improved upon.

In Section 4, I will go over the further development of the project, which will include the direction I would like to take it and the possibilities and features that can happen if I was given more time, resources, and research.

In Section 5, I will cover the references attached to the report and the project itself.

In Section 6, I will display all of my other material used throughout the development of the project , such as the Project Proposal, my Monthly Journals containing the work and research findings of that month along with the plans going forward and also my approved ethics application form for the Project.

2.0 System

2.1. Requirements

2.1.1. Functional Requirements

Functional Requirements Documented:

Use-Case id	Use-Case Description
UC-1	Navigate the Page using the Navigation Bar
UC-2	Add Entries to Databases
UC-3	Delete Entries from Databases
UC-4	Setting Notification reminder using the Reminder Page
UC-5	Selecting a Photo for the Barcode Scanner in the Scan Page
UC-6	Scanning a Barcode in the Scan page

- **UC-1** – System must recognise the user interacting with the Navigation Bar and redirect to the selected page accordingly.
- **UC-2** – System must be able to accept input from user, add the input to the database and display the input on screen.
- **UC-3** – System must recognise the user interacting with the created entry on screen and delete it from the database and the view model.
- **UC-4** – System must recognise the user interacting with the date and time fields and send a push notification to the phone with the inputted title/description provided permissions are met.

- **UC-5** – System must recognise the interaction between the user and the photo button, the system will navigate to the devices photo directory provided all permissions are met.
- **UC-6** – System must recognise the photo selected in UC-5 and display it on screen, once a user interacts with the scan button, the system must display the relevant barcode information.

2.1.1.1. Requirement 1 - Navigate the Page using the Navigation Bar

2.1.1.2. Description & Priority

UC – 1 – Priority 1 – The user must be able to navigate the application to access its features.

2.1.1.3. Use Case - 1

UC – 1 - Navigate the Page using the Navigation Bar

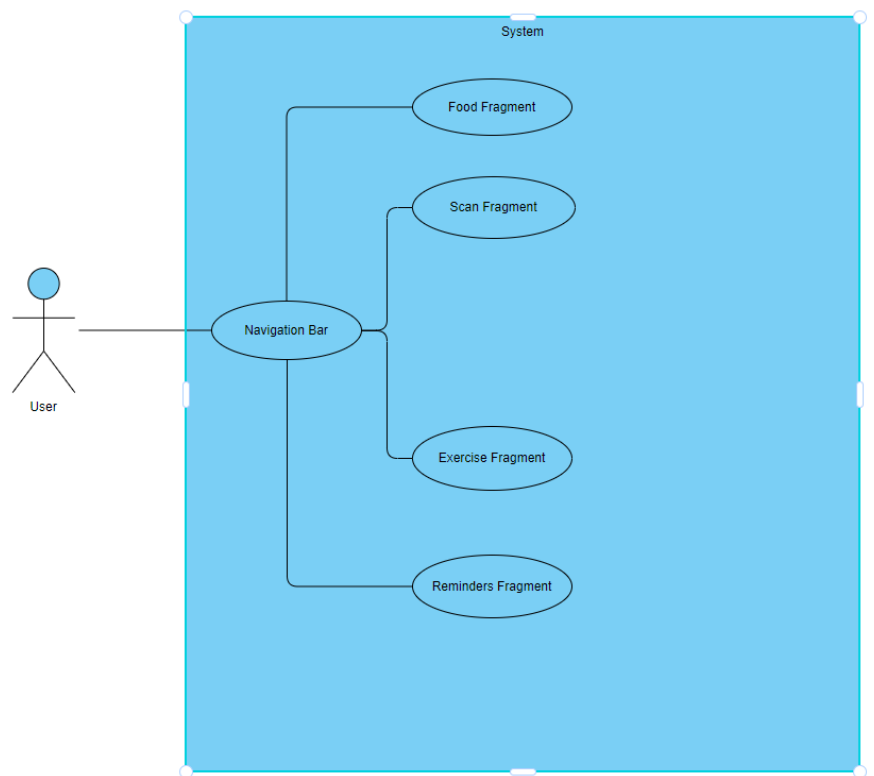
Scope

The User uses the bottom mounted navigation bar to navigate the applications pages.

Description

This use case describes the flow of the system for navigation of the App.

Use Case Diagram



Flow Description

Precondition

The application code is running.

Activation

This use case starts when the user runs the application.

Main flow

1. The system identifies the application is running.
2. The user clicks on a page on the navigation bar.
3. The system recognises the interaction and sends the user to the correct page.

Alternate flow

A1 : AF-1

1. The user clicks on a page on the navigation bar.
2. The system does not recognise the click, and nothing happens.
3. The use case continues at position 1 of the main flow.

Exceptional flow

E1 : EF-1

1. The user clicks on a page on the navigation bar.
2. The application crashes and sends an error.
3. The use case continues at position 1 of the main flow.

Termination

The system presents the required page.

Post condition

The system waits for another input.

[2.1.1.4. Requirement 2 - Add Entries to Databases](#)

[2.1.1.5. Description & Priority](#)

UC-2 – Priority 2 – The user must be able to add entries to the databases by inputting data into the required fields and pressing the add button.

[2.1.1.6. Use Case - 2](#)

UC-2 - Add Entries to Databases

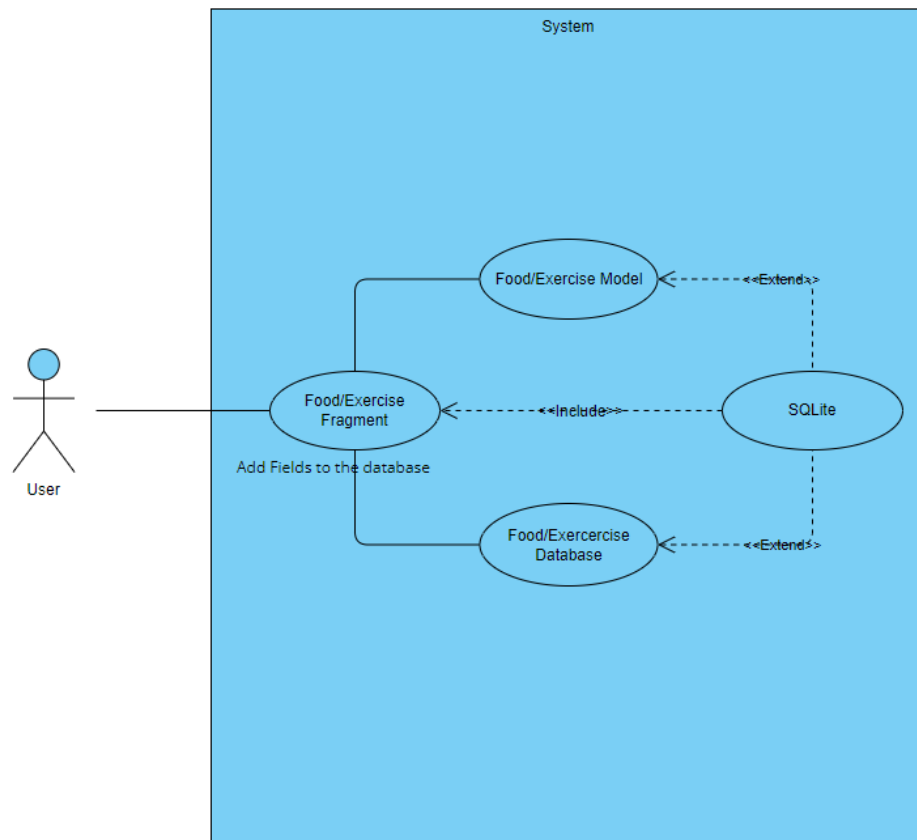
Scope

The user inputs data in the required fields and presses the add button to add the input to the database and have it display on screen.

Description

This use case describes the flow of the system for when the user adds an entry to the database.

Use Case Diagram



Flow Description

Precondition

The application is running, and the user is on the Food or Exercise Page.

Activation

This use case starts when a user navigates to the Food or Exercise page.

Main flow

1. The user inputs data into the respective fields.
2. The user presses the add button to add the inputted fields to the database.
3. The system adds the data to the database.
4. The system displays the database entry in its respective text view.

Alternate flow

A2 : AF-2

4. The user inputs data into some of the fields.

5. The user presses the add button to add the inputted fields to the database.
6. The system tells the user to fill in all the respective fields.
7. The use case continues at position 1 of the main flow.

Exceptional flow

E2 : EF-2

8. The user inputs data into the respective fields.
9. The user presses the add button to add the inputted fields to the database.
10. The system displays an error and restarts the application.
11. The use case continues at position 1 of the main flow.

Termination

The system adds the data to the respective database and displays it in the respective text field.

Post condition

The system waits for another input.

[2.1.1.7. Requirement 3 - Delete Entries from Databases](#)

[2.1.1.8. Description & Priority](#)

UC-3 – Priority 3 – The user must be able to delete entries from the databases by clicking on the required dataset.

[2.1.1.9. Use Case - 3](#)

UC-3 - Delete Entries from Databases

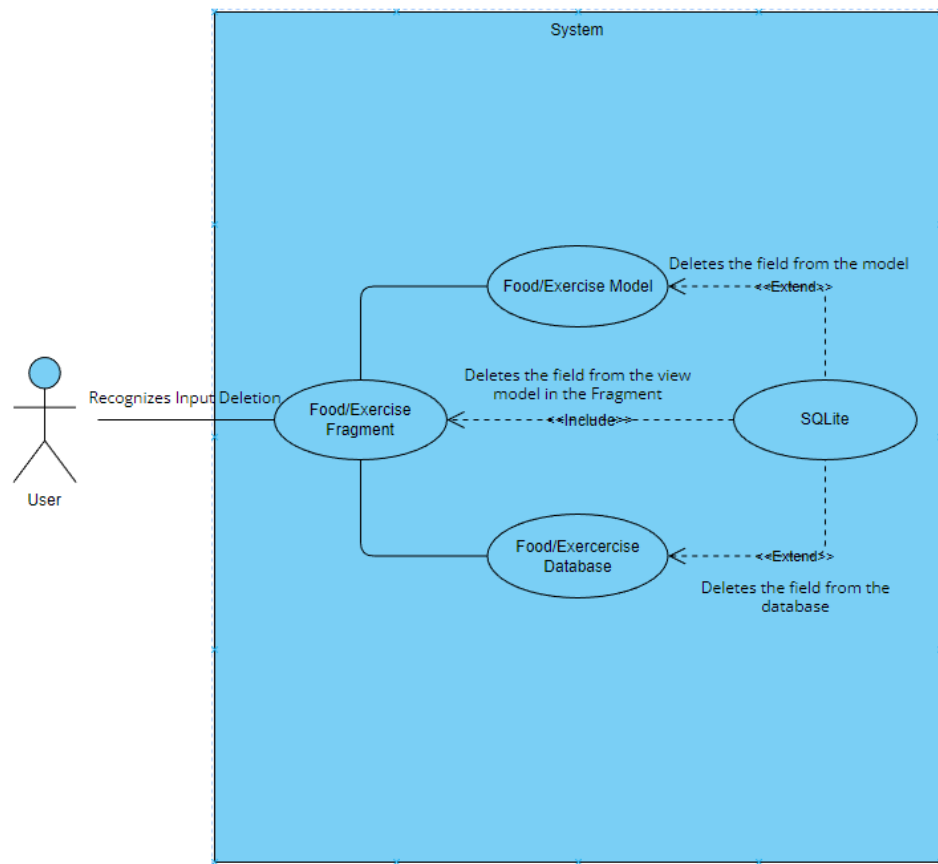
Scope

The user clicks on an existing dataset in the database, and it gets deleted from the database and text view.

Description

This use case describes the flow of the system for when the user deletes an existing entry from the database.

Use Case Diagram



Flow Description

Precondition

The application is running, and the user is on the Food or Exercise Page.

Activation

This use case starts when a user navigates to the Food or Exercise page.

Main flow

1. The user clicks on the existing text field they want to delete.
2. The system recognises the input.
3. The system removes the dataset from the respective database and text view.

Alternate flow

A3 : AF-3

1. The user clicks on the existing text field they want to delete.
2. The System does not recognise the click and the app restarts.
3. The use case continues at position 1 of the main flow.

Exceptional flow

E3 : EF-3 – N/A

Termination

The system deletes the data from the respective database and removes it from the respective text field.

Post condition

The system waits for another input.

[2.1.1.10. Requirement 4 - Setting Notification Reminder](#)

[2.1.1.11. Description & Priority](#)

UC-4 – Priority 4 – The user must be able to set a reminder with a title and description and have a push notification sent to their device at that specified time.

[2.1.1.12. Use Case - 4](#)

UC-4 - Setting Notification reminder using the Reminder Page

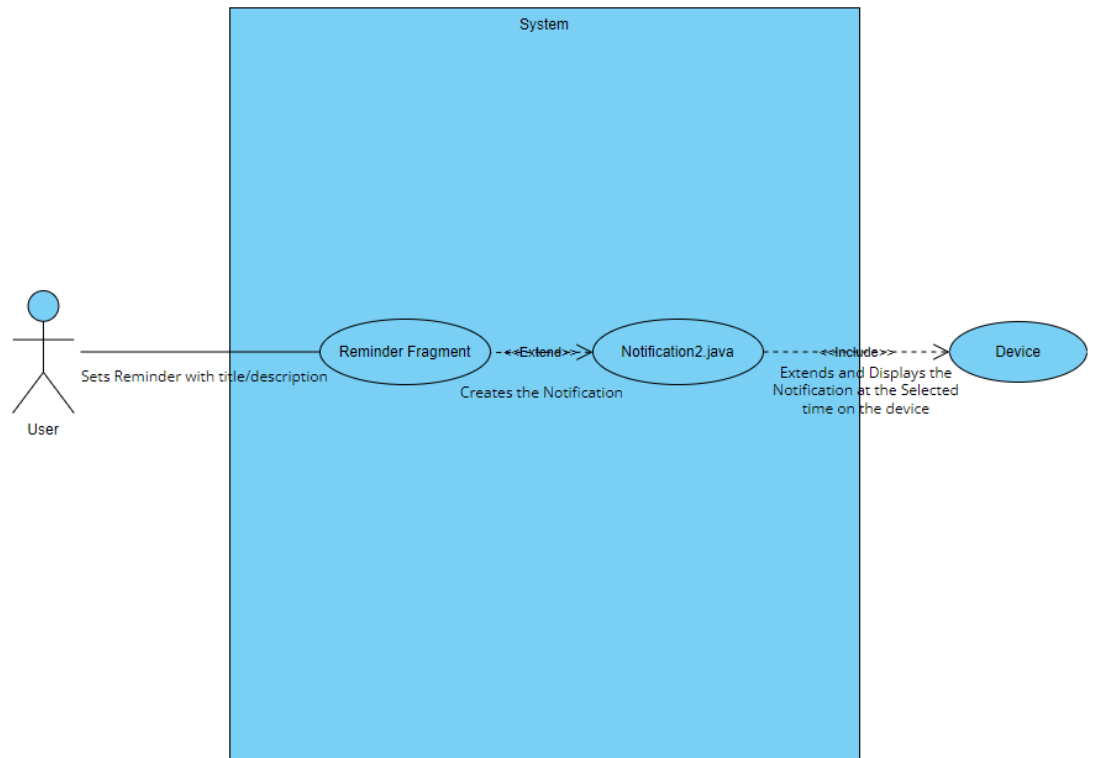
Scope

The user sets a reminder for a notification on the Reminders page at a specific time with a Title and Description.

Description

This use case describes the flow of the system for when the sets a notification on the reminders page.

Use Case Diagram



Flow Description

Precondition

The application is running, and the user is on the Reminders Page.

Activation

This use case starts when a user navigates to the Reminders Page.

Main flow

4. The user sets a title and description for the reminder then specifies the time and date for the notification.
 1. The user clicks the Notify button.
 2. The system sets the reminder and displays a message.
 3. The system sends a push notification to the phone at the specified time with the title and description of the reminder.

Alternate flow

A4 : AF-4

4. The user clicks the Notify button.
5. The system displays an invalid input error related to the date/time or text inputs.
6. The use case continues at position 1 of the main flow.

Exceptional flow

E4 : EF-4

7. The user clicks the Notify button.
8. The system doesn't recognise the input and the app restarts.
9. The use case continues at position 1 of the main flow.

Termination

The system sets the reminder for the user to be notified at the given time.

Post condition

The system waits for another input.

2.1.1.13. Requirement 5 - Selecting a Photo for the Barcode Scanner

2.1.1.14. Description & Priority

UC-5 – Priority 5 – The user must be able to select a photo on their device for use with the barcode scanner feature.

2.1.1.15. Use Case - 5

UC-5 - Selecting a Photo for the Barcode Scanner in the Scan Page

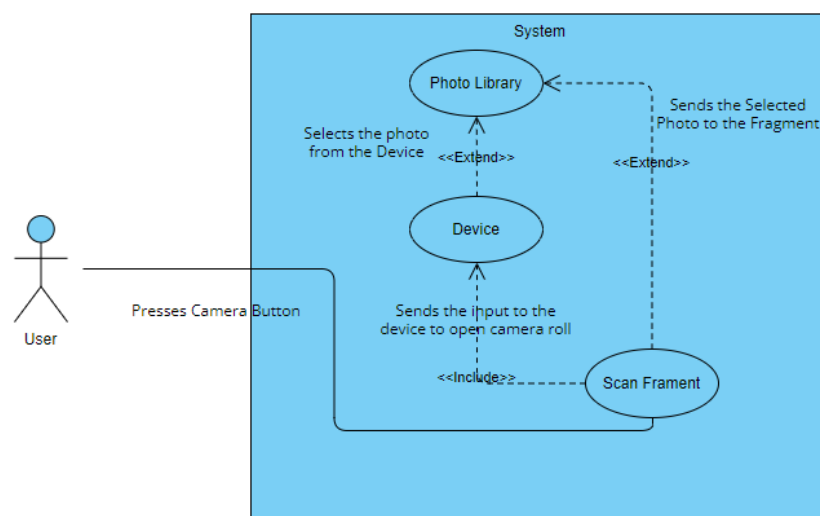
Scope

The user presses the photo button to select a photo from their device for use in the Barcode Scanner.

Description

This use case describes the flow of the system when a selects a photo from their device for use in the Barcode Scanner.

Use Case Diagram



Flow Description

Precondition

The app is running, and the user has navigated to the Scan Page.

Activation

This use case starts when the user has navigated to the Scan Page.

Main flow

1. The user presses the camera button to select a photo.
2. The user selects a photo for scanning with the barcode scanner.
3. The system recognises the input.
4. The system displays the barcode for scanning .

Alternate flow

A5 : AF-5

1. The user presses the camera button to select a photo.
2. The system provides an invalid photo error and prompts the user to select another photo.
3. The use case continues at position 1 of the main flow.

Exceptional flow

E5 : EF-5

4. The user presses the camera button to select a photo.
5. The system doesn't recognise the input and the app restarts.
6. The use case continues at position 1 of the main flow.

Termination

The system displays the photo selected to be used by the Barcode Scanner

Post condition

The system waits for another input.

[2.1.1.16. Requirement 6 - Scanning a Barcode in the Scan page.](#)

[2.1.1.17. Description & Priority](#)

UC-6 – Priority 6 – The user must be able to scan the photo they have selected with the barcode scanner and have the relevant information shown.

[2.1.1.18. Use Case - 6](#)

UC-6 - Scanning a Barcode in the Scan page.

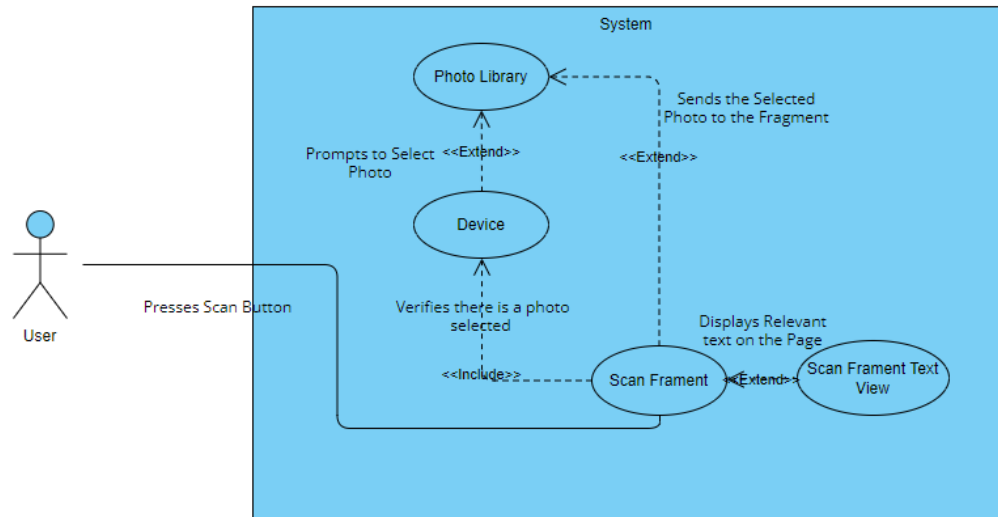
Scope

The user selects a photo as described in UC-5 and is able to scan the photo with the barcode scanner and have the relevant information described.

Description

This use case describes the flow of the system when a user scans a selected photo with the Barcode Scanner

Use Case Diagram



Flow Description

Precondition

The app is running, and a photo has been selected for scanning.

Activation

This use case starts when the user navigates to the Scan page and selects a photo for scanning.

Main flow

1. The user selects a photo for scanning with the barcode scanner.
2. The user presses the scan button once the photo has been selected.
3. The system recognises the input.
4. The system scans the barcode and displays the relevant information.

Alternate flow

A6 : AF-6

1. The user presses the scan button .
2. The system provides an invalid photo error and prompts the user to select another photo.
3. The use case continues at position 1 of the main flow.

Exceptional flow

E6 : EF-6

1. The user presses the scan button .
2. The system doesn't recognise the input and the app restarts.

3. The use case continues at position 1 of the main flow.

Termination

The system recognises and scans the barcode , then displays its relevant information.

Post condition

The system waits for another input.

2.1.2. Data Requirements

Data Requirements Documented:

Data Req. ID	Requirement Description
DR-1	The system must store and remove data from the databases
DR-2	The system must be able to send a push notification to the user's device at the specified time
DR-3	The system must be able to access the devices camera and photo library to scan barcodes

2.1.3. User Requirements

User Requirements Documented:

User Req. ID	Requirement Description
UR-1	The user must have an Android Device
UR-2	The user must have the Application installed

2.1.4. Environmental Requirements

Environmental Requirements Documented:

Env. Req. ID	Requirement Description
ER-1	The Android Device must run on Android 8.0 Oreo or Higher
ER-2	The user must have the Application installed
ER-3	Thy system must be easily Scalable for future updates and additions

2.1.5. Usability Requirements

Usability Requirements Documented:

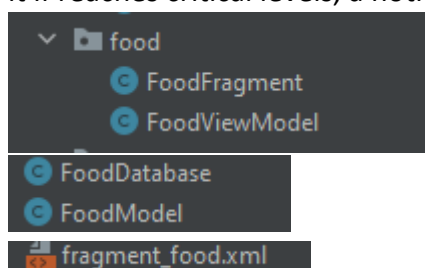
Use. Req. ID	Requirement Description
UBR-1	The system must add and remove entries from the Databases
UBR-2	The system must be easy to navigate
UBR-3	The system must be able to scan barcodes and display relevant info
UBR-4	The System must be able to ser reminders and notify the user at the specific time

2.2. Design & Architecture

The design of the project is that it is a 4-page application (for now) with the ability to change pages using a bottom mounted navigation bar, the navigation of the page is very fluid and good on the eyes.

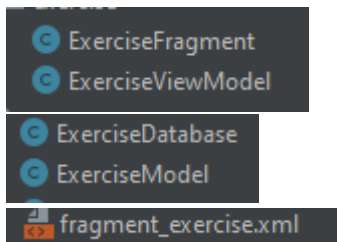
The four pages consist of the

- Food Page/Fragment – This is the home page of the application made up of the fragment functions, an external SQLite database and the Model for the page and database with an XML file for its layout. This is where users can enter food information into the local database for day-to-day storage. The user is able to input the name, sugar content (in g) and the time and date eaten so they can keep track of their sugar consumption throughout the day. I would also like to include some extra features on this page in the future such as the ability to calculate the sugar intake for the day and to display a warning if it gets too high, if it reaches critical levels, a notification will be sent to the device.

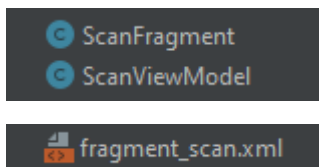


- Exercise Page/Fragment - This is built almost identically to the Food page in the sense that is made up of the fragment functions, an external SQLite database and the Model for the page and database with an XML file for its layout. This page will allow you to track your exercise and calories burned on the page along with the time and duration of the exercise. I would like to scale this by allowing it to work with the feature above mentioned in the food page where if there has been

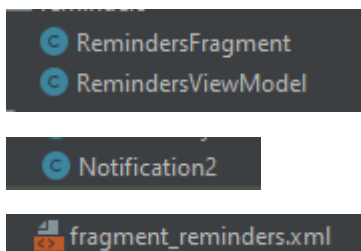
too much sugar consumed without exercise to burn it off, you will be presented with a warning and if it reaches critical levels, a notification will be sent to the device.



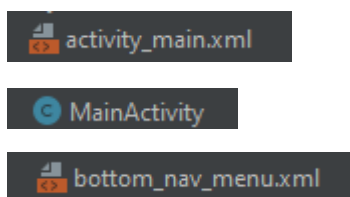
- Scan Page/Fragment – This page is made up of the scan fragment with tweaks to the Android Manifest file to allow for the import of Google ML’s features. On this page the user can scan a barcode or display a barcode they have already taken a photograph of and scan it to reveal the information associated with it. In the future I would like to develop this in a way that the important food information is extracted from the barcode and automatically placed inside the food database at the time its scanned.



- Reminders Page/Notifications/Fragment – This page is made up of the fragment of the main functionality and is also linked to the outside Notifications page to allow the notification to be created with the specific parameters and then to be sent to the phone at the given date/time and displayed in app.



This is all bonded together in the MainActivity and MainActivity.xml, where the navigation bar resides and allows the fluid navigation between the pages.



2.3. Implementation

The main function of the app is split into 4 fragments with a MainActivity for the navigation bar and outside classes for the food/exercise models and databases and a single outside class to handle the notifications being sent to the device.

Here we have a code snippet that handles the Nav Bar

```
binding = ActivityMainBinding.inflate(getLayoutInflater());
setContentView(binding.getRoot());

BottomNavigationView navView = findViewById(R.id.nav_view);
AppBarConfiguration appBarConfiguration = new AppBarConfiguration.Builder(
    R.id.navigation_food, R.id.navigation_exercise, R.id.navigation_scan, R.id.navigation_reminders)
    .build();
NavController navController = Navigation.findNavController( activity: this, R.id.nav_host_fragment_main);
NavigationUI.setupActionBarWithNavController( activity: this, navController, appBarConfiguration);
NavigationUI.setupWithNavController(binding.navView, navController);
```

And some test code for the initialisation of the barcode scanner using Google ML to determine if the function is working

```
private void extractBarcodeQRCodeInfo(List<Barcode> barcodes) {
    for (Barcode barcode : barcodes){
        Rect bounds = barcode.getBoundingBox();
        Point[] corners = barcode.getCornerPoints();

        String rawValue = barcode.getRawValue();
        Log.d(TAG, "extractBarcodeQRCodeInfo: rawValue: " + rawValue);

        int valueType = barcode.getValueType();

        switch (valueType){
            case Barcode.TYPE_WIFI:{
                Barcode.WiFi typeWifi = barcode.getWifi();

                String ssid = typeWifi.getSSID();
                String password = typeWifi.getPassword();
                String encryptionType = typeWifi.getEncryptionType();

                Log.d(TAG, "extractBarcodeQRCodeInfo: TYPE_WIFI: ");
                Log.d(TAG, "extractBarcodeQRCodeInfo: ssid: " + ssid);
                Log.d(TAG, "extractBarcodeQRCodeInfo: password: " + password);
                Log.d(TAG, "extractBarcodeQRCodeInfo: encryptionType: " + encryptionType);

                resultV.setText("TYPE: TYPE_WIFI \nssid: " + ssid + "\npassword: " + password + "\nencryptionType:" + encryptionType + "\nraw value: " + rawValue);
            }
        }
        break;
    }
}
```

Some code that shows the Scheduling of the notifications inside the reminder fragment

```
private void scheduleNotification() {
    Intent intent = new Intent(requireContext(), Notification2.class);
    String reminder = binding.reminderET.getText().toString();
    String message = binding.messageET.getText().toString();
    intent.putExtra(reminderExtra, reminder);
    intent.putExtra(messageExtra, message);

    PendingIntent pendingIntent = PendingIntent.getBroadcast(
        requireContext(),
        notificationID,
        intent,
        flags: PendingIntent.FLAG_IMMUTABLE | PendingIntent.FLAG_UPDATE_CURRENT
    );

    AlarmManager alarmManager = (AlarmManager) requireContext().getSystemService(Context.ALARM_SERVICE);
    long time = getTime();
    alarmManager.setExactAndAllowWhileIdle(
        AlarmManager.RTC_WAKEUP,
        time,
        pendingIntent
    );
    showAlert(time, reminder, message);
}
```

Some initialisations of the Notifications

```
package com.example.diadailyproject;

import ...

public class Notification2 extends BroadcastReceiver {

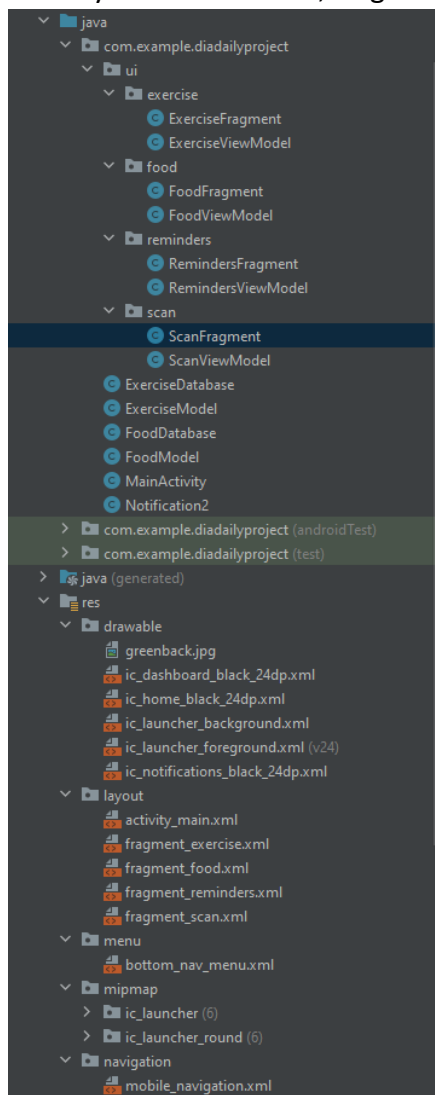
    public static final String reminderExtra = "reminderExtra";
    public static final String messageExtra = "messageExtra";
    public static final String channelID = "channel1";
    public static final int notificationID = 1;

    @Override
    public void onReceive(Context context, Intent intent) {
        NotificationCompat.Builder builder = new NotificationCompat.Builder(context, channelID)
            .setSmallIcon(R.drawable.ic_launcher_foreground)
            .setContentTitle(intent.getStringExtra(reminderExtra))
            .setContentText(intent.getStringExtra(messageExtra));
        NotificationManager notificationManager =
            (NotificationManager) context.getSystemService(Context.NOTIFICATION_SERVICE);
        notificationManager.notify(notificationID, builder.build());
    }
}
```

And finally, some code to recognise the selected photos from the device

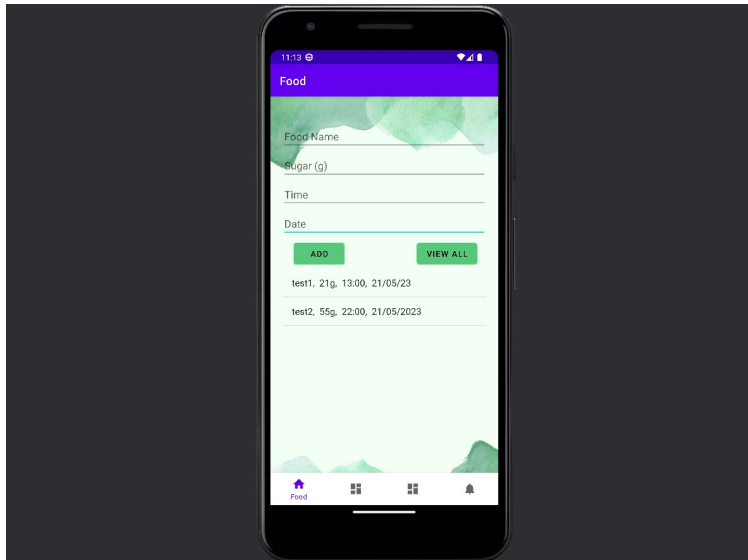
```
private void detectResultFromImage(){
    try {
        InputImage inputImage = InputImage.fromFilePath(getContext(), imageUri);
        Task<List<Barcode>> barcodeResult = barcodeScanner.process(inputImage)
            .addOnSuccessListener(new OnSuccessListener<List<Barcode>>() {
                @Override
                public void onSuccess(List<Barcode> barcodes) {
                    extractBarCodeQRCodeInfo(barcodes);
                }
            })
            .addOnFailureListener(new OnFailureListener() {
                @Override
                public void onFailure(@NonNull Exception e) {
                    Toast.makeText(getContext(), text: "Failed scan due to "+e.getMessage(), Toast.LENGTH_SHORT).show();
                }
            });
    }
    catch (Exception e){
        Toast.makeText(getContext(), text: "Failed due to "+e.getMessage(), Toast.LENGTH_SHORT).show();
    }
}
```

The Layout of the codes, fragments, and view models

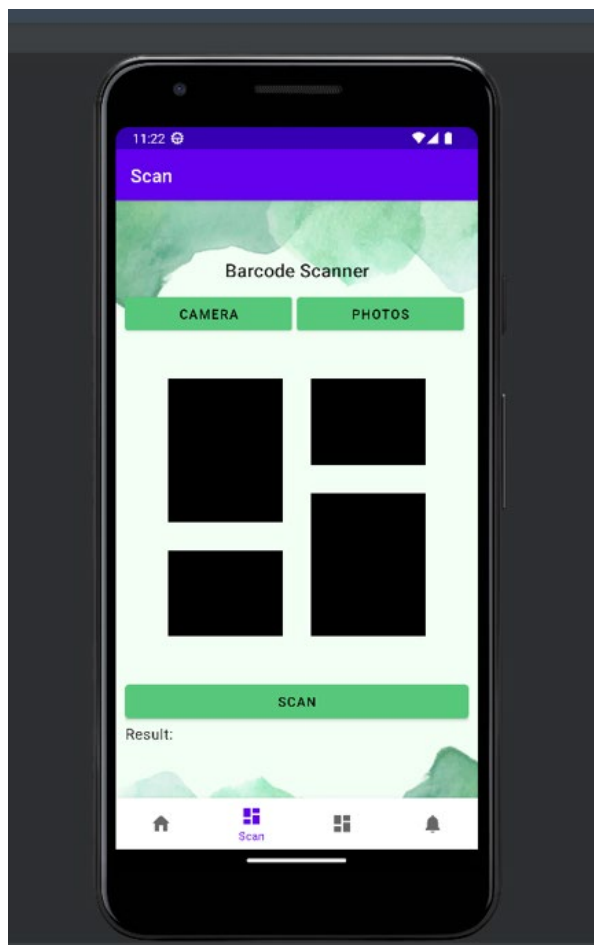


2.4. Graphical User Interface (GUI)

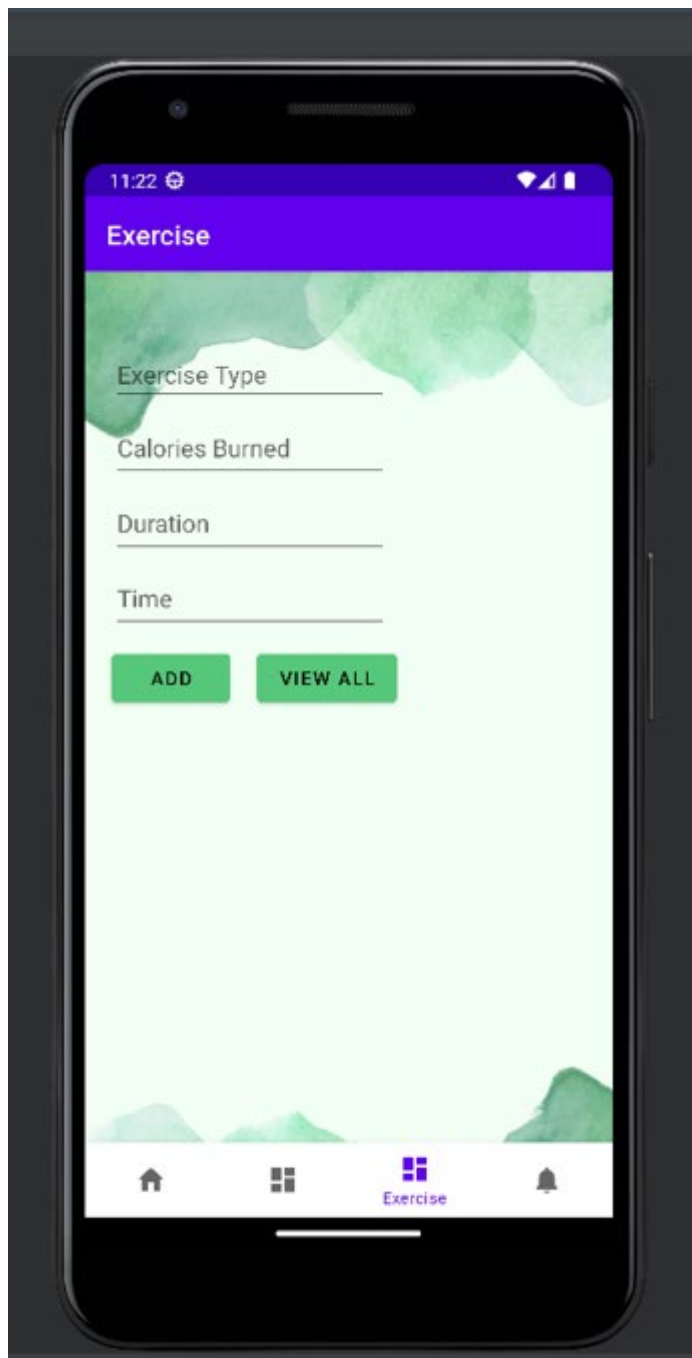
This is a screenshot of the Food Data page, where you can add all your food for the day, along with the time it was eaten and the sugar content to keep track of the food eaten.



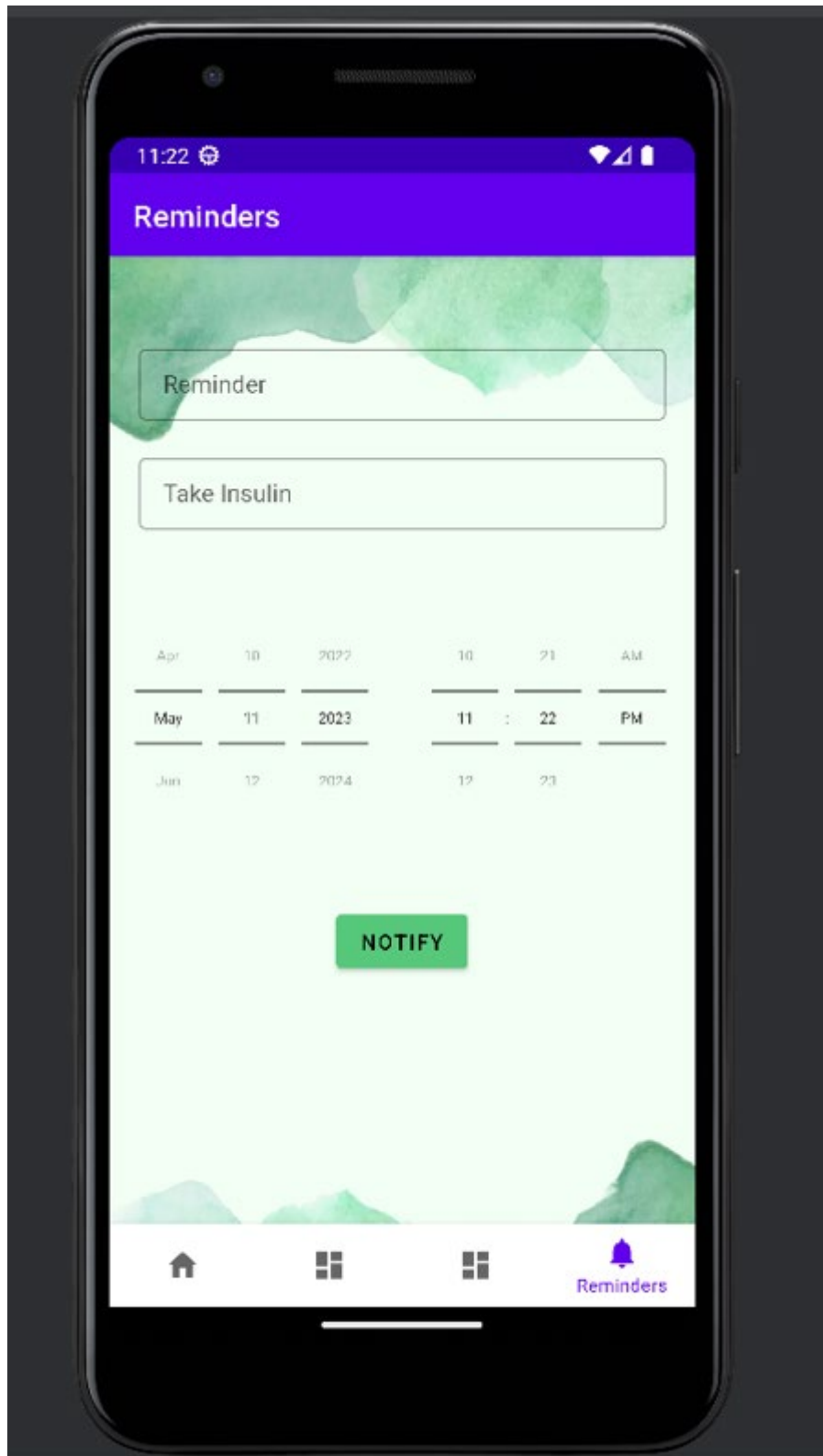
This is the barcode scanner screen, where you can use a photo that has already been taken or you can use your live camera to scan the barcode for its information.



This is the Exercise screen where in contrast to the food page , you can record your daily exercise and calories burned to help keep track of your blood sugar levels throughout the day.



This is the Reminders page, where you can schedule a date and time to receive a phone notification with a title and message such as a reminder to take your Insulin.



2.5. Testing

I used a test plan to document the major tests throughout the development.

Test Plan

id	Description	Expected	Actual
1	Add To Database (Food)	Food input would be added to the database and displayed below	Food data is added and displayed accordingly
2	Remove from Database (Food)	User interacts with then entry and the entry is deleted	Entry is deleted successfully; Toast message is displayed
3	Add To Database (Exercise)	Exercise input would be added to the database and displayed below	Bug Found – Data not Displayed, Issue with Navigation Bar.
4	Add To Database (Exercise) 2	Exercise input would be added to the database and displayed below	Exercise data is added and displayed accordingly
5	Remove from Database (Exercise)	User interacts with then entry and the entry is deleted	Bug Found – Data not Deleted, Issue with the onClick Delete Function
6	Remove from Database (Exercise) 2	User interacts with then entry and the entry is deleted	Entry is deleted successfully; Toast message is displayed
7	Set Reminder using Notification.kt/ ReminderFragment.kt	Reminder is set and notification is displayed at the given time	Bug Found – Kotlin files causing and error, Clash with Java code
8	Set Reminder using Notification2.java/ ReminderFragment.java	Reminder is set and notification is displayed at the given time	Notification pings the device at the given time with the title/description
9	Scan Barcode to Display information on the Scan Page	Photo is selected from the device; barcode is scanned, and relevant text is displayed	Bug Found – App Crashes and error is given when selecting photo

10	Scan Barcode to Display information on the Scan Page 2	Photo is selected from the device; barcode is scanned, and relevant text is displayed	Bug Found – Photo is selected and displayed; No Data is displayed upon pressing the scan button
11	Scan Barcode to Display information on the Scan Page 3	Photo is selected from the device; barcode is scanned, and relevant text is displayed	Photo is selected and displayed; Data is displayed, and the text is shown beneath the scan button.

2.6. Evaluation

The system was evaluated by me performing extensive local testing with the application, allowing me to get a user's hands-on experience with the app and allowing me to have the knowledge to implement some other features/quality of life changes, this also helped with finding bugs and fixing the source of the bug in the application using Android Studios Debug Attach feature, where I could debug certain areas of the application to ensure each component is working correctly to limit the possibilities of bugs slipping through. This then allowed me to get a full feel of the application and how it performs, making sure that the performance meets my expectations and having it in a state where I can scale the project up in the future and work on updated versions of the app, both visually and functionally.

3.0 Conclusions

This project has given me a really good feel for the Android Studio IDE and the inner workings associated with creating an Android application, this has given me the knowledge to allow me to continue with this project and develop it in the future or provide me with enough confidence to pursue another android based project in the future.

The advantages of the project and a big strength also is that all the data can be locally stored across devices, meaning that it will not require a login/registration function for the application, meaning there will be no need to deploy separate databases to ensure the application runs. This also allows all the features to work in an offline setting which is perfect for this type of application. This however brings a slight disadvantage when it comes to automatically clearing the databases daily, this instead will have to be done manually at this time. The ability to scale this project up is also a very big advantage as Android studio implements its own version control feature, allowing changes to be made before adding it to the latest version of the app.

The disadvantage to android studio is the potential to clash with other outside features that may be implemented, but this is partially controlled by the version control.

4.0 Further Development or Research

I think with additional time and resources I feel like this project could take a very good direction in the way that the barcode scanner can be refined to immediately implement the barcode information into the SQLite database for the food scanned, the food and exercise pages can be implemented with features that could allow you to balance your blood sugar levels based on food eaten and exercise done on a daily basis and to implement some new features and technologies to make the app more functional and secure.

5.0 References

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6.0 Appendices

6.1. Project Proposal

Objectives

This project sets out to be an all-in-one , day-to-day application for Diabetics that they can have on their phone to aid with all aspects of life with Diabetes.

The application serves as a convenience to people with Diabetes as it will allow them to monitor and interact with many peers of their condition without the need for multiple apps and services , DiaDaily sets out to keep all of these features in one app that they can keep anywhere and have on their phones at most points of day-to-day life.

Background

I chose to undertake this project as my research has noticed that a lot of apps currently devised for diabetics are very one-dimensional and only offer a small number of features.

To achieve what I set out in Section 1, Using DiaDaily, I plan to make the all-inclusive app for Diabetes management on your phone, I will incorporate all of the features as demonstrated in my pitch, without the need for switching between multiple apps , having all of the features and information in one safe place , where you can monitor everything from your phone.

State of the Art

There are many existing apps for Diabetes such as Mysugr and Glucose Buddy , the first of which being restricted to iPhones. They do similar things as each other but also leave out key features which are then filled by other niche applications.

With DiaDaily, the plan is to remove the need for all of these apps and incorporate all of the features needed into one application and put my own spin on the features and additions, such as the barcode and food logging sections. This will then help branch out DiaDaily as the only Diabetic app needed on your phone as it can do it all, which allows for increased ease of use as all the information is kept in one place as opposed to swapping information across multiple apps.

Certain features such as the Barcode scanner will also make the application unique in terms of diabetes apps which will hopefully make it stand out from the crowd.

Technical Approach

My approach to development will be carefully considered after a lot of research into the viability of the Application.

As for structure, I will plan out my tasks , milestones, duration of tasks and deadlines for tasks using a Trello board.

This will allow me to keep track of all aspects of the development and the timeframes I set for them, while also allowing me to add set deadlines and add specified tasks as time goes on.

This means I can use this board to stay up to date with all of my implementations and have a general idea of my progression as the application is built.

Using the Trello board allows me to create different boards inside the project to section out areas and split up tasks based on the features being implemented which will keep me organised and up to date on tasks I want to work on in a specific area at a specific time.

Technical Details

A lot of this is still under research and can be updated more at the midpoint so this will be a small section on the implementation of the main topic of research thus far, being the Barcode scanner.

This can be used to scan barcodes and note the food/drinks sugar and glucose levels and match it with the other inputted information for the day and decide if it is good to consume at that point.

To implement this, I will attempt to use Google ML along with a database structure to scan, input and store the information to allow it to be calculated and displayed on the user's profile, although a lot of this is still to be determined.

Special Resources Required

There are no Special Resources required as of now for this project, but this may change in the development and will be updated further if so.

Project Plan

The Project Plan is short as of now as I will need to fully research how I will create base of the project first.

What I Have so far is that I will create a main database as the core of all the info that will be inputted into the app, this will take hopefully no more than a couple of weeks as it has to be able to accept all forms of inputted data and sort the data accordingly, this database will be very important in making parts of the app work such as using the data in the database to determine blood sugar levels etc..

A lot more of the information regarding the main application will be accessible come the Midpoint presentation as I will have completed most of my research and hopefully will have the base of my project application intact.

Testing

As for testing, the thought for the future will be various integration tests conducted every time there's a feature added to the Application internally, my thought will also be to try roll out multiple beta builds of the Application to stress test and bug test the Application at various stages of Development and to draft up a Bug Report to iron out all the problems that may be present during

either the beta builds or the integration tests. When rolling out the Beta's I will hopefully be able to have a small sample size of people to essentially route out bugs in the Application and to make lists so I can prioritise the Fatal Errors and to work around the less important bugs and issues that may be present in the Early Stages. More testing may be needed during development, but this will be updated in the midpoint accordingly.

6.1. Ethics Approval Application

Ethics Application Checklist

1. I agree to obtain informed written consent from all human participants aged over 18 who are involved in this research (or if circulating digitally, I will ensure that informed consent is completed, and will have the participants indicate their informed consent by continuing with their study engagement).	X
2. I agree to obtain informed written consent from the parents of anyone aged under 18 in this research (or from the schools if appropriate), and informed written assent from those under 18 in this research.	<input type="checkbox"/> X
3. I include a letter of agreement from a clinically responsible individual agreeing to (where appropriate) help me recruit/provide clinical support in the event that participants become distressed/host the study data collection.	<input type="checkbox"/>
4. I append a letter of agreement from an external institution or organisation agreeing to host the study.	<input type="checkbox"/>
5. I agree to comply with NCI's Data Retention Policy.	<input type="checkbox"/> X
6. I have appended a) information sheet, b) consent form/assent form, c) debriefing sheet.	<input type="checkbox"/> X
7. I have provided details of how non-anonymised data will be stored, in a safe and encrypted manner.	<input type="checkbox"/> X
8. I have included my contact details and those of my supervisor (where appropriate). I have only included my NCI email address and not included any personal contact information.	<input type="checkbox"/>
9. I have given sufficient details on the proposed study design, methodology, and data collection procedures, to allow a full ethical review, and I understand that my failure to give sufficient detail may result in a resubmission being required.	<input type="checkbox"/> X
10. I understand that if I make changes to my study following ethical approval, it is my responsibility to seek an ethics amendment if the change merits ethical consideration.	<input type="checkbox"/> X
	<input type="checkbox"/> X

National College of Ireland

Human Participants Ethical Review Application Form

Part A: Title of Project and Contact Information

Name

Cameron Byrne

Student Number (if applicable)

X19474662

Email

X19474662@student.ncirl.ie

Status:

Undergraduate

Postgraduate

Staff

Supervisor (if applicable)

Athanasios Staikopoulos

Title of Research Project

DiaDaily – Your all in one application for Diabetics

Category into which the proposed research falls (see guidelines)

Research Category A

Research Category B

Research Category C

Have you read the NCI Ethical Guidelines for Research with Human Participants?

Yes

No

Please indicate any other ethical guidelines or codes of conduct you have consulted

N/A

Has this research been submitted to any other research ethics committee?

Yes

No

N/A

Is this research supported by any form of research funding?

Yes

No X

N/A

Part B: Research Proposal

Proposed starting date and duration of project

October 2022 – May 2023

The rationale for the project

There are many applications for diabetics out there but they all offer different features that are important to diabetics, meaning you have to split your info for different purposes.

It would be so convenient if there was an app that combined all of those features and more into one little package on your phone.

DiaDaily will be that mobile app which will be a diabetics best friend on a daily basis, eliminating the need to be repeatedly entering information into various apple and services, it will be a Quality of Life application for Diabetics everywhere.

The research aims and objectives

DiaDaily will be an Android application that will help diabetics through day to day life with such features as a blood sugar level monitor that can fluctuate depending on food and drink consumption, this can be monitored by scanning the barcodes of food and drinks which will then edit and monitor your blood sugar and glucose levels.

The calabder reminder feature will allow you to set reminders to take insulin and the app will notify you if Emergency insulin is needed , if your blood sugar and glucose levels drop too low.

The aim is to develop and text the application so it can be released to be a Quality of Life app for diabetics everywhere.

The research design

Once the Application has been developed to a beta state, the participants will be contacted to test the application to approve functionality and check for bugs in the app.

The participants will then fill out a form stating and issues they found with the application.

Once submitted, they will , contacted for the same testing once the app makes it into a updated version of Beta until all the issues are ironed out and the app is working as intended.

The research will be to test early versions of the application for use before the main release

There will be 1-3 testers that will be using their info to test the application

Emails will be sent out to inform testers , downloads will be attached

If the study involves a MEDICAL or CLINICAL group, the following details are required:

- a) **Do you have approval from a hospital/medical/specialist ethics committee?**
If YES, please append the letter of approval. Also required is a letter from a clinically responsible authority at the host institution, supporting the study, detailing the support mechanisms in place for individuals who may become distressed as a result of participating in the study, and the potential risk to participants.
If NO, please detail why this approval cannot or has not been sought.
- b) **Does the study impact on participant's medical condition, wellbeing, or health?**
If YES, please append a letter of approval from a specialist ethics committee.
If NO, please give a detailed explanation about why you do not expect there to be an impact on medical condition, wellbeing, or health.

The nature of any proposed pilot study. Pilot studies are usually required if a) a new intervention is being used, b) a new questionnaire, scale or item is being used, or c) established interventions or questionnaires, scales or items are being used on a new population. If no such study is planned, explain why it is not necessary.

N/A

The methods of data analysis. Give details here of the analytic process (e.g. the statistical procedures planned if quantitative, and the approach taken if qualitative. It is not sufficient to name the software to be used).

The Data will be used to test if the application is functional . The inputted info will be used to test the calculations for Blood Sugar and Glucose Levels.

Data will be saved to the user profile.

Study Procedure

Please give as detailed an account as possible of a participant's likely experience in engaging with the study, from point of first learning about the study, to study completion. State how long project participation is likely to take, and whether participants will be offered breaks. Please attach all questionnaires, interview schedules, scales, surveys, and demographic questions, etc. in the Appendix.

The participants are given a download for the application and will be given tasks to perform to stress test and bug test the application in various ways

They will then be given a form to fill out to explain any bugs or issues they encountered in the testing process

6.2. Reflective Journals

Supervision & Reflection Template

Student Name	Cameron Byrne
Student Number	19474662
Course	Software Development
Supervisor	Athanasios Staikopoulos

Month: October

What?

A lot of research has been done to determine the validity of the project, how I will integrate certain features into the app, and what the baseline for the Application will be.

Some consideration has gone into potentially removing some features as per the “Accepted with Amendment” recommendation for the project.

I have also given time to look over the documentation needed to be submitted for the midpoint presentation as I am familiar with the Documents from my academic internship module last year.

I have noted that a lot of the features will prove to be very difficult to implement so I am currently reprising an idea with a shortened feature list that still allows the Application to stand out from the competition.

I’ve also looked heavily into the Google ML aspect of the project with the barcode scanner and have studied some ways to implement it and link it to an existing database.

So What?

I think the research conducted this month has been very insightful and will go a long way in allowing me to progress with the project soon, a lot of factors still need to be determined to decide what areas will need to be revised.

My success with Google ML is important as it may allow for more features than just the barcode scanner, once I get the ability to link Google ML to a database to store the nutritional information of food and drink, then I can look into more areas to branch out using Google ML.

The challenge still remains of shortening the application as per the comments and feedback but to also keep the integrity of the project that will set itself out from its competitors in the market, so it can be more appealing to use than the current options available.

Now What?

I can reserve some time to create a new draft for the project to see what ways I can cut down the application to make my end goal more achievable in the long term.

The main focus is the challenge with the Google ML integration so after some draft projects and some testing with the ML software I hope to have the solution for the integration soon and then I can proceed to branch out into other areas of the project while also broadening my research into the other features that Google ML may bring to the project and if it could potentially solve some other issues that may arise later in development.

Student Signature	C. Byrne
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Supervision & Reflection Template

Student Name	Cameron Byrne
Student Number	X19474662
Course	Software Development
Supervisor	Athanasios Staikopoulos

Month: November

What?	
I have made good progress in terms of research inside of the projects field, I have made a small list of architectures and ways I want to begin development of the Application and it has set me up nicely to allow me to construct a prototype for the midpoint presentation. I have also drafted some wireframes and charts related to the main scope of the Project allowing me to get a better feeling for the direction I would like to take the project.	
So What?	
This was a big step for me this month as it has set me up nicely to begin development of a prototype which will hopefully integrate Google ML and some more basic features to present in December. The wireframes, along with feedback from my supervisor, have given me a good idea of what way I would like to construct the application and the style I would like to put alongside it. The challenges still remain to construct and test a prototype which I feel will be the most difficult part thus far, especially with some integration of outside features	
Now What?	
I feel like with some more research into the architecture surrounding the Application, I will be able to address this by construction an extremely basic application and adding these features one by one and testing the application until I am happy with the progress of the project and the state of the application for the Midpoint Presentation in December. This will be a very good step as once I can get a basic prototype working, I can use this to slowly implement different features and begin the work on the database for the Food Data Storage.	
Student Signature	C. Byrne

Supervision & Reflection Template

Student Name	Cameron Byrne
Student Number	X19474662

Course	Software Development
Supervisor	Athanasios Staikopoulos

Month: November

What? This month I was able to construct a basic prototype of the project, with a working database and navigation bar. One of my pages has been pushed close to completion and I have made the prototype run on most android device emulations. I have also begun research on implementing the API's necessary for project completion.	
So What? This has allowed me to get a basic running prototype of the application and has allowed me to test numerous small features related to the project in question. Implementing the small database on the food page was a success as it will allow me to use this to a greater extent later on with some other features in the application. I am slightly concerned on the implementation of the Google ML and certain APIs into the project but with some future research I feel it shouldn't pose too much of a long-term problem.	
Now What? I plan to research into the implementation of my APIs into an android application and begin to work on the exercise page with the given API. In the distant future, I then plan to work to implement the barcode scanner onto the application and link it to the database present in the food page prototype using Google ML, although this will take quite a-bit of research to reach this goal.	
Student Signature	C. Byrne

Supervision & Reflection Template

Student Name	Cameron Byrne
Student Number	X19474662

Course	Software Development
Supervisor	Athanasios Staikopoulos

Month: January

What? I made some small developments in the production of the application, implementing a fully functionalizing the navigation bar and making sure there are no issues with it, upon the creation of the prototype, I have completed and ironed out some of the bugs related to my Food fragment, allowing it to work seamlessly.	
So What? This month has allowed me to slightly develop my prototype and allow me to start focusing on the more challenging features that await me, it is now time to focus on the push notifications and the other fragment that will be using the database	
Now What? My focus has shifted slightly on the development side with me focusing more on the implementation of the other features of the application and saving the Google ML and barcode scanner until I complete and polish the other features, this also gives me enough time to allow for more research into the implementation of the Google ML into the Android Studio IDE and how I will incorporate it into my application	
Student Signature	C. Byrne

Supervision & Reflection Template
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Student Name	Cameron Byrne
Student Number	X19474662

Course	Software Development
Supervisor	Athanasios Staikopoulos

Month: February

What? In this space of time, I have managed to get the 2 databases working together seamlessly, allowing for the construction and completion of my Exercise Fragment and database. This, along with some smaller styling aspects has allowed me to allocate some time into the research of the Notification system where I will potentially need to implement Kotlin into the project alongside Java.	
So What? With my second function and Fragment implemented, this will now allow me to continue researching the potential inclusion of Kotlin in the Reminders and Notification system and how I will incorporate this code alongside Java.	
Now What? Now I will focus on the logistics of getting the Reminders page set up and implemented into the Application and how I can make this inclusion as seamless as possible without a lot of issues. The determining factor will be how the Kotlin code may clash with Java and how I might have to restructure the application to meet its inclusion.	
Student Signature	C. Byrne

Supervision & Reflection Template
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Student Name	Cameron Byrne
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Student Number	X19474662
Course	Software Development
Supervisor	Athanasios Staikopoulos

Month: March

What?	
Upon the conclusion of my research, I have determined that the inclusion of the Kotlin code inside of the Java application is possible and development has begun, this has allowed me to also begin implementing and initializing the Google ML barcode scanner into my code, so development on both of these features will continue as planned with some slight tweaks to the code and architecture.	
So What?	
With the beginning of the implementation of these 2 pages, I have noticed that the Navigation bar I have implemented in the code is seeming to cause issues with some of the functionality of this code, so upon completion of these features, that will need to be looked at and tested to resolve the issue I'm facing.	
Now What?	
The focus will continue on the Implementation of both pages and then the testing and bug fixing of the existing features to make sure everything is running smoothly. This will allow me to do some touching up of the application and bug fixing later on. But I have come to the conclusion that I may need to solve the issues with the navigation bar before I can test the other features.	
Student Signature	C. Byrne

Supervision & Reflection Template
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Student Name	Cameron Byrne
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Student Number	X19474662
Course	Software Development
Supervisor	Athanasios Staikopoulos

Month: April

What?	
<p>Upon implementing the other 2 pages, I have realized that the navigation bar is causing a whole host of issues related to the other features not working inside the application, I have since fixed the issues only to figure out that there are various other issues related to the selecting of photos for the barcode scanner and for the implementation of Kotlin into the app.</p>	
So What?	
<p>Since figuring out the issues with the nav bar, I had made that my number 1 priority and upon fixing that, it has made me aware of some issues that are not so easy to fix, I will debate the feasibility of the inclusion of Kotlin in the application and may need to redo the Notification page in Java to ensure it functions and displays correctly.</p>	
Now What?	
<p>I will now have to shift my focus to restructuring the whole notification and reminder fragment into Java to ensure there are no clashes with the 2 languages, I will be tidying up a lot of the existing code and this will allow me to tend to the barcode scanner issue once the Notification page has been dealt with.</p>	
Student Signature	C. Byrne