



NUI Galway  
OÉ Gaillimh

# Industrial Development Project Report

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# 1 Introduction

## 1.1 Document Outline

This document is designed to provide the reader insight into the design decision, and development process undertaken during the course of the Software design and development Industry Project.

As a whole the document will cover the project background, technologies chosen, challenges encountered, and give a comprehensive understanding of the development evolution, as well as testing and implementation of the final product.

## 1.2 Overview of Industry Partner

Sogeti is an international information technology consulting firm specializing in local professional services. It is a subsidiary of Capgemini Group. (Sogeti Ireland, 2017) Capgemini's mission statement outlines that their key philosophy is "people matter and results count". (Capgemini Capgemini Worldwide, 2017) They work in close collaboration with their clients (Sogeti Ireland, 2017) to create an original solution to their individual problems. Sogeti implements market leading software or creates custom software and apps for organisations (Sogeti Ireland, 2017) to bring these solutions to life.

## 1.3 Introduction to the Project Proposal

Following the direction of a practice lead, research was carried out on case studies of past projects undertaken by Capgemini which incorporate software solutions in the Digital space. (Appendix A) In 2014, in conjunction with HEMA a mobile application to deliver a secure, easily accessible, and user-friendly portal was developed. (Capgemini Capgemini Worldwide, 2017) Building on this concept of improving user experience and proving a portal encompassing an assortment of user needs in one easy to use product, the following project was proposed.

### 1.3.1 Statement of Problem

A recent study showed 61% of Irish households owned a cat or dog. (Independent.ie, 2017)

A separate study highlighted the difficulty many pet owners face when changing brand or purchasing new products for their pets. (PetfoodIndustry.com, 2017) Due to disillusion with advertising campaigns, pet owner's decisions are usually made based on past experiences or reviews of friends and neighbours.

### 1.3.2 Task

The app proposed is designed to improve pet owner's experiences in choosing and purchasing products for their pets as well as providing a community they could go to for advice.

## 1.4 Document Description

### 1.2.1 Introduction

This project aims to develop a fully functioning application for pet owners. The application should allow users to search for products, view product details and reviews. Additionally there should be a community forum that allows users to post new and reply to pre-existing questions. This will allow users with different experiences to come together to help one another and exchange knowledge.

### 1.2.2 System Overview

The Fluffle Collaboration (the app developed) will be a mobile application, developed for Android. The application will join with a database containing user details, product detail and all posts and reviews submitted to the application. Users will need to have internet access as, in order to allow for products and related information to be updated a non-local database will need to be used. As users will have the ability to review and post within the app, for traceability, they will need to register/login to gain access.

## 2 Design Considerations

This section guides the reader through the main design considerations taken over the course of this project. The system design was adapted throughout the course of the project to reflect the response to challenges met.

### 2.1 Assumptions

As the project will develop an Android app for smart phones, it is assumed that the end user will both have access to, and be familiar with, using smart phone technology. In addition to this, the user will need to have internet access and a valid email address to register and interact with the application.

To allow for separation of functionality, it is assumed that there will be two types of users, admin and general users.

### 2.2 Goals and Guidelines

The overall goal is to develop a fully functioning and user friendly application in the time allotted. The subsequent goals can be divided into two categories: primary and secondary.

#### 2.2.1 Primary Goals

The primary goals for the system are as follows.

- establish and maintain a connection to a database.
- contain the functionality to initiate various operations within the database, such as updates and insertions.
- allow for the addition of new products to the database.
- user information must be private
- uniquely identify each user.
- facilitate user login/out.
- register new users with the system.
- update user details.
- interact with the database to search through products.
- display product details and reviews.

#### 2.2.2 Secondary Goals

Building on the primary goals, the following secondary goals were specified:

- allow for users to post to a forum.
- allow users to reply to posts.
- all data displayed should be current.

## 2.3 General Constraints

### Security Constraint

Security constraints will be an important consideration during the development process, due to the need for the storage of user details.

### Time Constraint

Due to the strict 12 week time constraint imposed on this project, time management will have a large influence on its success or failure.

Other constraints that will need to be dealt with are usability and separation of admin and general user.

## 2.4 Development Methods

Agile development is the methodology used in Sogeti (Sogeti Ireland, 2017), and it is also the most appropriate for mobile application development. Due to this, it was chosen as the core development method for this project.

There are many adaptations of agile development, for this project aspects of SCRUM were used.

*"The SCRUM methodology is an iterative-incremental agile development framework. Projects are developed through series of iterations called "sprints". Each sprint is ideally a bunch of low level SDLC processes where a small sub feature is driven from idea conception, planning till testing phase, which takes around two to four weeks to complete."* (Kaleel & Harishankar, 2013)

As SCRUM is designed to be used in a team environment, not all aspects were applicable. However, the concept of working in sprints was adapted to suit the timeline of the project and implemented. If the focus of a sprint was key to the functionality of the application it would be awarded more time, while less functional requirements were to be awarded a week for completion.

### 2.4.1 Code Management

GitHub supports version control and allows for the creation of multiple repositories. With most IDEs supporting GitHub it is easy to document and commit changes to the project throughout development. Through the free student account offered it is also possible to set repositories to private. For these reasons GitHub was used to store and manage the code throughout the project's duration.

### 3 Detailed System Design

This section builds on the design considerations discussed above. It focuses on the conceptual decisions that were to be made before any coding/development could begin. Once this phase was complete technology would be chosen based on the needs identified.

The first part of this section outlines how a user will interact with the system. The use case diagrams illustrate the various interactions that will be allowed for each user. Some of these interactions are explored further with the use of use cases. These detail the expected actions and responses made by both the user and the system.

Developed from these are the User Interface (UI) prototypes seen in section 3.2.

Finally the database was designed. In section 3.3, an Entity Relationship Diagram can be seen. The tables are described and the relationships are explained.

#### 3.1.1 Use Case Diagrams

Actor: New User

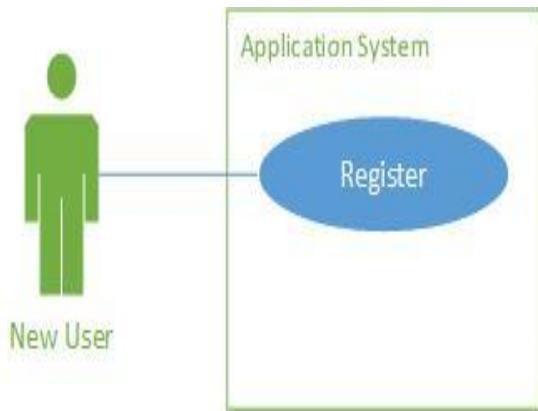


Figure 1: New User Use Case Diagram

Actor: Admin

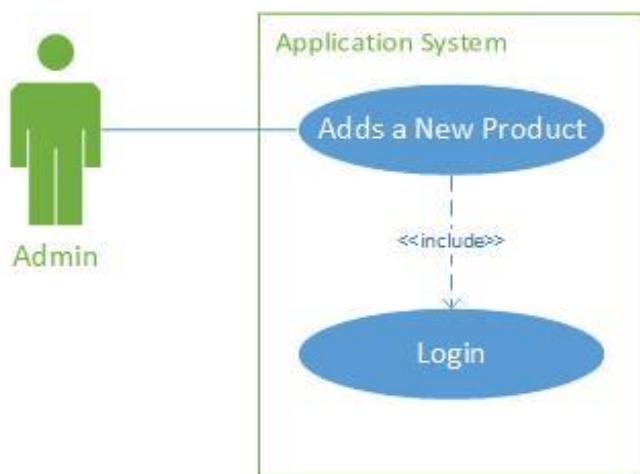


Figure 2: Admin Use Case Diagram

Actor: User

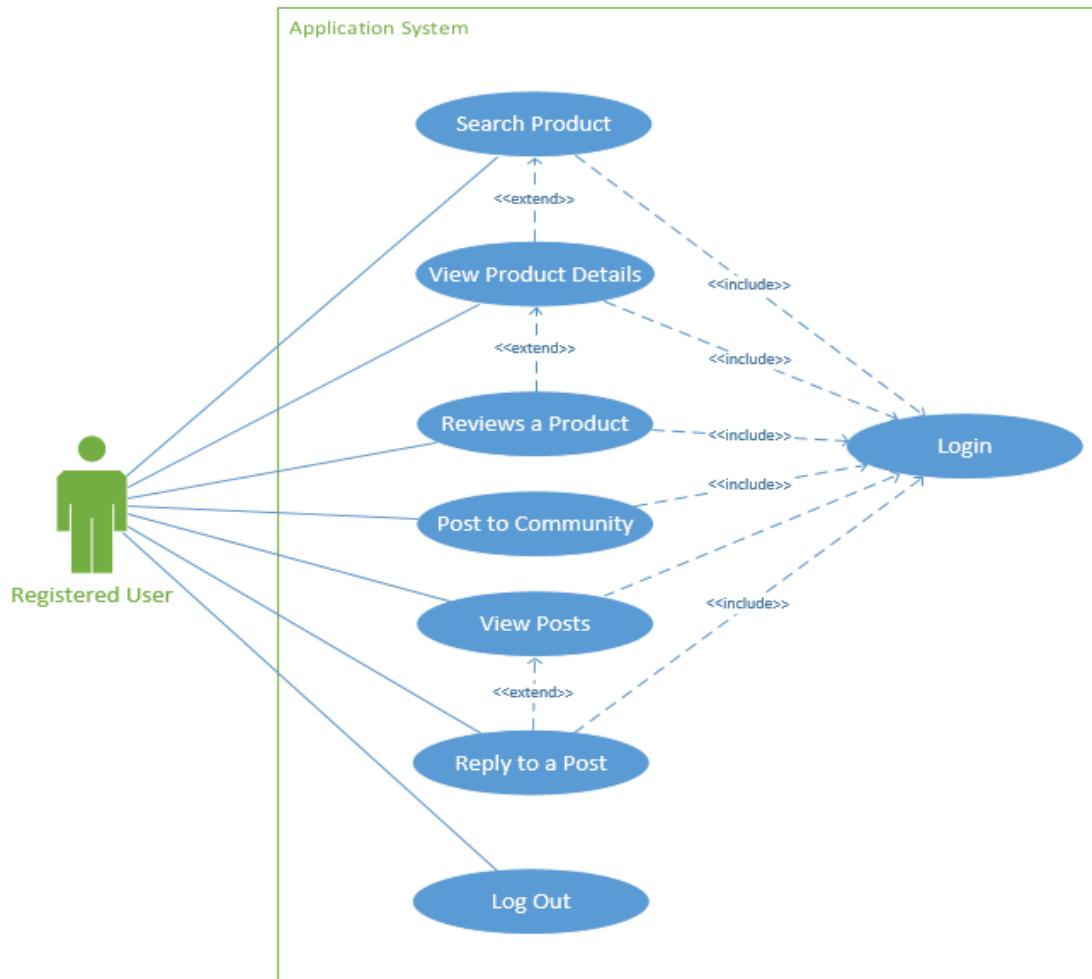


Figure 3: Registered User Use Case Diagram

### 3.1.2 Use cases

#### *Use Case 1*

**Title:** Register account.

**Actor:** New user.

**Scenario:** User registers account to gain access to the application.

- User navigates to the registration page.
- Users enters required details.
- User confirms and submits details by pressing button.
- System receives all details.
- System checks that details entered in both password fields match.
- System completes account creation.
- System sends a confirmation message to user.

#### **Extensions: User enters two different passwords**

- System displays error message
- Customer re-enters details and submits again.

#### *Use Case 2*

**Title:** Add new product.

**Actor:** Admin user.

**Scenario:** Admin adds a new product to the system.

- Admin logs into system.
- Admin selects “Add product” button.
- System displays a form to take in product details.
- Admin enters details.
- Admin selects “submit” button.
- System checks all fields have be filled in.
- System stores new product.

**Precondition:** Admin must be logged in.

#### **Extensions: Admin hasn't filled in all fields**

- System displays error message.
- Admin re-enters details and submits again.

#### *Use Case 3*

**Title:** Review a Product.

**Actor:** Registered user.

**Scenario:** User leaves a review of a product.

- User selects “Search products” section from main menu.
- User enters search criteria.
- System displays products matching search criteria.
- User selects product.
- System displays product details for selected product.
- User selects “see reviews” already left on product.
- System displays all reviews for the product.
- User selects “add review” button.
- System generates form to take in review details.
- User enters details.
- User submits details to system by pressing “submit” button.
- System stores review.

**Precondition:** User must be logged in.

#### **Extensions: No products matching search criteria**

- System displays error message to user.

### **Extensions: No reviews for product**

- System displays error message.
- User is redirected to add review page.

#### *Use Case 4*

**Title:** Posting to the community.

**Actor:** Registered user.

**Scenario:** User post to the community.

- User selects community section from main menu.
- User selects “New Post” option from Community welcome page.
- System generates form to take in post details.
- User fills in details.
- User submits details to system by pressing “submit” button.
- System checks all required details have been entered.
- System stores post.

**Precondition:** User must be logged in.

### **Extensions: User hasn't enter all details**

- System displays an error message.
- User enters required details and submits

#### *Use Case 5*

**Title:** Replying to a post.

**Actor:** Registered user.

**Scenario:** User comments on a post.

- User selects community section from main menu.
- User selects “View Posts” option from Community welcome page.
- System displays all posts.
- User selects a post.
- System displays the post details.
- User selects “add a comment”.
- System generates and displays a comment form.
- User enters comment details.
- User submits detail to system by pressing “submit” button.
- System checks all required details have been entered.
- System stores comment.

**Precondition:** User must be logged in.

### **Extensions: User hasn't enter all details**

- System displays an error message.
- User enters required details and submits

### 3.2 User Interface Prototype

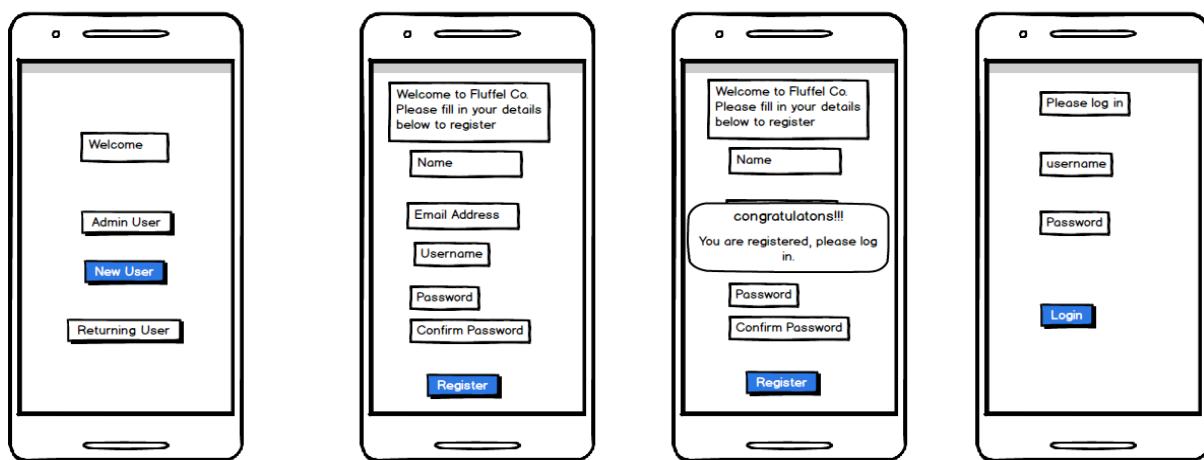
In the following UI diagrams buttons in blue represent buttons being pressed, leading to the next UI page.

*Admin User Interface prototype*



*Figure 4: Admin User Interface*

*New User Interface Prototype*



*Figure 5: New User, User Interface*

## Registered User Interface Prototype

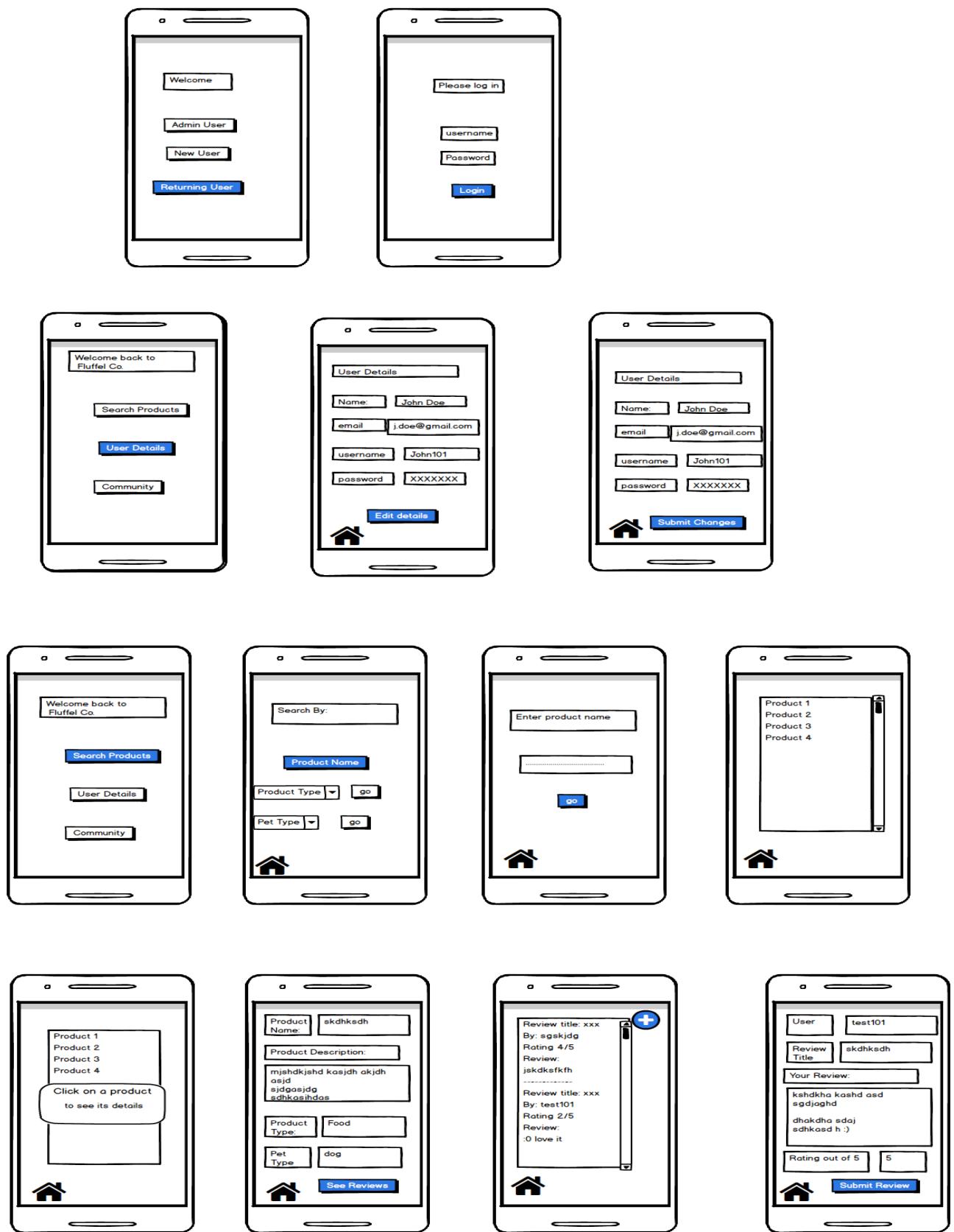


Figure 6: Registered User, User Interface (Part 1)



Figure 7: Registered User, User Interface (Part 2)

### 3.3 Database Design

#### 3.3.1 Entity Relationship Diagram (ERD)

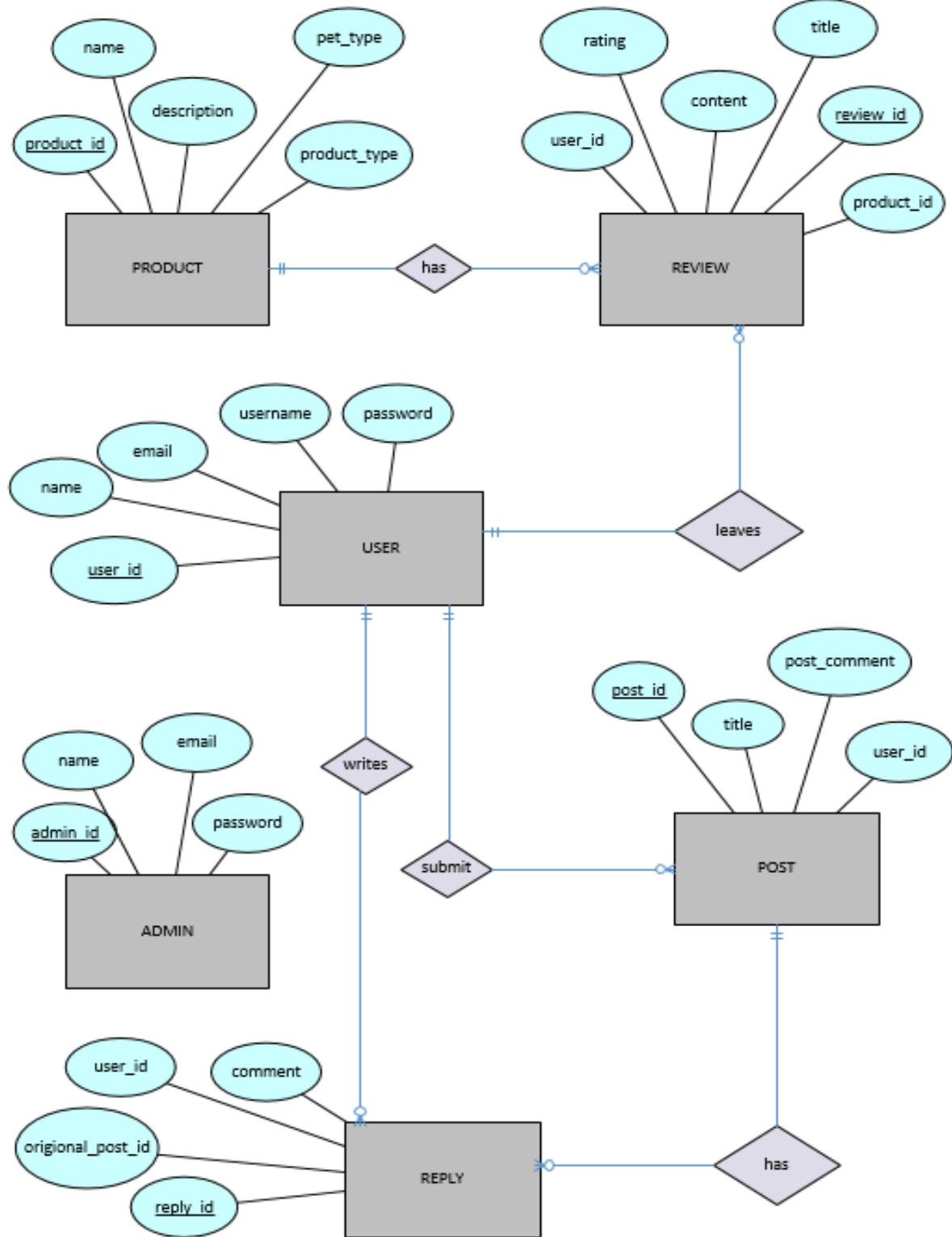


Figure 8: ERD

### 3.3.2 Database tables in shorthand notation

Key: Primary Key, Foreign Key

FLUFFELADMIN (id, name, email, password)

FLUFFELUSER (id, name, email, username, password)

FLUFFELPOST (post\_id, postTitle, post\_content, post\_user\_id)

FLUFFELPOSTREPLY (reply\_id, op\_id, reply\_user\_id, reply\_comment)

PRODUCT\_INFO (id, name, description, pet\_type, product\_type)

REVIEW (reviewID, reviewTitle, reviewContent, reviewRating, userID, productID)

The FluffelAdmin table will store the detail relating to all admin users. An admin's credentials will be checked against this before they are allowed access to the application.

FluffleUser will store the details of all users. Details will be added to this table through the app., allowing to users to register. Similar to admin, their credentials will be checked against the data in this table before they are allowed access to the application.

FluffelPost table stores all posts made in the community section of the app. The foreign key post\_user\_id references the id, from the FluffelUser table, of the user who creates the post.

FluffelPostReply will store all replies to pre-existing posts. The original post will be referenced by its id, through the foreign key op\_id, and the user id of the author of the reply will be stored in the foreign key reply\_user\_id .

Product\_info table stores the details of each product. Only Admin users will be allowed to update this table through the app.

The review table stores all reviews made in the app. Following the same design as the fluffelPostReply table, it stores the userID of the author (referencing the fluffelUser table) and the productID of the product being reviewed (referencing the product\_info table).

## 4 Core Technologies

Sogeti did not specify any technologies to be used in this project, however those listed in their graduate program outline were used as a guideline. (Sogeti Ireland, 2017)

The following technologies were chosen based on their ability to support the functionally identified in previous sections.

### Mark-up Language

- XML (eXtensible Mark-up Language)

### Programming Languages

- Java 8
- PHP (Hypertext Pre-processor)

### Data format

- JSON (JavaScript Object Notation)

### Database management system

- MySQL
- PHPMyAdmin was used to handle the administration of MySQL

### Development Environments used:

- Android Studio is the official Integrated Development Environment (IDE) for Android. It can be linked with the developers GitHub account to allow for easy code management.
- Notepad++ is a source code editor that supports many languages, including PHP.

## 5 System Architecture

The system was developed on a Windows OS. The presentation and business logic were developed in Android Studio. While for the data layer, NotePad++ was used to code any PHP files, and PHPMyAdmin was used to build and test the MySQL database.

### 5.1 Client/ Server Architecture

In the context of this section, the application can be considered to consist two components; the client side and the server side.

Client side: This relates to the Android application that is installed on the user's device.

Server side: This relates to the PHP files and MySQL database that are stored on the server. For this project NUIG granted space on the Danu6 server. Danu6 is an Apache web server with a Linux operating system.

### 5.2 Layered Architecture

The diagram below illustrates the technologies used in each layer.

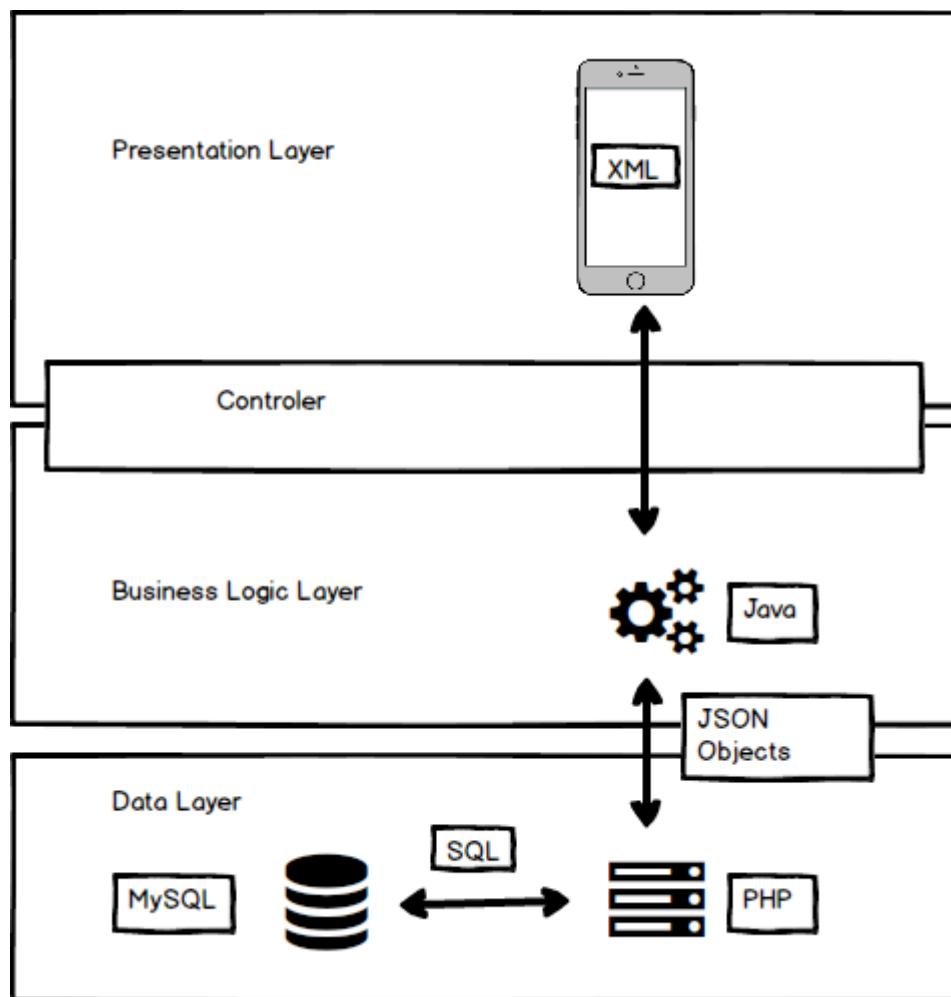


Figure 9: System Architecture Diagram

### 5.2.1 Interactions between the layers

All interactions between the user and the application occur through the XML UI. Data entered into the UI by the user is retrieved by Java methods. Using an `HTTPURLConnect` and referencing the URL the data is sent to the PHP page. These pages process the data and use SQL to carry out the necessary interactions with the database. Any data retrieved from the database is sent back to the Java class in the form of a JSON object. Any data needed by the application is extracted from the JSON object and either stored locally or displayed to the user. These processes will be discussed in detail later in this report, within the implementation section.

## 6 Implementation

### 6.1 Application development in Android Studio

There are many aspects to an application, the main parts that will be looked at here are the XML and Java files and how they interact. At a very basic level an application can be considered as a collection of interlinking activities. When you create a new activity two files are generated by the IDE, a Java file and a XML file. In order for an activity to be recognised by the application it must be declared in the Manifests.XML file. This is done by Android Studio automatically when a new activity is created. However if the Java and XML files are created separately or copied in from a different application this will have to be done manually.



Figure 10: FluffleCollaboration Manifests File

The following code is how the application knows what activity to initially open on.

```
<activity android:name=".OpenPage">
    <intent-filter>
        <action android:name="Android.intent.action.MAIN" />
        <category android:name="Android.intent.category.LAUNCHER" />
    </intent-filter>
</activity>
```

In order for this application to interact with the PHP file and get data from the server internet access had be set in the manifest file. This can be seen under the user-permission tag in the image above.

### 6.1.1 Layout design

The user interface is designed using XML layout files. Android Studio offers developers two ways to view and edit XML files, design layout and text layout.

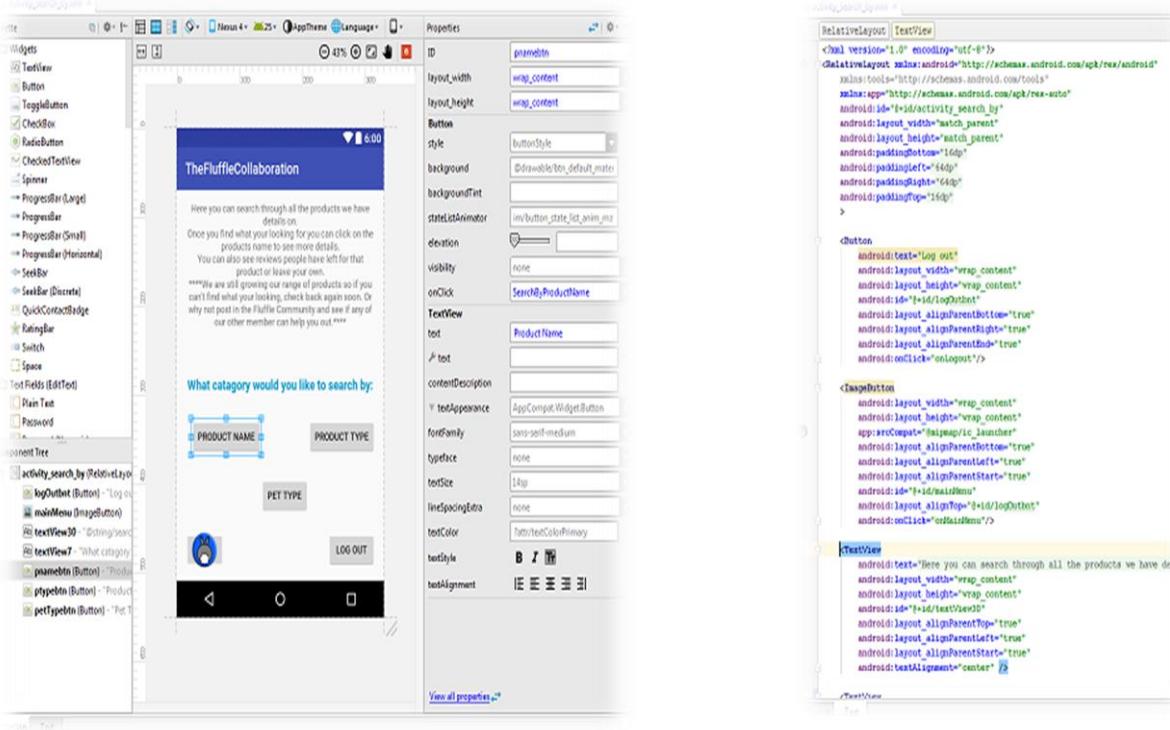


Figure 11: (right to left) XML Design View, XML Text View

In the design tab, widgets, text fields etc. can be dragged from the menu on the left and placed where desired in the simulated screen in the centre. The panel on the bottom left (the component tree) details the layout type, and all fields in the XML file. The panel on the right appears when a widget is selected. In the image above the properties displayed are for the Product Name button. Through this panel the ids and values can be changed, OnClick references can be added, and many other properties can be edited. All this can also be done through code in the Text tab.

```

<TextView
    android:layout_width="200dp"
    android:layout_height="wrap_content"
    android:layout_alignTop="@+id/textView4"
    android:layout_toRightOf="@+id/textView4"
    android:id="@+id/tx_email"
    android:layout_alignRight="@+id/tx_name"
    android:layout_alignEnd="@+id/tx_name" />

```

The code snippet above is from the XML file activity\_userdetails. The location and size of the Text View are declared here. The id is important as it is how objects such as a TextView or EditText are referenced in the Java files. The OnClick commands listed for buttons is the method in the Java file that is called when the button is pressed.

The relationship between the Java and XML file is created in the OnCreate method in the Java file using the setContentView method.

```
setContentView(R.layout.activity_leave_review);
```

### 6.1.2 Java methods and logic

In this section some of the main methods and concepts implemented in this application will be presented alongside code snippets.

#### *onCreate method and linking to XML widgets*

Every Java activity has a OnCreate() method. In this method class variables are created. Objects such as TextView and EditText are linked to the necessary widgets using the findViewById() method the object returned is cast back to the appropriate type. An example of this is seen below. The TextView variable tx\_ProductName is set equal to the object returned by the findViewById() , that's been cast to a TextView. The findViewById methods is passed R.id.tx\_reviewProductName, which is the id that's been given to textveiw in the XML file activity\_leave\_review.

```
Product product;
LocalProductDatabase localProductDatabase;
LocalUserDatabase localUserDatabase;
String reviewTitle, reviewContent, reviewRating, userID, productID, productName;
int reviewRatingInt;
EditText et_title, et_rating, et_review;
TextView tx_ProductName;

@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_leave_review);
    localProductDatabase = new LocalProductDatabase(this);
    localUserDatabase = new LocalUserDatabase(this);

    //get textview from xml page
    tx_ProductName = (TextView) findViewById(R.id.tx_reviewProductName);
    et_title = (EditText) findViewById(R.id.et_ratingTitle);
    et_rating = (EditText) findViewById(R.id.et_reviewRating);
    et_review = (EditText) findViewById(R.id.et_reviewContent);

    Contact contact = localUserDatabase.getLoggedInUser();
    userID = contact.id;
    product = localProductDatabase.getProductDetails();
    productID = product.getId();
    productName = product.getName();
    tx_ProductName.setText(productName);
```

Figure 12: OnCreate method and Class variables

Once TextView/EditText variables have been declared and created they can call on pre-existing methods to interact with the data contained in the relevant TextView/EditViews displayed to the user. The getText().toString() method returns the text currently in the widget. This is used to get the users input from the UI generated form, such as when reviewing a product. The .setText() method sets the texts displayed to the user. This can be seen in the last line of code above where the TextView tx\_ProductName is set to display the String productName.

#### *Starting new activities*

New activities can be opened using the startActivityForResult method and passing it an Intent. An example of this is in the onMainMenu method that is called when the home icon is pressed.

```

public void onMainMenu(View view) {
    startActivity(new Intent(this, MainMenu.class));
}
}

```

A new Intent object is created, the current class and the class to be opened are passed as arguments.

### *Toast*

A toast is a message that is displayed at the bottom of the screen. It can be set to display for a long or short period of time. It is a good way of providing feedback to a user and enhancing user interaction.

In this application it was used to display short messages to the user informing them when they were successful or if an error had occurred. It was also used to provide guidance when new activities were created.

```
Toast.makeText(getApplicationContext(), "Ratings are from 1-5, anything lower will be taken as 1", Toast.LENGTH_LONG).show();
```



Figure 13: Toast

### *Shared Preference*

Shared preference files were used to store detail that needed to be accessible across the application. They were used to store user, product, and post objects. The shared preference user file allowed a user to be logged in and out of the application and for the details of the log in user to be retrieved at any time without having to request them from the database. The product and post shared preference files allowed a post/product to be saved when it was selected from a list view, and its details retrieved by different activates when needed.

To access the shared preference file a Local Database class was created. Any method needed for various shared preference files were written here. For the user these included logging a user in, using a Boolean value, storing and retrieving the contact, logging a user out and clearing the data stored.

A constant is used as a key to reference the required SharePreference object. The SharePreference variable and the constant are declared as class variables.

```

private static final String SP_NAME = "UserDetails";
SharedPreferences localUserDatabase;

```

The localUserDatabase is created in the constructor which is passed the context when called.

```
localUserDatabase = context.getSharedPreferences(SP_NAME, 0);
```

Any changes to the preferences are done using the SharePreference.Editor object. This is necessary to ensure the values remain in a consistent state and control when they are committed to storage. (Android Developers, n.d.) In the storeData method, the localUserDatabase is updated to hold the

current user. User details are added using Key value pairs. The first value passed to the shared preference editors putString method is the key.

In the example below the string values passed were retrieved from the contact object. The commit method is called to when all details are added.

```
//store a new user
void storeData(Contact contact)
{
    SharedPreferences.Editor spEditor = localUserDatabase.edit();
    spEditor.putString("id", contact.id);
    spEditor.putString("Name", contact.name);
    spEditor.putString("Email", contact.email);
    spEditor.putString("Username", contact.username);
    spEditor.putString("Password", contact.password);
    spEditor.commit();}
```

The method below was used to return the logged in user. Each attribute stored in the shared Preference file was returned to a string and a new contact object was created and passes these values. This contact is then returned to where the method was called.

```
//return the detail of the logged din user
Contact getLoggedInUser()
{
    String id= localUserDatabase.getString("id", "");
    String name = localUserDatabase.getString("Name", "");
    String email = localUserDatabase.getString("Email", "");
    String usernamne = localUserDatabase.getString("Username", "");
    String password = localUserDatabase.getString("Password", "");
    return new Contact(id, name, email, usernamne,password);}
```

A user is logged in using the same methodology as adding a contact to the localUserDatabase, except, as a Boolean is used to represents the logged in state, putBoolean is used instead of putString. True represents a user being logged in.

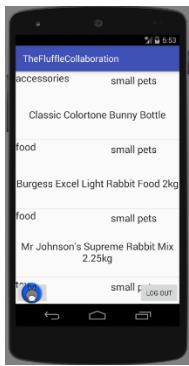
```
spEditor.putBoolean("loggedIn", loggedIn);
spEditor.commit();
```

To check if a user is logged in the getUserLoggedIn method is called, using getBoolean the key is the first value passed to the method. The second value passed is what the method should return if there is no value associated with the key.

```
//check if a user is logged in or out
boolean getUserLoggedIn()
{
    return localUserDatabase.getBoolean("loggedIn", false);
}
```

The clearData method deletes all values stored in the SharedPreference object it is called for.

```
//clear the user data stored
public void clearData()
{
    SharedPreferences.Editor spEditor = localUserDatabase.edit();
    spEditor.clear();
    spEditor.commit();
}
```



### List Views

List views were used multiple times in this application to display products, posts, reviews and comments. ListView incorporate multiple files.

- object class (e.g. product.Java)
- object Adapter class (e.g. productAdapter.Java)
- ListView UI (e.g. activity\_display\_products.XML)
- a XML file that defines the layout of each row (e.g. row\_layout.XML)
- the activity class (e.g. DisplayProductListView.Java)

Figure 14: ListView

An Adapter converts the data that is to be displayed in each slot into a suitable View object. It extends ArrayAdapter and overrides its getCount, getItem, getView methods. The adapter class has an arrayList which objects like products or reviews are added to. The getView method sets the values displayed in each row for each object.

In the activity class, the productAdapter and listView are set in the onCreate method.

```
productAdapter = new ProductAdapter(this, R.layout.row_layout);
listView = (ListView) findViewById(R.id.listView);
listView.setAdapter(productAdapter);
productAdapter.add(product);
```

When a product in the list is clicked the application opens a new activity that displays the products details. This is done using OnItemClickListener. The product is stored using sharedpreferences so it can be accessed by the next activity.

```
listView.setOnItemClickListener(new AdapterView.OnItemClickListener() {
    @Override
    public void onItemClick(AdapterView<?> parent, View view, int position, long id) {
        Product selectedProduct = (Product) listView.getItemAtPosition(position);
        localProductDatabase.storeProduct(selectedProduct);
        Intent i = new Intent (DisplayProductListView.this, DisplayProduct.class );
        startActivity(i);
    }
});
```

## 6.2 Database Implementation

A MySQL database on danu6 was supplied by NUIG: mydb2455. PHPMyAdmin was used to access the database, and SQL commands were used to create the tables and relationships illustrated in section 3.3.

SQL used to create each table followed the same format. First the table is given a name, then each row is named and the datatypes declared. The primary key is set using the key word “PRIMARY KEY”, while “NOT NULL” lets the database know values in this column cannot be null. Each table has an integer as their primary key type. To ensure that the id for each new object would be unique, the primary keys were set to auto increment using the key word “AUTO INCREMENT”. For attributes such as usernames and email address it was necessary to ensure the system would not allow two users to have the same details. This was prevented through the use of “UNIQUE”, as it ensures that there will be no duplicates within these fields.

Below is an example of the SQL command used to create the FluffelUser table.

```

CREATE TABLE `mydb2455`.`fluffelUser` (
  `id` INT(10) NOT NULL PRIMARY KEY AUTO_INCREMENT ,
  `name` VARCHAR(50) NOT NULL ,
  `email` VARCHAR(70) NOT NULL UNIQUE ,
  `username`VARCHAR(50) NOT NULL UNIQUE ,
  `password` VARCHAR(50) NOT NULL );

```

In tables that contained a foreign key, the link was created using the “REFERENCES” commands followed by the table name and the name of the relevant column in the reference table.

```

CREATE TABLE fluffelPostReply(
  reply_id int PRIMARY KEY AUTO_INCREMENT not null,
  op_id int not null,
  reply_user_id int not null,
  reply_comment varchar(2000) not null,
  FOREIGN KEY (op_id) REFERENCES fluffelPost(post_id),
  FOREIGN KEY (reply_user_id) REFERENCES fluffelUser(id));

```

## 6.3 PHP

In order to query the database PHP files were written. The initial connection is made in the conn.php file, using

```
$conn = mysqli_connect($server_name, $mysql_username, $mysql_password, $db_name);
```

Where the variables are declared at the beginning of the file. This file is then referenced in all subsequent files that need to access the database, through the following line of PHP code:

```
require "conn.php";
```

The database is queried using SQL statements. These were sent to the database with the command: mysqli\_query(\$conn, \$sql);

To test the logic, files were uploaded to the server and ‘dummy’ data was used. For example in the code below the id is set equal to 10.

```
SELECT reviewTitle, reviewContent, reviewRating, fluffelUser.username from Review INNER JOIN fluffelUser on Review.userID=fluffelUser.id INNER JOIN product_info onReview.productID = product_info.id where product_info.id=10
```

Once the files were running correctly the parameters for the query were set as variables that were to be retrieved using the http POST method.

```
$postID=$conn->escape_string($_POST["postId"]);
$sql="SELECT fluffelUser.username, reply_comment FROM `fluffelPostReply` INNER JOIN fluffelUser on fluffelPostReply.reply_user_id=fluffelUser.id WHERE op_id = $postID;";
```

### 6.3.1 JSON objects on the Server Side

The data returned is rendered as a JSON object in the PHP file and echoed back to the calling method.

```

$result = mysqli_query($conn, $sql);
$response = array();
while($row = mysqli_fetch_array($result))
{

```

```

array_push($response, array("username"=>$row[0], "reply"=>$row[1]));
}

echo json_encode(array("server_response"=>$response));

```

## 6.4 Java PHP interactions

Java classes in the application interact with the PHP files on the server using an HttpURLConnection.

### 6.4.1 HttpURLConnection

To illustrate its use we will look at how the application checked the login credentials of a user.

The URL of the PHP page is created in the onPreExecute() method. The connection itself is set up in the doInBackground() method of the nested class BackgroundTask which extends AsyncTask.

Here a URL object is created and passed the PHP page URL address. A new HttpURLConnection is created and the connection is opened. The method is set to POST, and an OutputStream and BufferedWriter are created.

```

url = new URL(login_url);
HttpURLConnection httpURLConnection = (HttpURLConnection) url.openConnection();
httpURLConnection.setRequestMethod("POST");
httpURLConnection.setDoOutput(true);
httpURLConnection.setDoInput(true);

OutputStream outputStream = httpURLConnection.getOutputStream();
BufferedWriter bufferedWriter = new BufferedWriter(new OutputStreamWriter(outputStream, "UTF-8"));

```

The variables sent to the PHP file are encoded, and each variable is matched with a key. This key is how the PHP file will extract the value. It must match the key referenced in the PHP file. Below is code from the Java file that will be sent to the PHP file.

```

String post_data = URLEncoder.encode("user_name", "UTF-8") + "=" + URLEncoder.encode(user_name, "UTF-8") + "&" +
URLEncoder.encode("password", "UTF-8") + "=" + URLEncoder.encode(password, "UTF-8");

```

Here you can see the code in the PHP file, login.php, where these values are extracted and set to PHP variables.

```

$user_name=$conn->escape_string($_POST["user_name"]);
$user_pass=$conn->escape_string($_POST["password"]);

```

The data is sent through the bufferedWriter and both the outputStream and bufferedWriter are closed. An InputStream and bufferedReader are created to retrieve the data echoed back by the PHP file. A stringBuilder is used to convert the data received into a string.

```

InputStream inputStream = httpURLConnection.getInputStream();
//iso-8859-1 is the type of data we are expecting
BufferedReader bufferedReader = new BufferedReader(new InputStreamReader(inputStream, "iso-8859-1"));
StringBuilder stringBuilder = new StringBuilder();

```

```

while ((JSON_STRING = bufferedReader.readLine()) != null) {
    stringBuilder.append(JSON_STRING + "\n");
}

```

The bufferedReader, inputStream and HttpURLConnection are closed and the interaction is completed. Before the method returns the data it uses the .toString().trim() method. All of this is contained in a try catch block.

In the onPostExecute method a separate method is called to examine the data returned from the connection and choose the appropriate response.

```

@Override
protected void onPostExecute(String result) {
    json_string = result;
    checkUser();
}

```

## 6.5 JSON objects on the client side

Continuing with the example used above this section will show how the checkUser method uses JSON to extract values from the data sent through the HttpURLConnection and either display error messages or log in the user.

A new JSON object is created and passed the string created from the data returned by the HttpURLConnection. The “server\_responce” array that was created in the PHP file is extracted and assigned to a jsonArray variable.

```

jsonObject = new JSONObject(json_string);
jsonArray = jsonObject.getJSONArray("server_responce");

```

Using an if statement, the method checks if any user details have been returned. If the array is of size zero no details have been returned meaning there is no user registered with the details entered. In this case a toast is used to display an error message to the user, and the app stays on the log in screen.

```

if(jsonArray.length()==0){
    Toast.makeText(getApplicationContext(), "Login details incorrect, please try again or register as a new user", Toast.LENGTH_LONG).show();
}

```

Otherwise the JSON object in the first index of the array is assigned to a new JSON object called JO. Using the keys defined in the PHP file that created the JSON object, the various details are extracted. In this case the details being extracted are the id, name, email address, username and password for the user that logged in.

```

JSONObject JO = jsonArray.getJSONObject(count);
id = JO.getString("id");
name = JO.getString("name");
email = JO.getString("email");
username = JO.getString("username");
password = JO.getString("password");

```

A new contact object is created and passed the strings created above. Using sharedPrefences this user is stored and the setUserLoggedIn method is used.

```
Contact contact = new Contact(id, name, email, username, password);
localDatabase.storeData(contact);
localDatabase.setUserLoggedIn(true);
```

A new activity is then started. In this method, due to pre-set constraints in the database the array will only be of size 0 (no user returned) or size 1. However in other cases, such as when products are searched, the array size will vary. To account for this, the extraction process described above would be placed in a while loop. An integer variable is incremented with each iteration of the loop, the condition of the loop is “while the size of the array is greater than the count enter loop.” All of this is enclosed in a try catch.

## 7 System Testing

Two types of testing were used in the development of this project; white box testing and black box testing. White box testing is where the tester has knowledge of the internal workings of the system and this structure/design is being tested. Black box testing occurs when the tester has no knowledge of the internal structure of the system. It is also referred to as functional testing. This is done through the user interface, where the aim is to test that the application displayed the expected response. The tester is aware of what should happen but is not concerned with how it happened.

### 7.1 White Box Testing

Here four examples of the white box testing that were implemented during the development of the system will be discussed.

#### Test Case 1: PHP Login

**Objective:** -Test the connection between the MySQL database and the PHP.

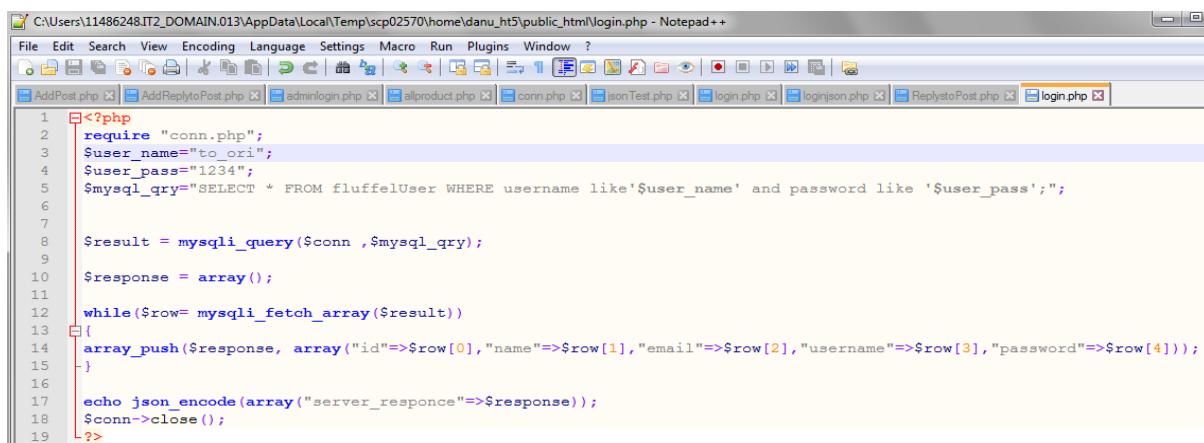
-Test the SQL.

-Test the JSON Object returned.

**Scenario:** PHP login file containing hard coded valid user details, database connection and SQL “select where” command is coded.

PHP file uploaded to the server.

The page is loaded through the Chrome browser.



The screenshot shows a Notepad++ window with the file 'login.php' open. The code is as follows:

```
<?php
require "conn.php";
$user_name="to_ori";
$user_pass="1234";
$mysql_qry="SELECT * FROM fluffelUser WHERE username like'$user_name' and password like '$user_pass';";

$result = mysqli_query($conn , $mysql_qry);

$response = array();

while($row= mysqli_fetch_array($result))
{
    array_push($response, array("id"=>$row[0], "name"=>$row[1], "email"=>$row[2], "username"=>$row[3], "password"=>$row[4]));
}

echo json_encode(array("server_responce"=>$response));
$conn->close();
?>
```

Figure 15: login.php

**Expected Result:** JSON object containing the user's details should be returned.

Id: 1, name: Tori, email: t.hume1@nuigalway.ie, username: to\_ori, password: 1234.

#### Actual Result:



Figure 16: JSON response

TEST 1 PASSED

## Test Case 2: PHP Register

**Objective:** Add a new user to the database through a SQL command, embedded in a PHP page.

**Scenario:** PHP login file containing hard coded details for a new user, database connection and SQL insertion command is coded.

PHP file uploaded to the server.

The page is loaded through the Chrome browser.

Database checked.

The screenshot shows a Notepad++ window with the title bar "C:\Users\11486248.IT2\_DOMAIN.013\AppData\Local\Temp\scp07107\home\danu\_h5\public\_html\registerTest.php - Notepad++". The menu bar includes File, Edit, Search, View, Encoding, Language, Settings, Macro, Run, Plugins, and Window. The toolbar has icons for Open, Save, Find, Replace, Cut, Copy, Paste, Select All, Find in Files, Go To, and others. Below the toolbar is a tab bar with multiple tabs: AddPost.php, AddReplytoPost.php, adminlogin.php, allproduct.php, conn.php, jsonTest.php, login.php, loginson.php, ReplystoPost.php, login.php, and registerTest.php (the active tab). The main code area contains the following PHP script:

```
1 <?php
2 require "conn.php";
3 $name="John";
4 $email="JohnSmith@nuigalway.ie";
5 $username="Jsmith";
6 $password="jSmith";
7
8
9
10 $mysql_qry="INSERT INTO fluffelUser(name, email, username, password) VALUES('$name', '$email', '$username', '$password');";
11
12
13 if($conn->query($mysql_qry)===TRUE) {
14     echo "Registration Successful";
15 }else {
16     echo "Error: " . $mysql_qry . "<br>" . $conn->error;
17 }
18
19
20 $conn->close();
21 ?>
```

*Figure 17: RegisterTest.php*

Browse Structure SQL Search Insert Export Import More

Showing rows 0 - 11 (12 total, Query took 0.0011 seconds.)

SELECT \* FROM `fluffeluser`

Profiling [ Edit inline ] [ Edit ] [ Explain SQL ] [ Create PHP code ] [ Refresh ]

	<input type="checkbox"/> Show all	Number of rows:	25	<input type="button" value="▼"/>	Filter rows: <input type="text" value="Search this table"/>	Sort by key: <input type="button" value="None"/>		
+ Options								
	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	<b>id</b>	<b>name</b>	<b>email</b>	<b>username</b>	<b>password</b>
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	1	Tori	t.hume1@nuigalway.ie	to_ori	1234
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	3	Tori	t.hume2@nuigalway.ie	to_ori1	1234
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	4	Rachel	r.c@gmail.com	rDog	test
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	5	Iola	lolabun@gmail.com	IolaBunBun	IolaBunBun
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	7	Lola Bunny	lolaBunny@gmail.com	Iola1	Iola1
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	11	Sean	sean101@gmail.com	sean101	1234
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	14	sorcha foy	sorchafoy@gmail.com	sorhabunny	Iola2017
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	18	John	john.doe@gmail.com	john	password
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	24	sarah	sarah@gmail.com	fgfg	fgfg
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	25	jane	janeholland67@hotmail.com	janeisss	cqznjgqa
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	26	juliette	@yahoo.com	juliette	1212
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	28	ciara	ciara-purcell@hotmail.com	ciara123	1234

Check all With selected:

*Figure 18: fluffelUser Table before Test*

**Expected Result:** Success message returned.

Correct details to be added to the database.

### Actual Result:

	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	<b>id</b>	<b>name</b>	<b>email</b>	<b>username</b>	<b>password</b>
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	1	Tori	t.hume1@nuigalway.ie	to_ori	1234
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	3	Tori	t.hume2@nuigalway.ie	to_ori1	1234
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	4	Rachel	r.c@gmail.com	rDog	test
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	5	Iola	lolabun@gmail.com	IolaBunBun	IolaBunBun
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	7	Lola Bunny	lolaBunny@gmail.com	Iola1	Iola1
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	11	Sean	sean101@gmail.com	sean101	1234
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	14	sorcha foy	sorchafoy@gmail.com	sorchaBunny	Iola2017
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	18	John	john.doe@gmail.com	john	password
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	24	sarah	sarah@gmail.com	fgfg	fgfg
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	25	jane	janeholland67@hotmail.com	janeisss	cqznjqqa
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	26	juliette	@yahoo.com	juliette	1212
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	28	ciara	ciara-purcell@hotmail.com	ciara123	1234
<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	29	John	JohnSmith@nuigalway.ie	Jsmith	jSmith

Figure 19: fluffelUser Table After Test Run

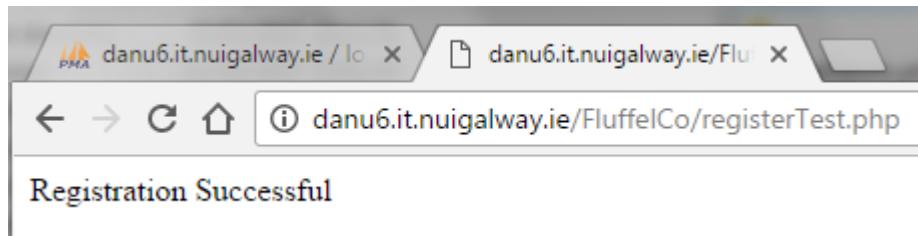


Figure 20: Success Message

**TEST 2 PASSED**

### Test Case 3: Inserting Product Details into Database through UI

**Objective:** -Database updated to include new entry in product table.

- Correct details added to database.
- Details added to correct table.

**Scenario:** Add product page of application open.

Product details entered.

Submit button pressed.

Products table in database checked.

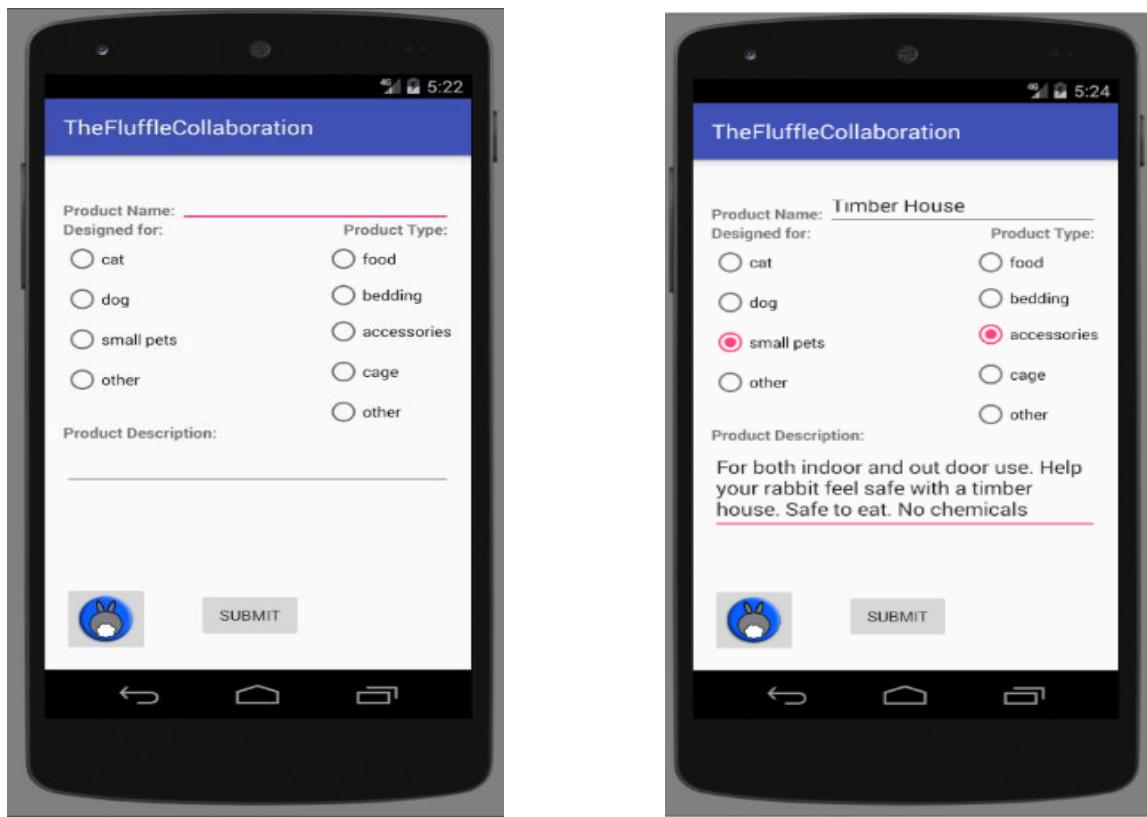


Figure 21: Add Product Form

product_info Table						
	id	name	description	pet_type	product_type	
<input type="checkbox"/>	1	Pawise Fold Flat Carrier Dog Crate Home	The Pawise Fold Flat Carrier is perfect for home, ...	dog	cage	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	2	Royal Canin Yorkshire Terrier Junior 1.5kg	Complete food specially for Yorkshire Terrier pup...	dog	food	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	3	Royal Canin Mini Adult Mature 8+	Royal Canin Mini Mature 8kg is a premium complete ...	dog	food	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	4	Royal Canin Maxi Light	Complete food for adult and mature, large breed do...	dog	food	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	5	Air Kong Squeaker Bone	The perfect toy if your dog loves to play fetch! M...	dog	toy	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	6	Busy Buddy Bouncy Bone Gnawhide Dog Treat And Toy	Stimulate your pet with the interactive Bouncy Bon...	dog	toy	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	7	Ancol Safe Reflective Cat Collar	Ancol Safe Reflective Cat Collar is specially desi...	cat	accessories	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	8	Cat Dangle Ball with Feather Cat Toy	The Dangle Ball/Feather toy is a great for both ca...	cat	toy	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	9	Classic Colortone Bunny Bottle	drinking is made easy with this bottle Bright an...	small pets	accessories	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	10	Burgess Excel Light Rabbit Food 2kg	Complementary food for adult rabbits Suitable for...	small pets	food	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	11	Mr Johnson's Supreme Rabbit Mix 2.25kg	Speciaily formulated for rabbits Fibrous feed wit...	small pets	food	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	12	Superpet Rolling In The Hay Toy For Hamsters and S...	Rollin' the Hay is nutrition and fun rolled into o...	small pets	toy	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	21	Large Sawdust	Used for bedding for small animals. Great for abso...	small pets	bedding	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	23	Heart Chew Toy	A heart shaped chew toy.	dog	accessories	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>
<input type="checkbox"/>	24	indestructable Ball	This will keep you pet entertained for hours. Guar...	dog	accessories	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>

Figure 22: product\_info Table Before Test Run

**Expected Result:** Correct details to be added to the database.

## Actual Result:

The screenshot shows the PHPMyAdmin interface with the 'product\_info' table selected. The table has columns: id, name, description, pet\_type, and product\_type. There are 26 rows of data.

	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	<a href="#">id</a>	<a href="#">name</a>	<a href="#">description</a>	<a href="#">pet_type</a>	<a href="#">product_type</a>
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	1	Pawise Fold Flat Carrier Dog Crate Home	The Pawise Fold Flat Carrier is perfect for home, Complete food specially for Yorkshire Terrier pup...	dog	cage
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	2	Royal Canin Yorkshire Terrier Junior 1.5kg	Royal Canin Mini Mature 8kg is a premium complete ...	dog	food
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	3	Royal Canin Mini Adult Mature 8+	Complete food for adult and mature, large breed dog...	dog	food
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	4	Royal Canin Maxi Light	The perfect toy if your dog loves to play fetch! M...	dog	toy
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	5	Air Kong Squeaker Bone	Stimulate your pet with the interactive Bouncy Bon...	dog	toy
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	6	Busy Buddy Bouncy Bone Gnawhicle Dog Treat And Toy	Ancol Safe Reflective Cat Collar is specially desi...	cat	accessories
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	7	Ancol Safe Reflective Cat Collar	The Dangle Ball/Feather toy is a great for both ca...	cat	toy
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	8	Cat Dangle Ball with Feather Cat Toy	drinking is made easy with this bottle Bright an...	small pets	accessories
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	9	Classic Colortone Bunny Bottle	Complementary food for adult rabbits Suitable for...	small pets	food
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	10	Burgess Excel Light Rabbit Food 2kg	Specially formulated for rabbits Fibrous feed wit...	small pets	food
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	11	Mr Johnson's Supreme Rabbit Mix 2.25kg	Rollin' the Hay is nutrition and fun rolled into o...	small pets	toy
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	12	Superpet Rolling In The Hay Toy For Hamsters and S...	Used for bedding for small animals. Great for also...	small pets	bedding
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	21	Large Sawdust	A heart shaped chew toy.	dog	accessories
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	23	Heart Chew Toy	This will keep you pet entertained for house. Guar...	dog	accessories
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	24	indestructable Ball	For both indoor and out door use. Help your rabbit...	small pets	accessories
<input type="checkbox"/>	<a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	26	Timber House			

Figure 23: product\_info Table After Test Run

## TEST 3 PASSED

### Test Case 4: Number of Results Show

**Objective:** Test that the number of results shown equals the number of entries in the database matching the search criteria.

**Scenario:** The application is opened.

The search by pet type page is navigated to.

The small animal's button is clicked.

The number of results is checked against the number of results matching the search in the products table in the database

**Expected Result:** Toast on phone displays a number equal to the number of rows returned by querying the table through PHPMyAdmin.

**Actual Result:** Both display 6.

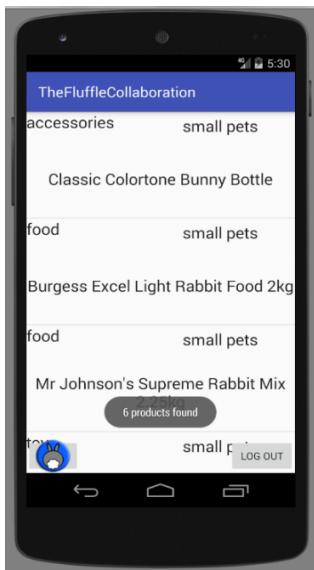


Figure 24: Products Returned and Displayed to User

The screenshot shows the PHPMyAdmin interface with the following details:

- Toolbar:** Browse, Structure, SQL, Search, Insert, Export, Import, Operations, Triggers.
- Search Bar:** Table search, Zoom search, Find and replace.
- Query Result:**
  - Showing rows 0 - 5 (total, Query took 0.0005 seconds.)
  - Query: `SELECT * FROM `product_info` WHERE `pet_type` LIKE 'small pets'`
  - Options: Profiling, Edit inline, Edit, Explain SQL, Create PHP code, Refresh.
- Data Table:**

+ Options	id	name	description	pet_type	product_type
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	9	Classic Colortone Bunny Bottle	drinking is made easy with this bottle Bright an...	small pets	accessories
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	10	Burgess Excel Light Rabbit Food 2kg	Complementary food for adult rabbits Suitable for...	small pets	food
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	11	Mr Johnson's Supreme Rabbit Mix 2.25kg	Specially formulated for rabbits Fibrous feed wit...	small pets	food
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	12	Superpet Rolling In The Hay Toy For Hamsters and S...	Rollin' the Hay is nutrition and fun rolled into o...	small pets	toy
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	21	Large Sawdust	Used for bedding for small animals. Great for abso...	small pets	bedding
<input type="checkbox"/> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a>	26	Timber House	For both indoor and out door use. Help your rabbit...	small pets	accessories
- Bottom Buttons:** Check all, With selected: [Edit](#), [Copy](#), [Delete](#), [Export](#).

Figure 25: Results From Query Run In PHPMyAdmin

**TEST 4 Passed**

## 7.2 Black Box Testing

### Test Case 1: Incorrect Details Entered For Login

**Objective:** Test to ensure correct message is shown when invalid details are entered on Admin or User login page.

**Scenario:** The application is opened.

Tester navigates to User or Admin login page.

Enter the following details, and clicks Login button.

Admin Login		User Login	
Email address	<a href="mailto:notAdmin@gmail.com">notAdmin@gmail.com</a>	Username	shelly
Password	1234	Password	12345

**Expected Result:** Application displays appropriate error message

**Actual Result: Admin:**

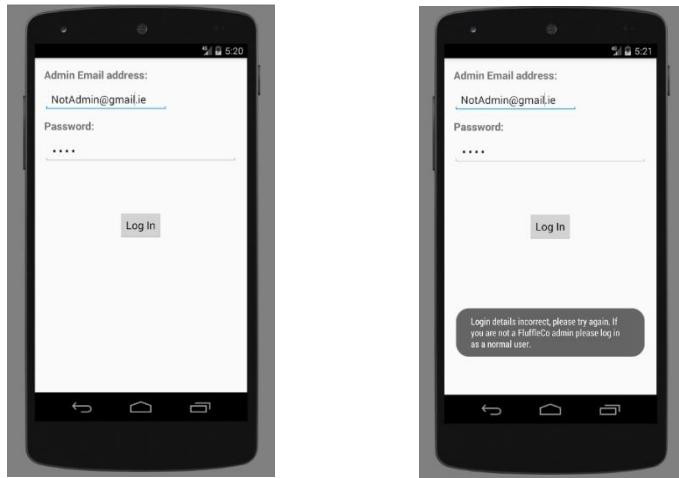


Figure 26: Admin Login Page

**User:**

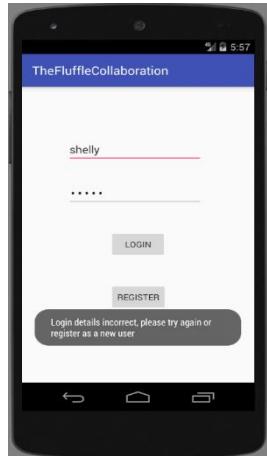


Figure 27: User Login Page

**TEST 1 PASSED**

## Test Case 2: Registration Page

**Objective:** Test to ensure correct message is shown when different passwords are entered.

Test that if all criteria are met application shows success message and opens log in page.

**Scenario:** The application is opened.

Tester navigates to registration page.

Enter the following details, and clicks register button.

Attempt 1		Attempt 2	
Name	Shelly	Name	Shelly
Email	<a href="mailto:shelly@hotmail.com">shelly@hotmail.com</a>	Email	<a href="mailto:shelly@hotmail.com">shelly@hotmail.com</a>
Password	shell	Password	shell
Confirm Password	no	Confirm Password	shell

**Expected Result:** **Attempt 1:** Application displays appropriate error message.

**Attempt 2:** Application opens login page and displays success message.

**Actual Result:**

**Attempt 1:**



Figure 28: Register Attempt 1

**Attempt 2:**

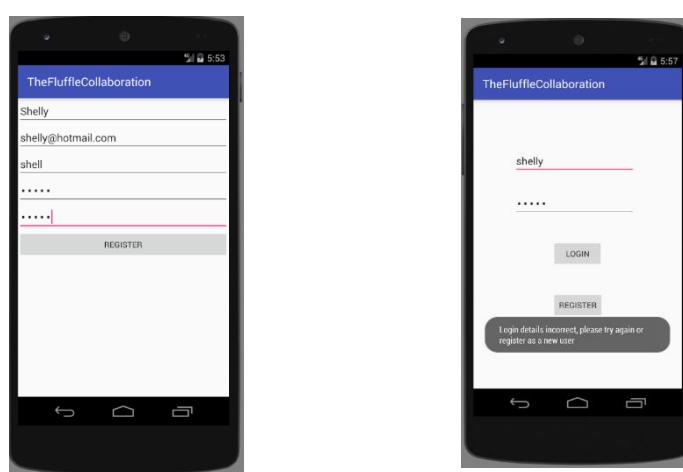


Figure 29: Register Attempt 2

**TEST 2 PASSED**

### Test Case 3: Edit User Details

**Objective:** Test to ensure correct message, and new details are displayed when a user edits their registered details.

**Scenario:** The application is opened.

Tester navigates to View Details page.

Tester selects Edit.

Tester enters Shelly101 in username field.

Tester clicks Submit.

Enter the following details, and clicks Login button.

**Expected Result:** Application displays appropriate message and displays new details.

**Actual Result:**

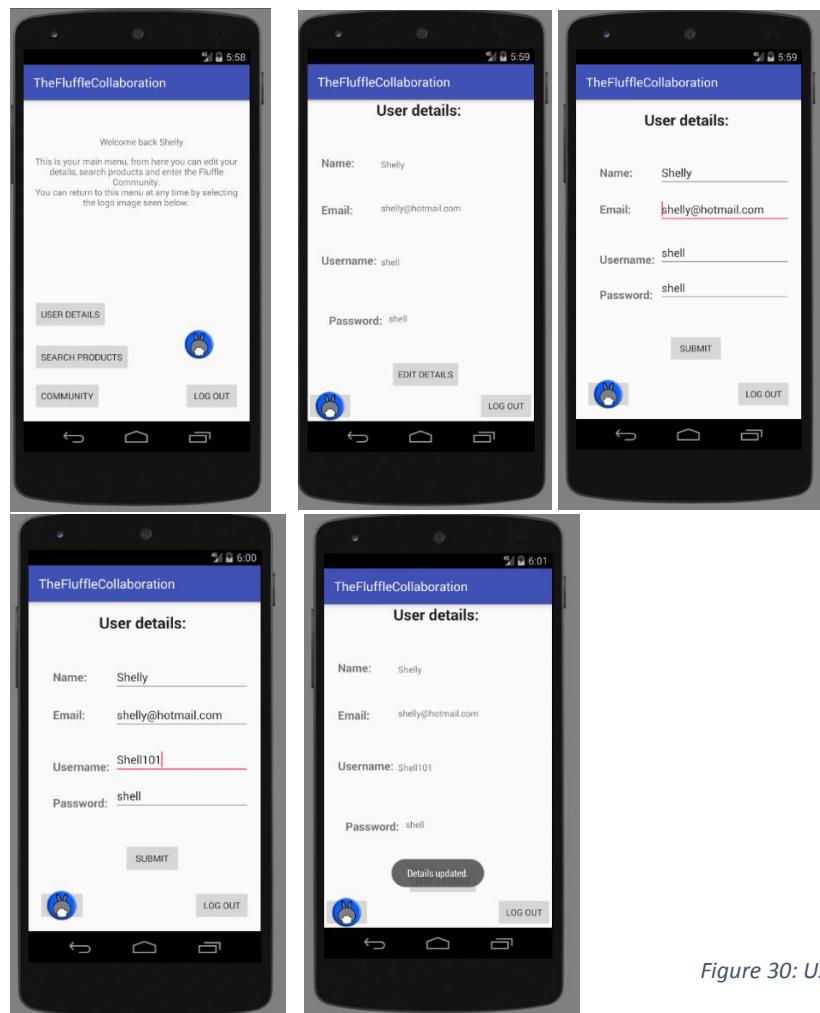


Figure 30: User Details

**TEST 3 PASSED**

#### Test Case 4: Reviewing a Product

**Objective:** Test that the application responds correctly when a user adds a review to a product

**Scenario:** The application is opened.

Tester searches products.

Tester selects any product from the list.

Tester clicks add review comment.

Tester fills in form and clicks submit.

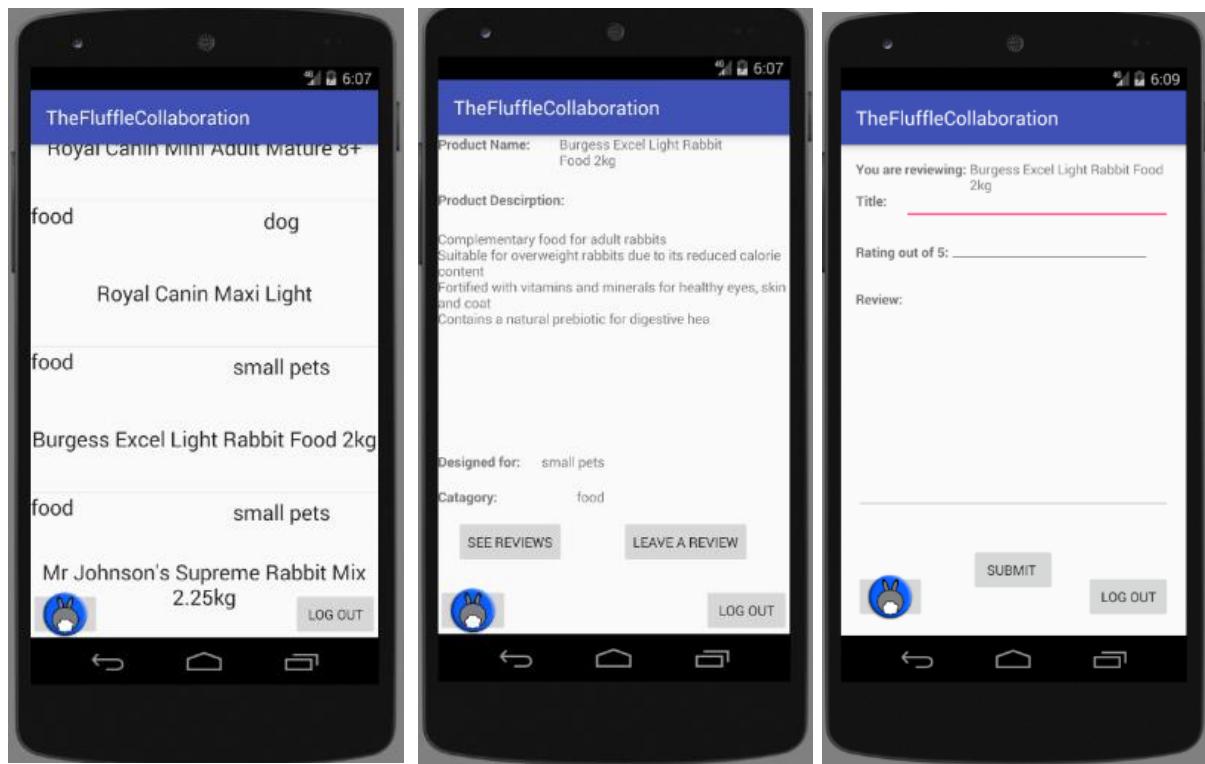
**Expected Result:** Application displays products details.

Application displays add review page.

Application displays success message.

Application displays new review on review page.

#### Actual Result:



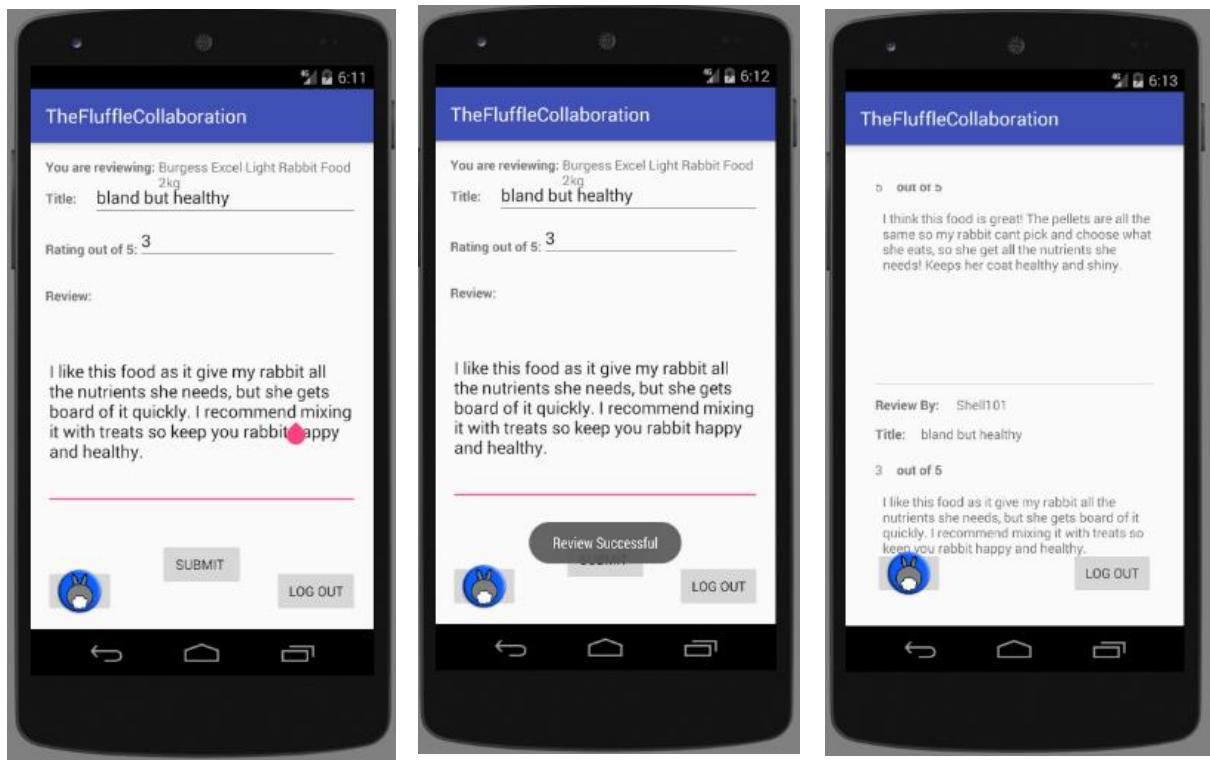


Figure 31: Review Product

**TEST 4 PASSED**

## Test Case 5: Comment on a post in the Community Forum

**Objective:** Test that application responds correctly when a user adds a comment to a post.

**Scenario:** The application is opened.

Tester navigates to community page.

Tester selects View Posts.

Tester selects a post.

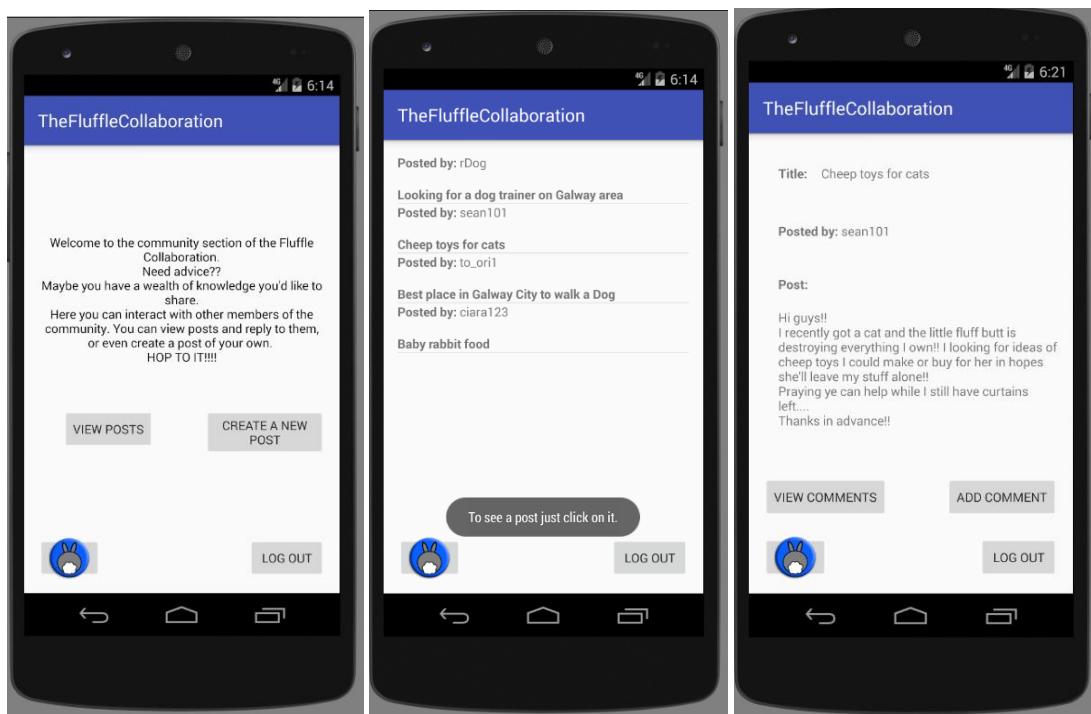
Tester selects Add Comment.

Tester fills in form.

Tester submits comment.

**Expected Result:** Application displays appropriate messages and activities in response to tester's actions.

**Actual Result:**



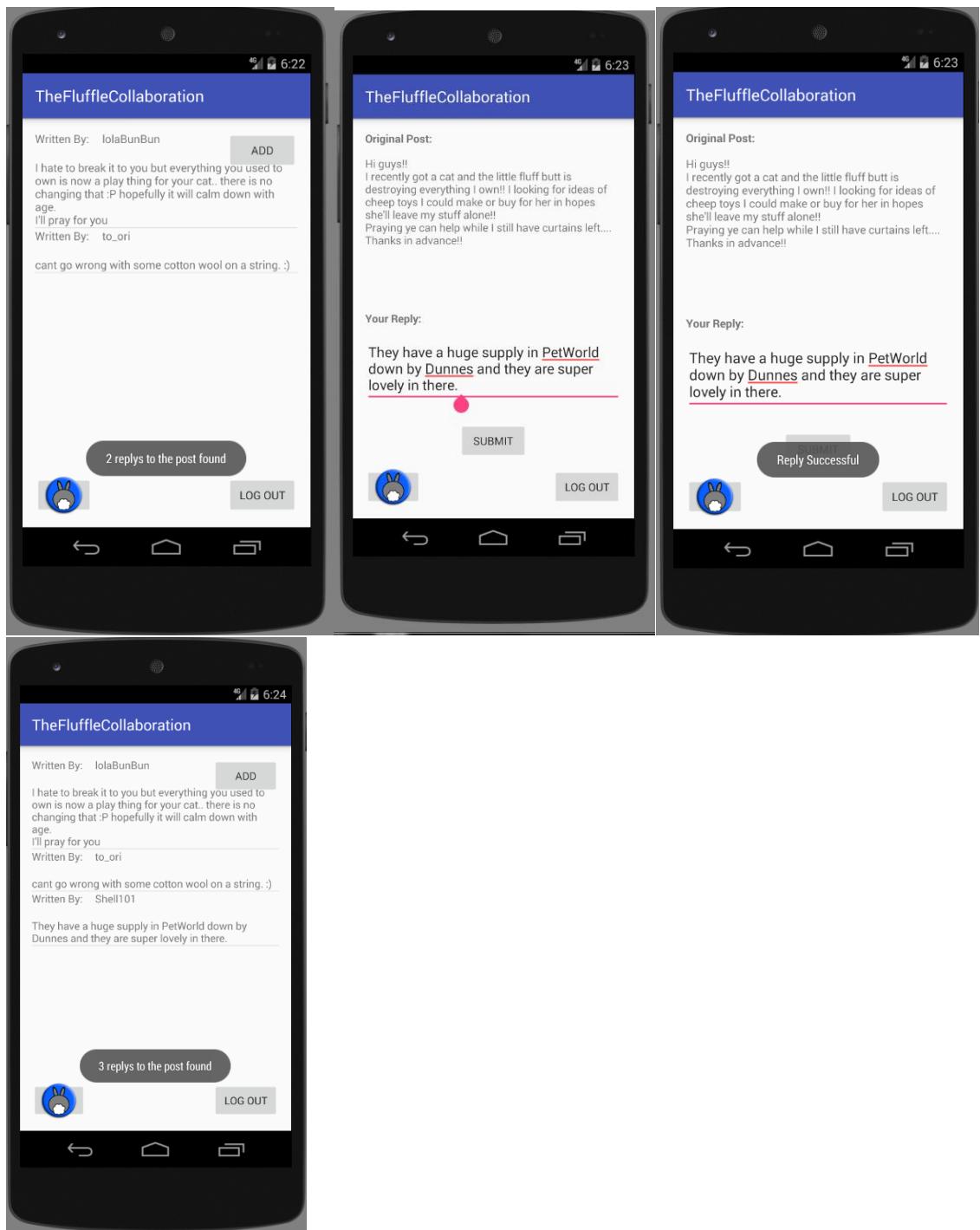


Figure 32: Commenting on Posts in Community

**TEST 5 PASSED**

## Test Case 6: Post to the Community Forum

**Objective:** Test that application allows user to add a new post to the forum.

**Scenario:** The application is opened.

Tester navigates to community page.

Tester selects Create Post.

Tester fills in form and clicks Post to Community.

Enter the following details, and clicks Login button.

**Expected Result:** Application displays appropriate messages and activities in response to tester's actions.

### Actual Result:

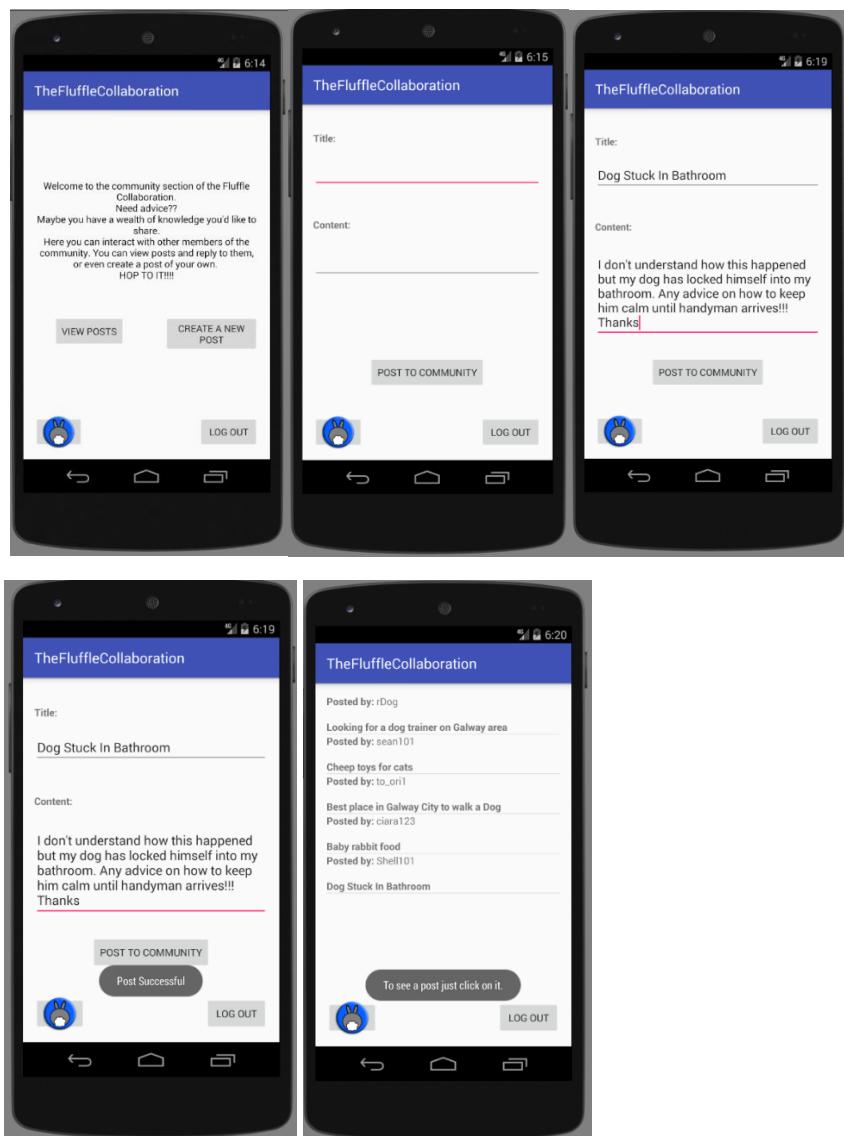


Figure 33: Posting to the Fluffle Community

**TEST 6 PASSED**

### 7.3 Survey

In addition to the test discussed above five testers downloaded the app on to their phones and completed a survey. (Appendix 3)

Analysis of Survey Results:

#### Ease of Use

60% users found the app Very Easy to use, while the remaining 30% categorised it as easy.

#### Appearance

80% of users rated the appearance as good, 20% rated it a very good.

#### Likely Hood of Repeated Use

60% of users said they were likely to use this app again. 20% said they were Very Likely, and the final 20% said they were indifferent.

#### Recommend to a Friend

60% of users said they were likely to recommend the FluffleCo app to a friend, 20% said they were very likely.

#### Issues Encountered

The only issues stated by the users where those encountered when they lost internet access.

#### Overall Opinion and Recommendations

Tester 3 recommended that the app be updated to allow for users that has forgotten their password.

Tester 1 suggested the layout could be improved on the page that displayed the products.

Overall the applications was received well and no failures or problems were reported.

(Note the dependence on constant internet access is not considered a failure as it was speculated as a constraint during the design of the application)

These users' reviews can be found in the appendix of this report.

## 8 Evaluation

### 8.1 Learning outcomes

At the beginning of this project the author set the Project Success Criteria as:

*“A functioning system that meets the user requirements should be delivered within the time allotted. It should be easy to use and developed using high quality code. The documentation supporting it should also be of a high standard.*

*By the end of this project the author is expected to have gained a deeper understanding of the technologies used.”*

In week one the author had no previous experience in app development. The most complex development projects they had been involved in were those assigned as part of continuous assessment by programming modules in Semester 1 of 1SD3. By week 12 they have gained a much deeper insight into both the range of functionality that Java provides and the design principles and coding standards that should be applied to all future developments they are involved in. On completion of this project the author has met their goal of producing a functioning application that is both user friendly and meets all but one of the goals set out at the start of development.

While the focus of this project was app development, the author has learned much about the programming language PHP which will benefit them greatly going forward.

Due to the nature of SQL, the skills learnt from developing and using a MySQL database will place the author at an advantage when dealing in SQL in future projects.

### 8.2 Challenges

Having never developed an Android application before, every aspect of the project was challenging in its own way. In the beginning of the project, the authors focus was centred on adapting to the new development environment in Android Studio, and learning basic commands used in app development.

Once the basics were mastered the focus move to developing a working connection to the database. This proved to be the most challenging aspect of the project and took four weeks to achieve. Following the principles of SCRUM, after a week and a half of trying to connect to the MySQL database, a new approach was adopted. Under guidance from a 1SD3 graduate currently working in Sogeti, the developer began using a SQLite database as opposed to the MySQL database. While this solved the initial issue, within a week it was realised that this approach would not be viable. The use of a SQLite database meant each instance of the application would be running its own database. This would mean new product, review and post that were added on one device would not be accessible to other devices.

The developer then returned to research other options. Up until this point, all tutorials and guidelines found by the developer promoted the use of `httpClient`. This was not possible in this project as the method was deprecated this for API 22+.

In week 8, a successful connection to the database was made using an `httpURLConnection`.

Once this challenge was overcome the pass of development increase greatly. The rest of the functionality pulled on skills the developer had gained in the early stages of the project, making the development easier.

After the database connection challenge was resolved, the next most challenging aspect of the development was creating the list view, and the various classes and method needed to implement it.

Similarly to the `httpURLConnection`, once the concept was understood, replicating the methods for different occurrences of the `ListView` was relatively simply.

It is also worth noting that in week 9, alongside the researching `ListView`s, the developer was introduced to JSON for the first time.

In week 10, the developer became familiar with the concept of `sharedPreference` files. This allowed the application to store users as being login. The concept was also implemented for product and Posts to allow the same information to be accessed across multiple activities.

### 8.3 Future Development

While this application has met all the requirements set forward at the start of the project, there is much room for expansion. To begin with, the app should be developed to account for the issues/recommendations brought to light in the user surveys.

Given more time the application could be expanded to include more images. Building on the Community environment, a messaging service between users could be added.

If it were to be used commercially, a section for companies to list the price they have products available at could be added. As could a promoted products page, along with in-app advertisement.

## 9 Acknowledgments

The author would like to thank the project supervisor Dr Finlay Smith, for his advice and guidance during the course of this project.

The author would also like to acknowledge Mr. Joe O'Connell, for his help solving all technical issues that arrived during the development of the application.

Finally the author would like to thank the course director Dr Enda Howley.

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## Appendices

### Appendix 1: Sogeti Project Guidelines

**From:** [REDACTED]  
**Sent:** 10 January 2017 15:28  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** RE: NUI Galway Software Design and Development course project.

Hi [REDACTED]

As Tori is undertaking a software design and development H Dip it is most likely she will joining Daire's growing practice.

I would suggest that Tori look at a project that incorporates software solutions in the Digital space.

I discussed with Daire and we would prefer not to be overly directive on what Tori should look at as something not in our immediate / local capability can help expand our own offerings.

If you could ask Tori to take a look at this webpage and select an area that takes her interest: <https://www.capgemini.com/disrupt-with-digital#services> and select "The Foundation For Digital" to see the categories / areas.

Regards,

[REDACTED]

[REDACTED] | SOGETI • | Ireland

Principal Consultant

T: +353 (0)1 639 0109 | M: +353 (0)87 987 7020

[www.sogeti.com](http://www.sogeti.com) | [www.capgemini.com](http://www.capgemini.com)

[REDACTED]



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## Appendix 2: SQL commands to create each table

Tables	
Table	Create Table
fluffelAdmin	CREATE TABLE `fluffelAdmin` (   `id` int(3) NOT NULL AUTO_INCREMENT,   `name` varchar(25) NOT NULL,   `email` varchar(75) NOT NULL,   `password` varchar(50) NOT NULL,   PRIMARY KEY (`id`),   UNIQUE KEY `email` (`email`) ) ENGINE=InnoDB AUTO_INCREMENT=3 DEFAULT CHARSET=utf8
fluffelPost	CREATE TABLE `fluffelPost` (   `post_id` int(11) NOT NULL AUTO_INCREMENT,   `postTitle` varchar(200) NOT NULL,   `post_content` varchar(2000) NOT NULL,   `post_user_id` int(11) DEFAULT NULL,   PRIMARY KEY (`post_id`),   KEY `post_user_id` (`post_user_id`),   CONSTRAINT `fluffelPost_ibfk_1` FOREIGN KEY (`post_user_id`) REFERENCES `fluffelUser` (`id`) ) ENGINE=InnoDB AUTO_INCREMENT=4 DEFAULT CHARSET=utf8
fluffelPostReply	CREATE TABLE `fluffelPostReply` (   `reply_id` int(11) NOT NULL AUTO_INCREMENT,   `op_id` int(11) NOT NULL,   `reply_user_id` int(11) NOT NULL,   `reply_comment` varchar(2000) NOT NULL,   PRIMARY KEY (`reply_id`),   KEY `op_id` (`op_id`),   KEY `reply_user_id` (`reply_user_id`),   CONSTRAINT `fluffelPostReply_ibfk_1` FOREIGN KEY (`op_id`) REFERENCES `fluffelPost` (`post_id`),   CONSTRAINT `fluffelPostReply_ibfk_2` FOREIGN KEY (`reply_user_id`) REFERENCES `fluffelUser` (`id`) ) ENGINE=InnoDB AUTO_INCREMENT=5 DEFAULT CHARSET=utf8
fluffelUser	CREATE TABLE `fluffelUser` (   `id` int(10) NOT NULL AUTO_INCREMENT,   `name` varchar(50) NOT NULL,   `email` varchar(70) NOT NULL,   `username` varchar(50) NOT NULL,   `password` varchar(50) NOT NULL,   PRIMARY KEY (`id`),   UNIQUE KEY `username` (`username`),   UNIQUE KEY `email` (`email`) ) ENGINE=InnoDB AUTO_INCREMENT=28 DEFAULT CHARSET=utf8
product_info	CREATE TABLE `product_info` (   `id` int(15) NOT NULL AUTO_INCREMENT,   `name` varchar(100) NOT NULL,   `description` varchar(2000) NOT NULL,   `pet_type` varchar(50) NOT NULL,   `product_type` varchar(50) NOT NULL,   PRIMARY KEY (`id`) ) ENGINE=InnoDB AUTO_INCREMENT=23 DEFAULT CHARSET=utf8
Review	CREATE TABLE `Review` (   `reviewID` int(11) NOT NULL AUTO_INCREMENT,   `reviewTitle` varchar(255) DEFAULT NULL,   `reviewContent` varchar(2000) DEFAULT NULL,   `reviewRating` int(1) DEFAULT NULL,   `userID` int(11) NOT NULL,   `productID` int(11) NOT NULL,   PRIMARY KEY (`reviewID`),   KEY `userID` (`userID`),   KEY `productID` (`productID`),   CONSTRAINT `Review_ibfk_1` FOREIGN KEY (`userID`) REFERENCES `fluffelUser` (`id`),   CONSTRAINT `Review_ibfk_2` FOREIGN KEY (`productID`) REFERENCES `product_info` (`id`) ) ENGINE=InnoDB AUTO_INCREMENT=26 DEFAULT CHARSET=utf8

Appendix 3: Survey

## Fluffle Co. User Evaluation Form

Tester Number:

Make of Phone Used:

How easy to use did you find this app?

Difficult      Not to Difficult      Indifferent      Easy      Very Easy

How would you rate the appearance of the app?

Very Bad      Bad      Indifferent      Good      Very Good

How likely are you to use the app again?

Not Likely      Unlikely      indifferent      Likely      Very Likely

How likely are you to recommend this app to a friend?

Not Likely      Unlikely      indifferent      Likely      Very Likely

Did you encounter any issues while using the app?

What is your overall opinion of the app?

Thank You.

The Fluffle Collaboration

Tester 1

FluffelCo. User Evaluation Form

Tester Number: 1

Make of Phone Used:

Samsung Galaxy grand prime.

How easy to use did you find this app?

Difficult

Not to Difficult

Indifferent

Easy

Very Easy

How would you rate the appearance of the app?

Very Bad

Bad

Indifferent

Good

Very Good

How likely are you to use the app again?

Not Likely

Unlikely

indifferent

Likely

Very Likely

How likely are you to recommend this app to a friend?

Not Likely

Unlikely

indifferent

Likely

Very Likely

Did you encounter any issues while using the app?

No

What is your overall opinion of the app?

It's really easy to use and suitable for it's purpose.  
I think products layout upon searching could be improved, just to be a bit easier to read.

Thank You.

The Fluffel Collaboration

Tester 2

Fluffle Co. User Evaluation Form

Tester Number: 2

Make of Phone Used: Le ECO Pro 2.

How easy to use did you find this app?

Difficult

Not to Difficult

Indifferent

Easy

Very Easy

How would you rate the appearance of the app?

Very Bad

Bad

Indifferent

Good

Very Good

How likely are you to use the app again?

Not Likely

Unlikely

indifferent

Likely

Very Likely

How likely are you to recommend this app to a friend?

Not Likely

Unlikely

indifferent

Likely

Very Likely

Did you encounter any issues while using the app?

Nope, all good!

What is your overall opinion of the app?

Cute!

Helpful.

Informative!

quick loading time!

Thank You.

The Fluffle Collaboration

Tester 3

Fluffle Co. User Evaluation Form

Tester Number: 3

Make of Phone Used: Huawei

How easy to use did you find this app?

Difficult

Not to Difficult

Indifferent

Easy

Very Easy

How would you rate the appearance of the app?

Very Bad

Bad

Indifferent

Good

Very Good

How likely are you to use the app again?

Not Likely

Unlikely

Indifferent

Likely

Very Likely

How likely are you to recommend this app to a friend?

Not Likely

Unlikely

Indifferent

Likely

Very Likely

Did you encounter any issues while using the app?

- Only when internet was slow
- Should add allowance for forgotten passwords

What is your overall opinion of the app?

Easy to use. I liked it

Thank You.

The Fluffle Collaboration

Tester 4

Fluffle Co. User Evaluation Form

Tester Number: 4

Make of Phone Used:

Samsung

How easy to use did you find this app?

Difficult      Not to Difficult      Indifferent

Easy

Very Easy

How would you rate the appearance of the app?

Very Bad      Bad      Indifferent

Good

Very Good

How likely are you to use the app again?

Not Likely      Unlikely      indifferent

Likely

Very Likely

How likely are you to recommend this app to a friend?

Not Likely      Unlikely      indifferent

Likely

Very Likely

Did you encounter any issues while using the app?

Yes, I wasn't connected to the internet.

What is your overall opinion of the app?

Fast authentication when registering.

Thank You.

The Fluffle Collaboration

Tester 5

Fluffle Co. User Evaluation Form

Tester Number: 5

Make of Phone Used: One Plus One

How easy to use did you find this app?

Difficult      Not to Difficult      Indifferent       Easy      Very Easy

How would you rate the appearance of the app?

Very Bad      Bad      Indifferent       Good      Very Good

How likely are you to use the app again?

Not Likely      Unlikely      indifferent       Likely      Very Likely

How likely are you to recommend this app to a friend?

Not Likely      Unlikely      indifferent      Likely       Very Likely

Did you encounter any issues while using the app?

No issues were encountered at all while using this application.

What is your overall opinion of the app?

Very well designed app , forum is brilliant!

Thank You.

The Fluffle Collaboration

## Appendix 4: Learning Journals

### Week 1

#### **What work have you undertaken on your project this week?**

This week the aim was to decide on an idea for a project and develop and submit a requirements document.

By Thursday a project idea was decided on.

I propose developing an app. The app would be designed to improve pet owner's experiences in choosing and purchasing products for their pets as well as providing a community they could go to for advice.

It would be linked to a database of pet products (eg food, bedding, toys etc) with information on the product. It would allow users to log in and add reviews of products, and favour products. Time/scope pending it would allow users to search products by scanning a bar code, and allow a message board section where users could ask question of the community, or a chat section where users could communicate one on one, and such.

The technologies to be used are: Java, PHP, and a MySQL Database.

#### **What challenges have you encountered on your project this week?**

Contact from my company was an issue. As there very busy it took a while for them to get back to me. It was Tuesday before I received any guidelines from them.

They were also relaxed in relation to this, and so Tuesday and Wednesday were spent trying to research the company and any technology's used by them to develop a project concept around.

Due to the delays I am behind on my Requirements document.

#### **What actions are you now going to take to address these challenges?**

Over the weekend I will complete my research and complete my requirements document to allow me to start work on the project early next week.

### Week 2

#### **What work have you undertaken on your project this week?**

This week was spent gaining a better understanding of the Android development Studio. Some basic commands and short cuts were learnt through the development of simple apps. The code needed to develop a "toast" (a pop up message displayed on a phone for a short space of time that disappears by its self.) was also learnt.

#### **What challenges have you encountered on your project this week?**

The first issue this week was getting Android Studio to download correctly on the lab computers. After failed attempts on Monday and Tuesday it was installed on my laptop instead.

This then lead to a second issue, my computer does not support hardware accelerated virtualization. So I cannot, currently, test any apps with the built in virtual device.

A separate issue was that while there are many useful tutorials available on line, few are related to the newest edition of the Android Studio. This has made it a bit harder to get a handle on app development.

**What actions are you now going to take to address these challenges?**

I will research on how to get the AVD to run on my computer. Otherwise I'll try to get a Android phone to test with.

I will continue to search for other sources to aid in the development of my app.

**Week 3**

**What work have you undertaken on your project this week?**

Monday and Tuesday were spent trying to fix issues I had with the Development Studio. These were resolved thanks to the help of the senior lab technical officer, Joe O'Connel.

The rest of the week was spent developing my knowledge of the Development Studio. A series of tutorials by TheNewBoston were very helpful with this.

A second set of tutorials by TheNewBoston were also used to get started with the database using MySQL and phpMyAdmin. A user table was created and propagated with data to be used to test the log in page once developed.

While I have not created a log in page yet I feel I'll have the skills to do so by early next week.

**What challenges have you encountered on your project this week?**

This week challenges mainly revolved around developing the skills and understanding needed to work with Android Studio, as well as familiarising myself with phpMyAdmin.

**What actions are you now going to take to address these challenges?**

Over the weekend I plan to complete the Android development series by The New Boston with the aim to have the Login page completed by Monday evening. Once I have a working Log In page that interacts with the database correctly I can move on to developing the Review section, and filling the product table with information.

**Week 4**

**What work have you undertaken on your project this week?**

This week I focused on getting the log in and register pages linked to the database.

A set of PHP files were created to interact with the database. These were uploaded to the danu6 server and run to ensure they work correctly.

**What challenges have you encountered on your project this week?**

The problem occurred when trying to incorporate these into the Java files for the app.

**What actions are you now going to take to address these challenges?**

If I can't overcome this problem by Monday evening I will ask for help in DISC, the computer programming drop in service offered by NUIG. If they cannot aid me I shall ask my supervisor for help.

**Week 5**

**What work have you undertaken on your project this week?**

**What challenges have you encountered on your project this week?**

After consulting many people and resources around the college I concluded that while it should be doable I would not be able to link my app to a MySQL database.

**What actions are you now going to take to address these challenges?**

Under the advice of a previous 1SD3 graduate I have decided to use a SQLite database instead. The later part of this week was focused on getting this to work. By Friday night I have working log in and Sign Up pages.

Next week I aim to develop a page that allows users to view products stored in the database

**Week 6**

**What work have you undertaken on your project this week?**

This week I had intended to start work on a page that allows users to search for products. However, I decided that first I wished to create an Admin log in page that leads to a page that allows admin to add new products to the system.

**What challenges have you encountered on your project this week?**

I wish to have a main welcome page that the app opens on. If the user swipes left it opens the admin log in page and if they swipe right it opens the user log in page.

I am having issues getting the code to run correctly.

**What actions are you now going to take to address these challenges?**

During week 7 I shall focus on fixing this code. If by the end of the week I have not succeeded, I will get rid of the swipe functionality and put in buttons instead.

**Week 7**

**What work have you undertaken on your project this week?**

This week I perfected the swiping functionality in my app. Allowing users to access different pages by swiping left or right in the app.

I also focused on building a working admin log in page. Once logged in this page will allow admin users to add products to the products table.

**What challenges have you encountered on your project this week?**

The main issue this week was with the admin table in the SQLite database. I could not find a safe way to have 2 users hard coded into it from the moment it is downloaded onto a device. Each time its downloaded the database is created from scratch on the device.

So unless I coded in these admin user details to the app itself I would have to have a admin register page that allowed the admin users to register before they could log in. But this would defeat the purpose as it would allow anyone to register as an admin.

**What actions are you now going to take to address these challenges?**

Over the course of week 8 I will once again try to get a working connection to a MySQL database.

## Week 8

**What work have you undertaken on your project this week?**

This week was focused on developing a working connection to a MySQL database.

By following a tutorial by [ProgrammingKnowledge](https://www.youtube.com/watch?v=HK515-8-Q_w) : [https://www.youtube.com/watch?v=HK515-8-Q\\_w](https://www.youtube.com/watch?v=HK515-8-Q_w)

Once I had this working for a test app, I then set about applying the code to my app.

**What challenges have you encountered on your project this week?**

Until I found the tutorial mentioned about, I was having difficulty as the majority of the documentation on how to connect to a database used HttpClient, however org.apache.http.client.httpclient is deprecated for API 22+.

Thankfully this tutorial showed me how it can be done using a HttpURLConnection

**What actions are you now going to take to address these challenges?**

I now have the app writing to the users table in the database through a register page, and checking details entered by admin, and users against the appropriate tables. Next I wish to display the user's details on a separate page, and then display all the products on a separate page.

## Week 9

**What work have you undertaken on your project this week?**

This week the focus was on developing a page that displays all the products currently in the database with their name, product type and what animal they are for. This was done using a combination of Java class's, XML files and the ListView widget in Android Studio. A separate page was also developed to allow users to update their details.

**What challenges have you encountered on your project this week?**

The main challenge this week was gaining an understanding of JSON and how to use it to return information for the database.

**What actions are you now going to take to address these challenges?**

While the issues faced this week have been resolved there is still a lot of work to achieve in the next three weeks. I hope to focus mainly on my project in week 10 and hopefully cover a lot of ground.

## [Week 10](#)

### **What work have you undertaken on your project this week?**

This week the search functionality of the app was expanded. Users can now click on product item in the list view and it will open an activity that displays all the product details. From here the user can leave a review of the product or view all reviews.

The functionality was also added to allow a registered admin user to add new products to the database.

### **What challenges have you encountered on your project this week?**

The challenges faced this week were storing a products details locally.

This was overcome through the implementation of Shared Preference

### **What actions are you now going to take to address these challenges?**

The challenges faced this week overcome by expanding my knowledge of sharedPreference in Java.

Entering into Week 11 I hope to develop the community section.

Up to this point I have testing the app through the emulator in Android Studio. I will need to acquire an Android phone to demonstrate for the bench demo.

## [Week 11](#)

### **What work have you undertaken on your project this week?**

This week I focused on developing the Community section. This section allows users to post to the group, view all posts, view all comments/reply to posts and post their own reply.

### **What challenges have you encountered on your project this week?**

While this week's work involved developing a lot of code and files, it is all based on principals that I have encountered in different forms earlier in the project. Due to this there were no significant challenges this week.

### **What actions are you now going to take to address these challenges?**

During the final week I will be focusing on the Design and Test Specification Document and tidying up the app to increase ease of use. I hope to get 2-3 people to test out the app and fill in a short evaluation form which will be included in the report. If time allows I hope to fix any issues these testers encounter.

## Appendix 5: Requirements Document