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Stephen McDonnell
X13350371
Stephen.mcdonnell1@student.ncirl.ie

Support Desk Mobile Application
Technical Report



Declaration Cover Sheet for Project Submission

SECTION 1

Name: Stephen McDonnell
Student ID: x13350371
Supervisor: Eamon Nolan

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Executive Summary

The IT Support desk in McCann FitzGerald is currently operating at high capacity, the statistics which are generated for management are seen as very important. Company management want the service desk responding to over 80% of tickets immediately. The service desk is currently operating well below this level. To improve service the chief information officer (CIO) has requested that the support desk now concentrate on email's instead of answering the phone. Ringing the support desk is to be used as a last resort and in an emergency. This in itself poses its own problems. The problem that currently generates the most tickets per day is issues relating to Microsoft outlook & internet explorer becoming non responsive. As users as working on thin client PC's which operate via the citrix environment these process must be shut down remotely by a support analyst.

However with the new email only policy in place it raises the question of how, if the phones won't be answered does a user contact the support desk? Most people would suggest to email via your mobile device, however only 60 employees out of 400 have access to their work email on their mobile device.

Furthermore during an IT systems outage, currently the only means of communication are IT staff on the floors and advisory posters outside all lift entrances in the building. This isn't a viable approach to a systems outage.

This is where the mobile application comes in. The CIO requested that a mobile application be developed to solve the above problems. I was given the project to complete as part of my 4th year project. The McCann Fitzgerald IT Support Application will allow users to log into the app via two factor authentication. There they will then be able to send a ticket to the IT Support desk with a description of their issue. As the user needs to log into the application, all of their details will be display to the IT support desk. This will increase response time as the analyst will have all of the user's details available to them.

Furthermore the application will be a key element of communication during a systems outage. The application will be able to send a push notification to the user's phone informing them of the systems outage and provide regular updates

until the issue is resolved. This will allow IT staff to concentrate on fixing the problem at hand rather than performing floor walks, this will have a positive effect on the service restoration time.

The application will be of benefit to the company and also of benefit to myself as it will improve my coding skills. Coding is an area I feel I lag behind in. This challenge is the ideal chance to improve my skills while producing something practical that will be used.

1 Introduction

1.1 Background

Currently the only ways to contact the IT department are by phone or email. Email's take priority on the IT Support desk therefore users that are having issues and can't access their emails could be waiting for a large period of time for the phone to be answered. Not all users have emails on their phone either. Only 60 out of 400 staff have access to emails on their phones. This is where the application will be of assistance. Instead of users consistently ringing the helpdesk they can instead submit their support case via the McCann FitzGerald application.

1.2 Aims & Objectives

The overall objective of this 4th year computing project is to create an android mobile application for the assistance of a busy IT Support Desk that supports a large number of users spread out geographically over a number of offices.

Through development and consultation with my employer it is expected that that this application will be rolled out firm wide and will be fully supported in house upon completion.

The objectives of the project are:

- Conduct market research – To initiate a project requirement's specification I will conduct market research to find similar applications if any that are available on the android platform.
- Build a prototype – I intend to have a GUI with basic functionality working before the mid-term presentations which will be presented to the college during presentation week and also presented to my employer at a mid-point briefing prior to Christmas.
- To implement two – factor security authorisation in the application via an already in place application called secure envoy.

- To correctly link the application to the company database which will pull down the correct email identification for each employee.
- To implement a push notification to inform users instantly of system outages and to provide updates via push notification.
- To deploy the application on the Google Play store so that it is available for download throughout the company.
- To improve cost efficiency on the IT Support Desk.
- To reduce SLA breaches on the IT Support Desk.

1.3 Technologies

The project has been coded using a mix of java, java script and xml languages. These are the 3 languages I feel were most needed in order to create the application. I am basing this view from a previous college project that I was involved in creating which used these three languages.

As I am using android studio the android studio NDK provides a set of native headers and shared library files. I plan to use the built in API libraries to the full extent.

1.4 Research

There has been in-depth research carried out in relation to this application. As this is an android mobile application, research so far has been focused on the Google Play store. The first application that came highly recommended on the play store was developed by Spiceworks and is called "Help Desk". This application has over 100,000 downloads, however it is only directed towards those that work in IT support and not the users that are being supported which is where it varies from the intended project. There are other applications also, such as Manage Engine ServiceDesk plus and Freshdesk. However again like the earlier mentioned Spiceworks application these focus on the IT support employee and management of their calls instead of being focused on the end user who is logging the calls.

The research also threw up an interesting idea. The intended project could also include a web interface, the current set up in MCF is that user have no access to the help desk ticketing system and this is controlled by IT and only IT staff have access. The proposal that has been thought up during the research period is to along with the application create a web service ticketing system where access to the system is based on your log in credentials. IT staff would have admin access while normal users could also have access but this would be limited to only logging a ticket and receiving updates for that ticket.

This idea has been passed to management, whom I am waiting on to reply to me.

A business analysis of the helpdesk was also carried out to gain an understanding of the monetary effect of this application on the IT helpdesk. An IT analyst earning €2,300 per month currently processes on average 300 helpdesk tickets per month, each ticket there for costs €7.60. The average telephone call lasts over 10 minutes whereas an email to helpdesk will see a technician turnaround time of on average 5 minutes. Therefore if all phone calls are replaced with emails, the average helpdesk tickets per analyst should increase, hence increasing productivity and reducing the cost per helpdesk ticket.

2 System

The system should operate as follows.

- The system shall have a secure log in facility.
- The system shall be able to submit support tickets from the application to the support desk after the user presses the submit button.
- The system shall be able to send updates to users with regards to system outages.
- The system shall transfer the users data along with a support ticket.

2.1 Requirements

2.1.1 Functional requirements

Requirement 1: Secure Log in

Description & Priority

The system shall be secure. The log in process shall be secure and verified with two factor authentication. A unique code shall be sent to the users' firm owned mobile device, this code will be used for log in along with the user's network details. This is of high priority and an essential requirement.

Use Case

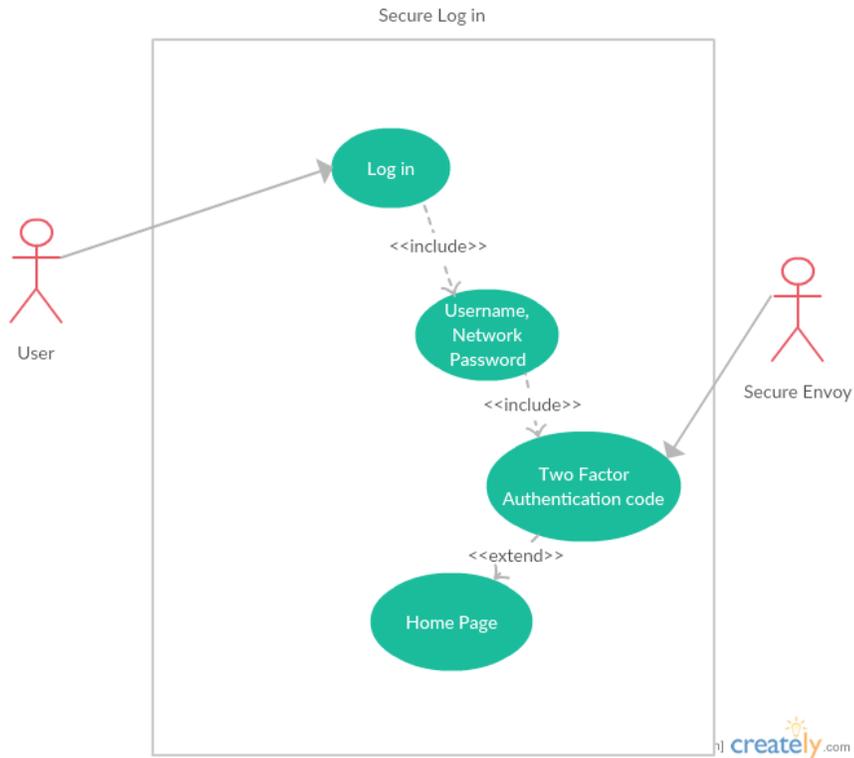
Scope

The scope of this use case is to detail the process involved in relation to secure log in.

Description

This use case describes the process that the system will undertake during the secure log in process.

Use Case Diagram



Flow Description

Precondition

The system is idle and waiting for user.

Activation

This use case starts when the user opens the application

Main flow

1. The system identifies the user as having opened the application.
2. The User Enters their Username & Network Password. (See E1)
3. The user enters their authentication code sent from the secure envoy actor.
4. The user has successfully logged in and is brought to the home page.

Alternate flow

A1: Authentication fails & retry

5. The system identifies the user as having opened the application

6. The user enters their username and network password.
7. The user enters their authentication code.
8. Log in fails – incorrect details enter.
9. User reverts back to step 2 in the main flow.
10. User enters details and logs in successfully.

Exceptional flow

E1 : Unable to log in

11. User begins at step 1 on the main flow
12. The user continues to step 3 on the main flow.
13. The user does not have a secure code.
14. The user can't log in and use case reverts to step 2.

Termination

The system presents the home screen.

Post condition

The system goes into a wait state and waits for the next log in attempt

Requirement 2: Logging tickets to the IT Support Desk

1. Description & Priority

The system shall be able to log tickets without delay to the IT Support Desk. This shall be done via email with the system communicating the problem description to the IT Support Inbox. This is of high priority and critical to the overall success of the system.

2. Use Case

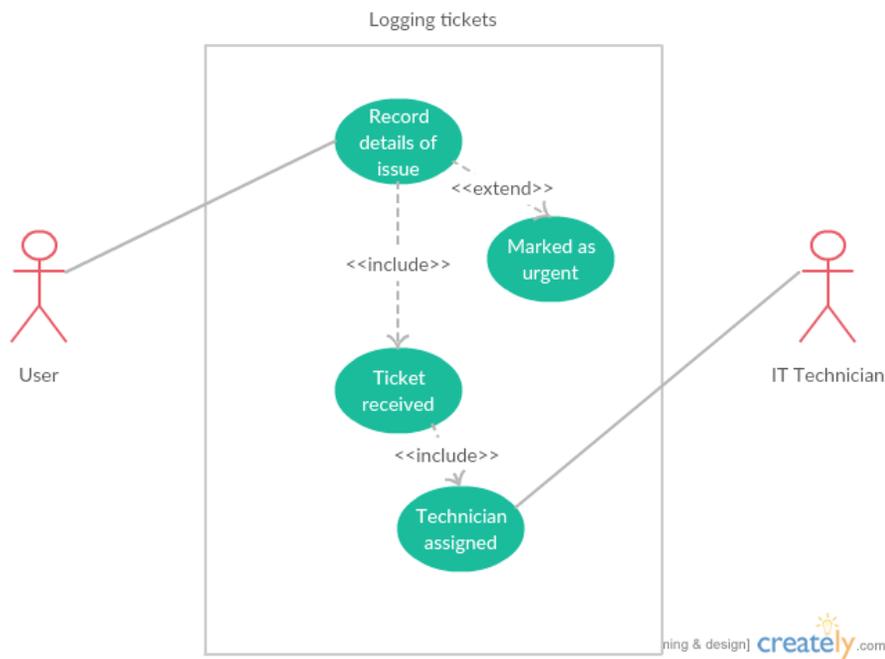
Scope

The scope of this use case is to show the process the system will take to log tickets once the user submits their query.

Description

This use case describes the system process when logging tickets with the IT Support Desk.

Use Case Diagram



Flow Description

Precondition

The system is waiting for a ticket to be created.

Activation

This use case starts when a user creates a ticket in the application

Main flow

1. The system identifies the user via their details provided on log in.
2. The user gives details of the issue in the text box.(See E1)
3. The user doesn't mark ticket as urgent.
4. The user submits the ticket.
5. The ticket is received.
6. Technician assigned.

Alternate flow

A1: Urgent ticket

7. The system identifies the user via their details provided on log in.
8. The user gives details of the issue in the text box (See E1)
9. The user marks the ticket as urgent
10. The user submits the ticket.
11. The ticket is received and auto forwarded to all technicians
12. A technician is assigned to the ticket.

Exceptional flow

E1 : No details given regarding the issue

13. The system cannot process request.

14. The user is returned to step 1 on the main flow.

Termination

The system has logged the ticket

Post condition

The system goes into a wait state

Requirement 3: Ability to send system updates

3. Description & Priority

The system shall be able to send push notifications to all of its users in the event of a systems outage. A member of IT Support shall be able to enter the details and the system shall send the notification. This is a medium priority and is not critical to the success and implementation of the system.

4. Use Case

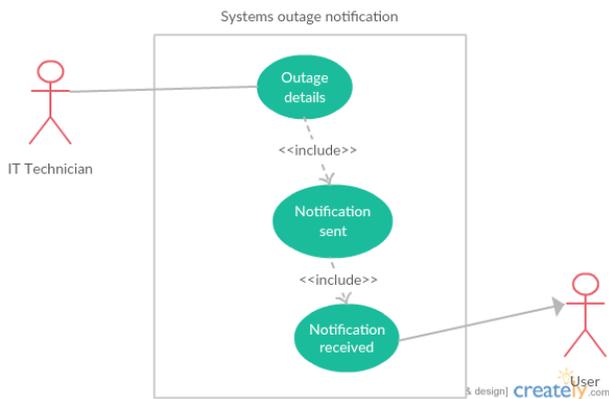
Scope

The scope of this use case is to show the process behind sending a push notification.

Description

This use case describes the system process when sending a push notification to users.

Use Case Diagram



Flow Description

Precondition

The system is in idle awaiting input from technician

Activation

This use case starts when a technician inputs information

Main flow

2. The system identifies the technician
3. The technician inputs the outage details
4. The system sends the details to all mobile devices (See A1 + E1)
5. The user receives the notification

Alternate flow

A1 : Delivery delayed

6. The system contuse to step 3 in the main flow
7. The user doesn't receive the notification
8. The device must be connected to internet

9. Return to step 4 in the main flow

Exceptional flow

E1 : Unable to deliver notification – Mobile server outage

10. The system is unable to deliver notifications due to issue with the server etc

11. Delivery failed.

Termination

The system has delivered the notification.

Post condition

The system goes into a wait state until system restore notification is sent.

Requirement 4: Sending users data to IT Support Desk application

1. Description & Priority

The system shall be able to convey the users contact details to the IT Support Desk when a ticket is logged, this includes their direct office extension and mobile number where applicable. This is a low priority as IT staff will be able to retrieve these details however it speeds up the reply time and is not crucial to the systems performance.

2. Use Case

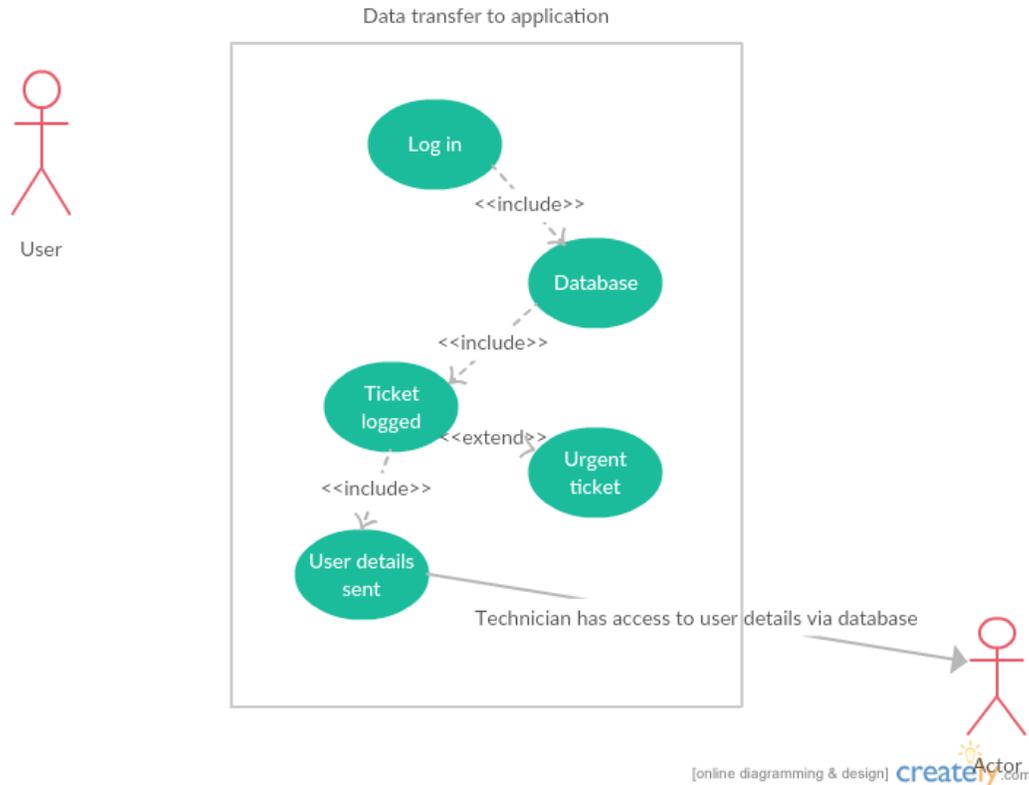
Scope

The scope of this use case is to show the process behind the transfer of user's data to the support desk.

Description

This use case describes the system process when retrieving user's data from the firm database to send to the support desk.

Use Case Diagram



Flow Description

Precondition

The system is awaiting log in

Activation

This use case starts when a user logs in

Main flow

1. The user logs in
2. The system communicates with the database to retrieve user's details.

3. The user fills in ticket details (E1)
4. The user submits ticket
5. Details sent from database (See A1)
6. Technician assigned with access to details

Alternate flow

A1 : Unable to retrieve all of users details

7. The use case continues to step 5 of main flow
8. The technician is unable to view all of user's details on ticket.
9. The technician can query data base.
10. Sequence ends

Exceptional flow

E1 : No ticket details provided

11. The user doesn't provide any ticket details
12. The system is unable to process the request

Termination

The system presents the data to the technician.

Post condition

The system goes into a wait state ahead of receiving the next ticket.

2.1.2 Non- Functional Requirements

Performance/Response time requirement

The system should be able to respond to the user in a timely manner, there shouldn't be any performance or response time issues that affect the users experience with the system.

Availability requirement

The system should be available to all android users via the google play store. This is in line with the firm's policy of moving to android operated devices. Therefore the system will not be available to iOS users.

Recover requirement

The system should be recoverable in the event of downtime.

Robustness requirement

The system should be robust and not effected by an overall systems outage, it should be ran separately to the main systems.

Security requirement

The application should be secure and third parties should be unable to log into the application. This is stated within the functional requirements.

Maintainability requirement

The application should be maintained to a high standard and be updated with new technology requirements when available.

Extendibility requirement

The system should be able to accept future changes and developments in technology. The application should be able to adopt itself to meet the needs of the firm as time goes on.

2.1.3 Data requirements

Due to the nature of this project I will need to have a secure database. Due to the sensitive information relating to users accounts and users work details I need to have a secure database. I am currently consulting with the companies information security officer regarding these requirements and hope to have them finalised shortly.

2.1.4 User requirements

The user requirements are critical to the success of this project. Below are a set of objectives and requirements for the system. These objectives and requirements have been set out by the CIO.

- The system should be secure, no unauthorized log in's should be possible nor should it be possible for a third party to log into the system.
- The system should log tickets with the IT Support Desk with little or no delay.
- The system should be easily accessible to IT personnel for maintenance.
- In the event of a systems outage the system should be able to quickly send users information about the outage after input from IT personnel.
- It is the firm's objective that this application will be available on the android market in line with the firm's policy of moving all firm owned mobile devices to the android operating system.

2.1.5 Usability requirements

The usability requirements for this project are:

Understand ability

- Interface elements (e.g. menus) should be easy to understand

Learnability

- The user documentation and help should be complete
- The help should be context sensitive and explain how to achieve common tasks
- The system should be easy to learn

Operability

- The interface actions and elements should be consistent

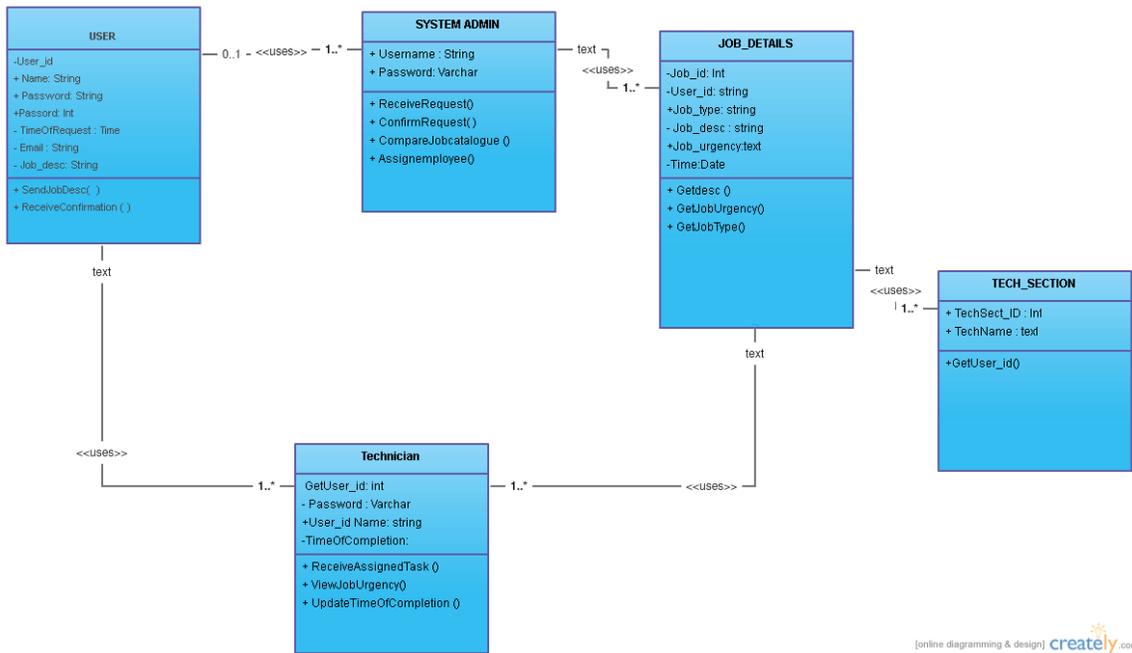
- Error messages should explain how to recover from the error
- Undo should be available for most actions
- Actions which cannot be undone should ask for confirmation

Attractiveness

- The screen layout and colour should be appealing

2.2 Design and Architecture

The proposed system design and architecture is shown in the below diagram. Algorithms will be implemented during the log in stage, an external two factor authentication service will authenticate users that are logging into the application. This is the main algorithm in the system, all other code is java based.



2.3 Implementation

The Android application is built using a number of activities that perform varying tasks and are linked together using the various GUI's. When a user who is not logged in launches the application they are brought to the MainActivity, it is here in this activity that the user has to option to register for an account or log in if they already have an account. The register and log in functionality are built using Google Firebase. Google Firebase allows real time feedback to a database that is hosted by Google but linked to the application based on its package name and a downloaded google-services.json file. It is this json file that allows communication between the application and the Firebase database. This json file is inserted into the app level source folder. The below snip of code is from the generated json file showing the link between application and Firebase.

```
{
  "project_info": {
    "project_number": "1090267904051",
    "firebase_url": "https://finalyearproject-e1eb2.firebaseio.com",
    "project_id": "finalyearproject-e1eb2",
    "storage_bucket": "finalyearproject-e1eb2.appspot.com"
  },
  "client": [
    {
      "client_info": {
        "mobilesdk_app_id": "1:1090267904051:android:2509eda86bbaceca",
        "android_client_info": {
          "package_name": "com.example.stephen.finalyearproject"
        }
      },
      "oauth_client": [
        {
          "client_id": "1090267904051-fqlvanprh9pct1eav31k7isa7fekqilm.apps.googleusercontent.com",
          "client_type": 3
        }
      ],
      "api_key": [
        {
          "current_key": "AIzaSyCBvtcEFXcOOdhCr8FMJ9QoUtMkc8YE17M"
        }
      ]
    }
  ]
}
```

The MainActivity file is essentially the registration page for the application. Here the user is asked to input both email address and password. The user can't advance to the home page of the application until they have either registered or signed in. The registration process is quite straightforward coding wise with both

email and password being declared as strings awaiting input from the user. Should the user fail to enter details in either field a toast message is set to appear prompting the user to enter in the given field. Once the user completes the registration process a progress dialog box will appear on screen informing the user that they are currently being registered. This feature adds to the GUI and to the user experience. These explained processes are shown below.

```
private void registerUser() {
    String email = editTextEmail.getText().toString().trim();
    String password = editTextPassword.getText().toString().trim();

    if (TextUtils.isEmpty(email)) {
        //email is empty
        Toast.makeText(this, "Please enter email", Toast.LENGTH_SHORT).show();
        // stopping function from executing further
        return;
    }

    if (TextUtils.isEmpty(password)) {
        //password is empty
        Toast.makeText(this, "Please enter password", Toast.LENGTH_SHORT).show();
        // stopping function from executing further
        return;
    }

    // if validations are ok
    // we will show a progress bar
    progressDialog.setMessage("Registering User");
    progressDialog.show();
}
```

The Firebase service now comes into effect to register the user in our database.

```
firebaseAuth.createUserWithEmailAndPassword(email,password)
    .addOnCompleteListener(this, new OnCompleteListener<AuthResult>() {
        @Override
        public void onComplete(@NonNull Task<AuthResult> task) {
            if (task.isSuccessful()){
                finish();
                startActivity(new Intent(getApplicationContext(),ProfileActivity.class));
            } else {
                Toast.makeText(MainActivity.this, "Could not register. Please try again", Toast.LENGTH_SHORT).show();
            }
        }
    });
progressDialog.dismiss();
```

Once the user has been successfully registered they will be re-directed to the ProfileActivity as shown above. Finish(); ends the current task once it is successful with the startActivity function working alongside an Intent to launch the user Profile.

The Login page is also quite similar to the registration page with both email and password being declared as strings and a link to the Firebase database using the firebaseAuth function. This function checks with Firebase that the user is indeed registered on the application.

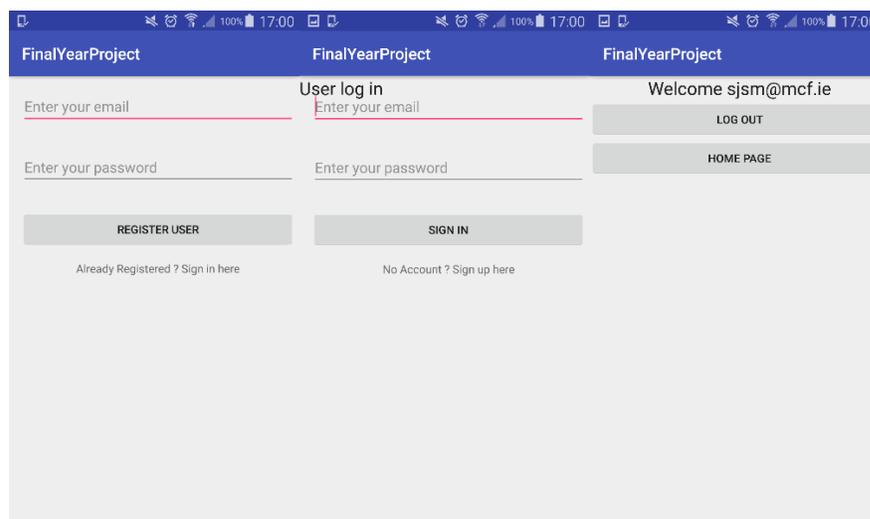
Once registered the user is brought to the ProfileActivity which is based on their email address supplied in the registration process. The ProfileActivity pulls in the users registered email address and supplies a welcome message on the screen with two button options, log out or proceed to the application home page. Once on the application home page the user can then select the 'IT Support' button in order to log a ticket with the IT Support Desk. To log a ticket is the main feature that was asked for in the project requirements.

The actual send button is coded as shown below.

```
buttonSend.setOnClickListener(new OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        String to = textTo.getText().toString();  
        String subject = textSubject.getText().toString();  
        String message = textMessage.getText().toString();  
  
        Intent email = new Intent(Intent.ACTION_SEND);  
        email.putExtra(Intent.EXTRA_EMAIL, new String[]{ to});  
        //email.putExtra(Intent.EXTRA_CC, new String[]{ to});  
        //email.putExtra(Intent.EXTRA_BCC, new String[]{to});  
        email.putExtra(Intent.EXTRA_SUBJECT, subject);  
        email.putExtra(Intent.EXTRA_TEXT, message);  
  
        //need this to prompts email client only  
        email.setType("message/rfc822");  
  
        startActivity(Intent.createChooser(email, "Choose an Email client :"));  
    }  
});  
}
```

The use of the email Intent alongside the putExtra function takes our email address, subject and inputted text. Clicking on the send button then launches the option for email client.

The implementation of the above code examples enables the below app features to work correctly.



2.4 Graphical User Interface (GUI) Layout - Wireframes

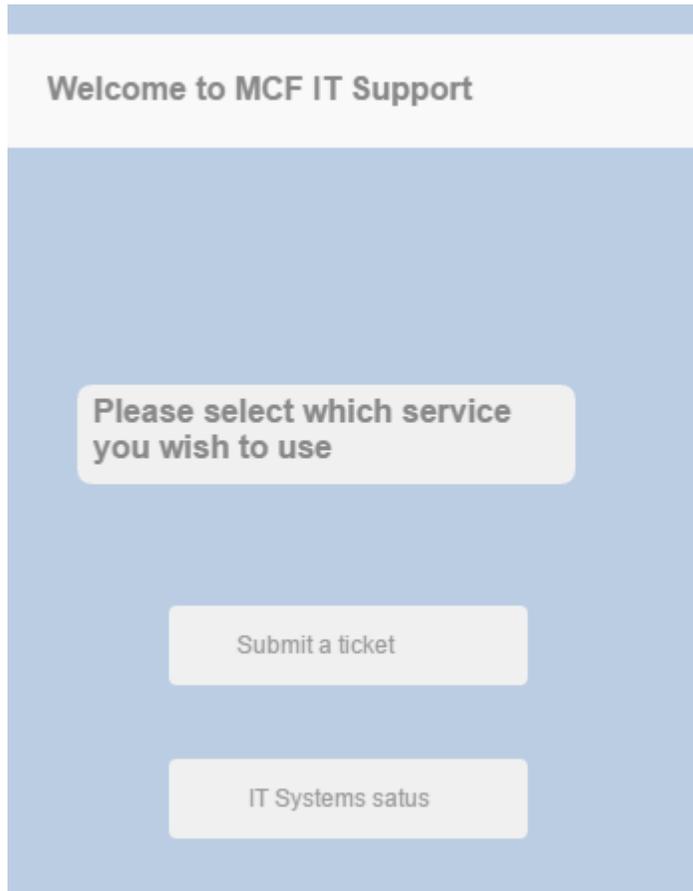
GUI – Application log on page

The GUI that you see below is the secure log on page that opens when the user first opens the application. The MCF logo is displayed at the top of the screen. Underneath this the user enters their username, the first password field is their network password and the second password field is their security code. The then use the log in button.



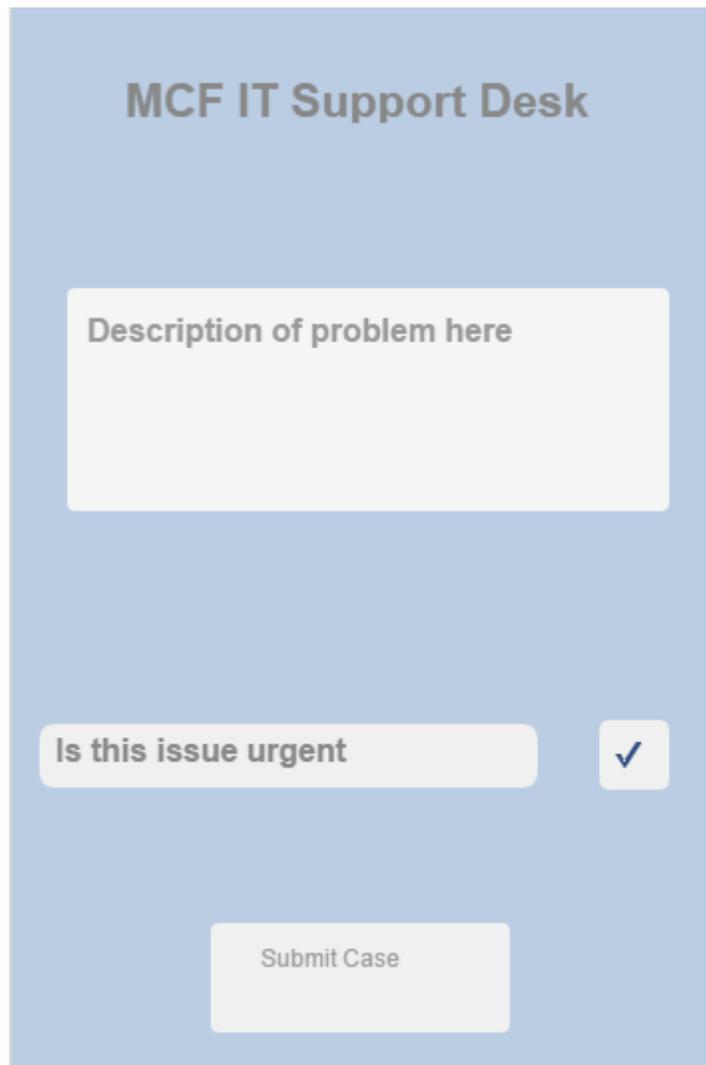
GUI – Home Page

Once the user has logged in they will be presented with the home page. From the home page they can select which service they wish to use in the application.



GUI – Submit a case

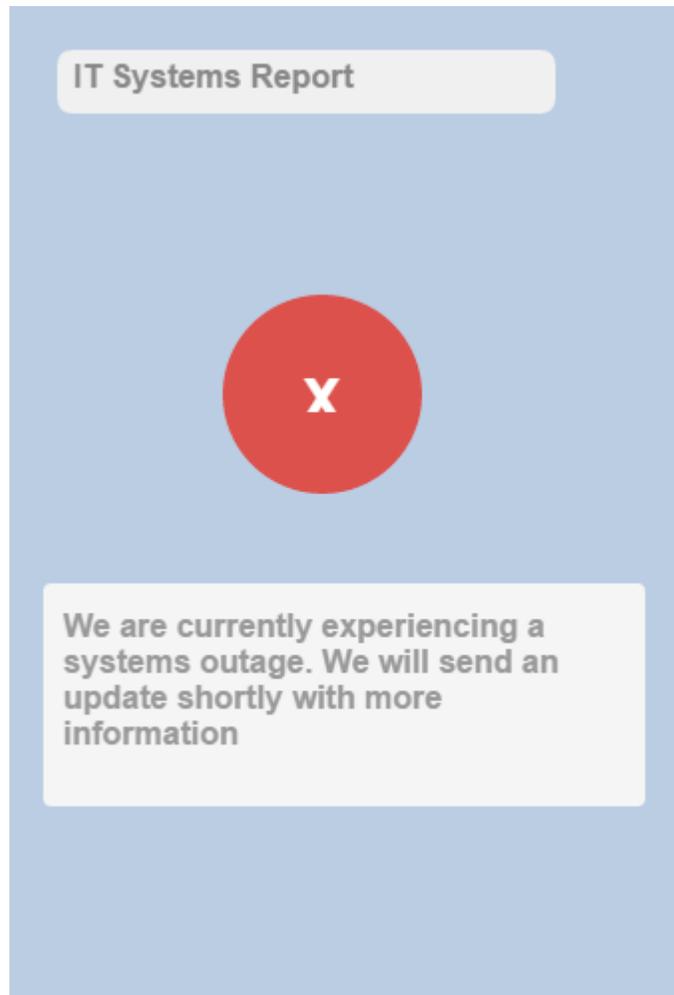
The below GUI shows a skelton version of the submit a case page which is where the user is able to submit their ticket to the IT Support desk. The user fills in the description of the issue and can then mark the issue as urgent if it is an issue which needs to be looked at straight away. Marking the issue as urgent send the ticket to all members of the support desk.



The image displays a user interface for submitting a case to the MCF IT Support Desk. The interface is set against a light blue background. At the top, the title "MCF IT Support Desk" is centered in a bold, dark grey font. Below the title is a large, light grey rectangular input field with the placeholder text "Description of problem here". Underneath this field is a label "Is this issue urgent" in a dark grey font, followed by a small square checkbox containing a dark grey checkmark. At the bottom of the form is a light grey rectangular button with the text "Submit Case" in a dark grey font.

GUI – Systems Status

The below GUI shows the systems status page. Although the application should send a push notification in the event of a systems outage, the user also has the option to check on the application.



2.5 Testing

Testing was carried out using Espresso Test Recorder which generates a testing script for the application. This testing script checks that the functionality in the app is working and that the buttons perform the expected functions. Screenshots of the testing code are shown below. The testing script is located within the project package, `com.example.stephen.finalyearproject`. The test script for sending to email is called `SendMessageTest.java`. This script runs all the way from the log in functionality to the send to email function which is the final step.

Espresso Test Recorder is testing feature that proving popular amongst developers. This feature allows you to create UI tests by recording interactions with your application on physical devices. It will then produces test code and this test code will re-enact the test that you have carried out. Within Android Studio the console will return the test success or fail message.

Usability testing was also carried out among a sample set of users. The description of the usability tests carried out along with the results is available in the customer testing section below.

```
package com.example.stephen.finalyearproject;

import android.support.test.espresso.ViewInteraction;
import android.support.test.rule.ActivityTestRule;
import android.support.test.runner.AndroidJUnit4;
import android.test.suitebuilder.annotation.LargeTest;

import org.junit.Rule;
import org.junit.Test;
import org.junit.runner.RunWith;

import static android.support.test.espresso.Espresso.onView;
import static android.support.test.espresso.Espresso.pressBack;
import static android.support.test.espresso.action.ViewActions.click;
import static android.support.test.espresso.action.ViewActions.closeSoftKeyboard;
import static android.support.test.espresso.action.ViewActions.pressImeActionButton;
import static android.support.test.espresso.action.ViewActions.replaceText;
import static android.support.test.espresso.matcher.ViewMatchers.isDisplayed;
import static android.support.test.espresso.matcher.ViewMatchers.withId;
import static android.support.test.espresso.matcher.ViewMatchers.withParent;
import static android.support.test.espresso.matcher.ViewMatchers.withText;
import static org.hamcrest.Matchers.allOf;

@LargeTest
@RunWith(AndroidJUnit4.class)
public class FullTest {

    @Rule
    public ActivityTestRule<MainActivity> mActivityTestRule = new ActivityTestRule<>(MainActivity.class);
```

```
@Rule
public ActivityTestRule<MainActivity> mActivityTestRule = new ActivityTestRule<>(MainActivity.class);

@Test
public void fullTest() {
    ViewInteraction appCompatTextView = onView(
        allOf(withId(R.id.textViewSignIn), withText("Already Registered ? Sign in here"), isDisplayed()));
    appCompatTextView.perform(click());

    ViewInteraction appCompatEditText = onView(
        allOf(withId(R.id.editTextEmail), isDisplayed()));
    appCompatEditText.perform(click());

    ViewInteraction appCompatEditText2 = onView(
        allOf(withId(R.id.editTextEmail), isDisplayed()));
    appCompatEditText2.perform(replaceText("sjsm@mc.f.ie"), closeSoftKeyboard());

    ViewInteraction appCompatEditText3 = onView(
        allOf(withId(R.id.editTextPassword), isDisplayed()));
    appCompatEditText3.perform(replaceText("123456"), closeSoftKeyboard());

    ViewInteraction appCompatButton = onView(
        allOf(withId(R.id.buttonSignIn), withText("Sign in"), isDisplayed()));
    appCompatButton.perform(click());

    ViewInteraction appCompatButton2 = onView(
        allOf(withId(R.id.buttonHomePage), withText("Home Page"), isDisplayed()));
    appCompatButton2.perform(click());

    ViewInteraction appCompatButton3 = onView(
        allOf(withId(R.id.button3), withText("IT Support"),
```

```
ViewInteraction appCompatButton3 = onView(
    allOf(withId(R.id.button3), withText("IT Support"),
        withParent(allOf(withId(R.id.activity_main),
            withParent(withId(android.R.id.content)))),
        isDisplayed()));
appCompatButton3.perform(click());

ViewInteraction appCompatEditText4 = onView(
    allOf(withId(R.id.editTextTo),
        withParent(allOf(withId(R.id.activity_itsupport),
            withParent(withId(android.R.id.content)))),
        isDisplayed()));
appCompatEditText4.perform(click());

ViewInteraction appCompatEditText5 = onView(
    allOf(withId(R.id.editTextTo),
        withParent(allOf(withId(R.id.activity_itsupport),
            withParent(withId(android.R.id.content)))),
        isDisplayed()));
appCompatEditText5.perform(replaceText("help@mcf.ie"), closeSoftKeyboard());

ViewInteraction appCompatEditText6 = onView(
    allOf(withId(R.id.editTextTo), withText("help@mcf.ie"),
        withParent(allOf(withId(R.id.activity_itsupport),
            withParent(withId(android.R.id.content)))),
        isDisplayed()));
appCompatEditText6.perform.pressImeActionButton());

ViewInteraction appCompatEditText7 = onView(
    allOf(withId(R.id.editTextSubject),
        withParent(allOf(withId(R.id.activity_itsupport),
```

```
ViewInteraction appCompatEditText10 = onView(
    allOf(withId(R.id.editTextMessage), withText("can so"),
        withParent(allOf(withId(R.id.activity_itsupport),
            withParent(withId(android.R.id.content)))),
            isDisplayed()));
appCompatEditText10.perform(replaceText("can someone contact"), closeSoftKeyboard());

ViewInteraction appCompatEditText11 = onView(
    allOf(withId(R.id.editTextMessage), withText("can someone contact"),
        withParent(allOf(withId(R.id.activity_itsupport),
            withParent(withId(android.R.id.content)))),
            isDisplayed()));
appCompatEditText11.perform(click());

ViewInteraction appCompatEditText12 = onView(
    allOf(withId(R.id.editTextMessage), withText("can someone contact"),
        withParent(allOf(withId(R.id.activity_itsupport),
            withParent(withId(android.R.id.content)))),
            isDisplayed()));
appCompatEditText12.perform(replaceText("can someone contact me"), closeSoftKeyboard());

pressBack();

ViewInteraction appCompatButton4 = onView(
    allOf(withId(R.id.button4), withText("Send"),
        withParent(allOf(withId(R.id.activity_itsupport),
            withParent(withId(android.R.id.content)))),
            isDisplayed()));
appCompatButton4.perform(click());
}
```

2.6 Customer testing / Usability Testing

The application was added to the phones of a sample test group of 5 people. This test group were given a usability test known as a “Trunk Test”. The aim of the trunk test is to see how the sample group react when given a task in an environment that they are unfamiliar with such as the application. None of the sample group had seen the application prior to the trunk test.

The main aim of customer testing was to gauge the efficiency and usability when users of the application were logging support tickets. All 5 participants were given the same outcome to achieve by sending a message using a chosen mail client. The below results and comments were noted from the sample group.

User 1

Aim: Send support ticket

Starting Page: Main Activity

User outcome: User successfully navigated to IT Support page and successfully selected their email client and sent the message.

User comments: Within the IT Support page the user didn't know what button to press to exit the text field where they were describing the issue. User pressed the phones back button as a guess and was correct. The user suggested a possible prompt to tell application users what button to press.

User 2

Aim: Send Support ticket

Starting Page: Main Activity

User outcome: User navigated to IT Support page and after filling out the required details was unable to send the support ticket.

User comments: The user didn't have an email account logged in on the phone and was unsure of the default gmail account on the phone. The user suggested that it be noted that an email client will need to be available on the phone and logged in.

User 3

Aim: Send Support ticket

Starting Page: Main Activity

User outcome: User successfully sent support case to IT Support Desk

User comments: User noted that the application was easy to use. The user also suggested additional functionality such as the option to provide more case details for the user to input such as drop down lists. This they said would narrow the problem issue for the IT technician if minimal details had been supplied.

User 4

Aim: Send Support ticket

Starting Page: Main Activity

User outcome: User successfully sent support case to IT Support Desk

User comments: User enjoyed the layout of the application and it's ease of use. The user has suggested that the person logging the support ticket be given the option to track the progress being made on their support ticket.

User 5

Aim: Send Support ticket

Starting Page: Main Activity

User outcome: User successfully sent support case to IT Support Desk

User comments: N/A – User had no additional comments to add.

The above 5 tests were carried out at different times, the reason for this was that the participants could not see what the other participants were doing. Knowing what each other were doing would defeat the purpose of the trunk test. As is shown above only one user was unable to send a support case due to the intergration with the email client. The feedback that was given will lead to improvements going forward in the application but they are not currently realistic given the timeframe that is being worked to.

2.7 Evaluation

The application has been evaluated against both the functional and non-functional requirements to ensure that the requirements have been met.

The application has been tested with a sample set of users following while testing has also taken place using espresso test recording as stated in the testing section of this document. The application has been evaluated by members of the IT department in the workplace as part of the usability testing phase. Their feedback has proved instrumental in the final tweaks to the application prior to submission. In the coming week's it is hoped that this application will be made available on the Google Play store therefore enabling staff to download and access the application.

3 Conclusions

This application although quite simplistic meets the requirements that have been set out by the CIO at the beginning of the project. The main piece of functionality that was required was the ability to send a support ticket, this was to be the backbone of the project and this has been achieved.

In relation to the needs of the business this application can provide the following advantages:

- Simplified process of logging support desk emails for users.
- Reduced business costs which have previously been mentioned in this document.
- Increased IT efficiency. With less phone calls coming into the support desk the turn around time on support tickets should reduce and SLA's should now be hit within the given time.

However as with any piece of software there may be disadvantages of the end product. I feel that the disadvantages of this project are minimal in the overall end product.

- Continued professional maintenance of the application which will incur the business a cost. Maintenance of the application should be minimal however it will require a professional on an ad-hoc basis.
- Staff will need to be trained in relation to the application, therefore taking resources away from normal training.

It is also envisaged that the application can be modified going forward to become the firms overall mobile application with various other features for departments and not solely be dedicated to IT.

The application is currently limited to McCann Fitzgerald and would need to be customised to be used by other companies going forward.

4 Further development or research

Further development has already begun with the BDG and Contact Us options within the application. Although functionality is currently very basic on these options it is a good start. It is envisaged that the application can be modified going forward to become the firms overall mobile application with various other features for departments and not solely be dedicated to IT. However this would require a professional developer and the firm to buy into the idea of the application overall and not limited to the IT department.

In terms of the re-sale potential of the application to other companies this is very much achievable. The application can be used as a template for other companies with the current information replaced with those of the specific company. There would be coding changes needed to input a different email address for support tickets to be sent to along with all traces of McCann FitzGerald being removed from the application.

The upcoming project showcase will give me a good footing to see if there is interest in the application. Based on this feedback I will be able to decide if it is possible to improve the application and add to current features in order to make the application available to other companies.

However all of this work that would be needed would require full time development. Something that I currently wouldn't be able to commit to.

5 References

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6 Appendix

6.1 Project Proposal

1. Objectives

The overall objective of this 4th year computing project is to create an android mobile application for the assistance of a busy IT Support Desk that supports a large number of users spread out geographically over a number of offices.

Through development and consultation with my employer it is expected that that this application will be rolled out firm wide and will be fully supported in house upon completion.

The objectives of the project are:

- Conduct market research – To initiate a project requirement's specification I will conduct market research to find similar applications if any that are available on the android platform.
- Build a prototype – I intend to have a GUI with basic functionality working before the mid-term presentations which will be presented to the college during presentation week and also presented to my employer at a mid-point briefing prior to Christmas.
- To implement two – factor security authorisation in the application via an already in place application called secure envoy.
- To correctly link the application to the company database which will pull down the correct email identification for each employee.
- To implement a push notification to inform users instantly of system outages and to provide updates via push notification.
- To deploy the application on the Google Play store so that it is available for download throughout the company.

These objectives will take the project from the initial research stage through the development stage and finally to the deployment stage.

2. Background

There is quite a large background behind this project. Currently I am working for McCann FitzGerald solicitors, the biggest law firm in Ireland. I joined the IT department of McCann FitzGerald in January 2016 as part of my 3rd year 6 month work placement module. I independently secured this placement following a lengthy interview process.

After only 4 months with the firm a permanent position became available within the IT department. I applied for the role, the role was given to me straight away without a recruitment campaign given my experience within the IT department.

During my work placement academic supervisors visit in June 2016 the topic of the 4th year project was brought up in conversation. It was suggested to my employer that if they had an upcoming project that it be assigned to me as my 4th year project. This would allow me to combine both work and college into one assignment and producing a finished independent project for both college and work.

The IT Support desk in McCann FitzGerald is currently operating at high capacity, the statistics which are generated for management are seen as very important. Company management want the service desk responding to over 80% of tickets immediately. The service desk is currently operating well below this level. To improve service the chief information officer (CIO) has requested that the support desk now concentrate on email's instead of answering the phone. Ringing the support desk is to be used as a last resort and in an emergency. This in itself poses its own problems. The problem that currently generates the most tickets per day is issues relating to Microsoft outlook & internet explorer becoming non responsive. As users as working on thin client PC's which operate via the citrix environment these process must be shut down remotely by a support analyst.

However with the new email only policy in place it raises the question of how, if the phones won't be answered does a user contact the support desk? Most people would suggest to email via your mobile device, however only 60 employees out of 400 have access to their work email on their mobile device.

Furthermore during an IT systems outage, currently the only means of communication are IT staff on the floors and advisory posters outside all lift entrances in the building. This isn't a viable approach to a systems outage.

This is where the mobile application comes in. The CIO requested that a mobile application be developed to solve the above problems. I was given the project to complete as part of my 4th year project. The McCann Fitzgerald IT Support Application will allow users to log into the app via two factor authentication. There they will then be able to send a ticket to the IT Support desk with a description of their issue. As the user needs to log into the application, all of their details will be display to the IT support desk. This will increase response time as the analyst will have all of the user's details available to them.

Furthermore the application will be a key element of communication during a systems outage. The application will be able to send a push notification to the user's phone informing them of the systems outage and provide regular updates until the issue is resolved. This will allow IT staff to concentrate on fixing the problem at hand rather than performing floor walks, this will have a positive effect on the service restoration time.

I feel that this application will be of benefit to the company and also of benefit to myself as it will improve my coding skills. Coding is an area I feel I lag behind in. This challenge is the ideal chance to improve my skills while producing something practical that will be used.

3. Technical Approach

The technical approach for this project has been well thought out. There will be a project plan to be followed. The project plan will set out what needs to be done and when it needs to be done. It is imperative that this plan be followed as each piece of the project depends on the previous. You will see this plan later in this document.

In order to complete this project from a technical perspective there will be a number of steps to be taken throughout the project.

The first stage will be the gathering of requirements. I will speak with my IT colleagues to see what they would like the application to do. I will then present my initial requirements to the chief information officer for his comment and adjust to reflect what he sees as the critical requirements.

From these requirements will come the second stage which will be research. I have already conducted the initial stages of market research, I have searched through the Google play store for similar applications. There are as I expected applications which are quite similar. However quite often these applications are only available to companies who already have the web application version operating in their environment which the application is simply an add on. From my initial research I cannot locate an application which is in use by another law firm to aid their support desk, I can only locate generic helpdesk applications. I have however downloaded these applications and inspected their features, this has allowed me to add more ideas to my application. The research stage is ongoing as I search for the best possible implementation method for the application.

Once research has been completed and the final requirements confirmed I will set about implementing the project solution. This will be done firstly through the creation of GUI's. The GUI's from the design phase will be presented to the various stakeholders for review and comment. Once feedback has been received, the GUI's will be edited to reflect these comments. The GUI's will form part of the requirements specification which follows this document.

Following the creation of the GUI's some basic code will be implemented behind the GUI to enable various buttons etc to work. This will form the basis to start the more complex coding including database integration and two factor authentication.

Once the project is near completion the testing phase will begin. I will test the application locally before making it available to a test group. The test group will review the application and provide comment on the application. These comments will form the basis for any final adjustments to be made with the application.

The completed android application will then be deployed on the Google play store and presented to the college for grading and to my employer for company approval.

4. Special Resources

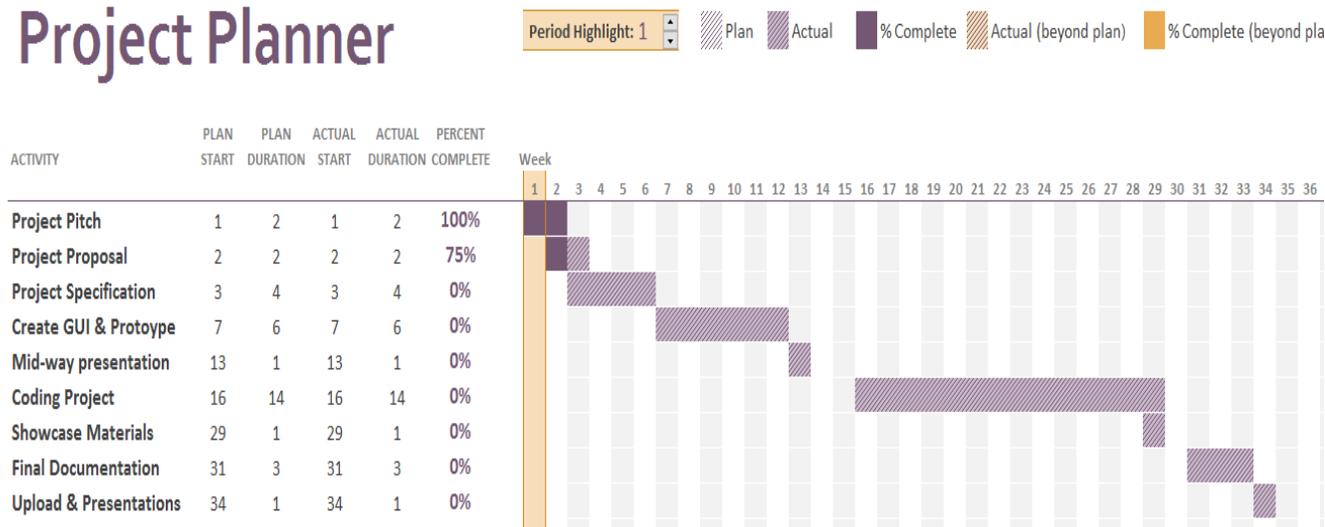
There will be only minimal special resources required for this project. I will need software to develop the android application. The software I will use is Android Studio which is a free downloadable program.

There are other resources that will be required to implement two factor authentication such as secure envoy. However I have experience with secure envoy therefore I don't envisage any difficulty in that regard.

5. Project Plan

The below is my proposed project plan followed by a brief explanation of the activities.

Project Planner



- Project pitch – This was the initial pitch of my project in the dragons den format. My project proposal was accepted therefore this stage is complete.
- Project proposal – This is this document. As I am currently at the project plan stage I would classify this document at this moment 75% complete.
- Project specification – I plan to start this document very soon as it is scheduled to start in week 3. This document will contain scope, functional

and non-functional requirements along with architecture diagrams, use case diagrams and a mock GUI.

- Create GUI and Prototype - I plan to start this in week 7 which is reading week. I can start this stage of the project as I have the functional, non-functional requirement along with the system architecture diagrams and use cases. I envisage this process of creating the prototype bringing me up to the mid-point presentation before Christmas.
- After Christmas and the exams period I plan to start developing the code of the application. This process will be on going until the application is complete. I have set aside 14 weeks for this process. This will include testing the application.
- Showcase materials – To prepare for the showcase I have set aside 1 week.
- Final documentation – I feel that 3 weeks is the amount of time needed to prepare all my documentation to a high standard ahead of the project presentation.
- Upload & Presentation – Submission of project and presentation to panel

6. Technical Details

The project will be coded using a mix of java, java script and xml languages. These are the 3 languages I feel will be needed in order to create the application. I am basing this view from a previous college project that I was involved in creating which used these three languages.

As I am using android studio the android studio NDK provides a set of native headers and shared library files. I plan to use the built in API libraries to the full extent.

There is very little of technical details as I just need to concentrate on the code and the implementation of the code.

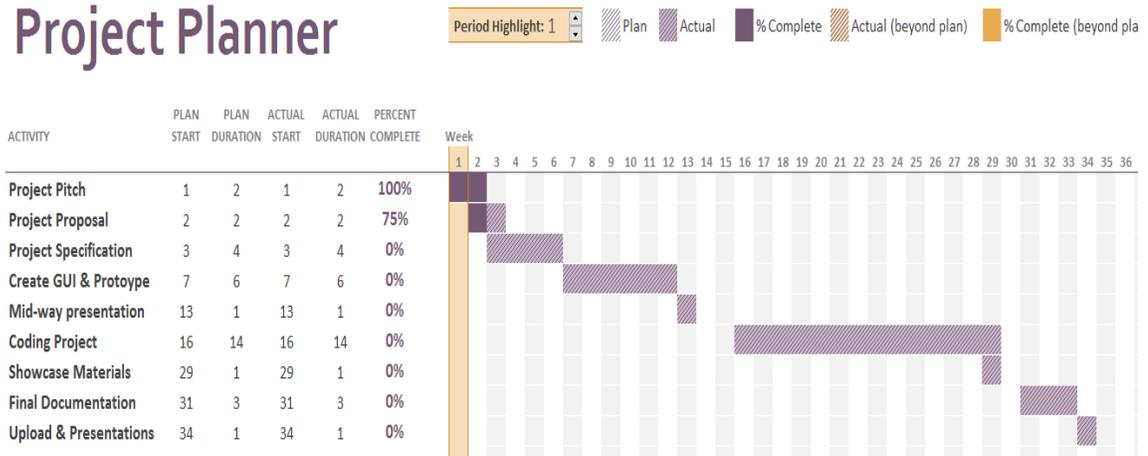
7. Evaluation

The application will be evaluated against both the functional and non-functional requirements to ensure all requirements have been met.

The application will be tested with a sample set of users. The application will be evaluated by members of the IT department in work. Their feedback will prove instrumental in the final tweaks to the application before deployment to the app store. After final changes have been made, the sample group of users will again test the app to confirm its functionality. It will then be published on the Google Play store and made available for download.

6.2 Project Plan

Project Planner



6.3 Monthly Journals

Reflective Journal

Student name: Stephen McDonnell – x13350371

Programme: Bsc Computing

Month: September

My Achievements

This month saw the beginning of the new college year. For my final year I have transferred from the full time stream of the Bsc Computing to the part time stream having secured a full time contract from my 3rd year work placement. In terms of my software project I began thinking some time ago for possible ideas, I want to take on a project that relates to my work and would be beneficial to my company.

So far this month has consisted of researching possible projects and comparing them to other possible products on the market. I finally settled on a project and then began to put together my project pitch. In early October, I had my project pitch which saw my project idea accepted. My project will be a Support Desk Mobile Application.

My Reflection

I found it hard to try and narrow down my project ideas. My research threw up many potential ideas with pros and cons of each. There were parts of projects I liked and some I did not like so narrowing possible ideas was quite difficult.

I feel that I was well prepared for my project pitch and I look forward to the coming few months in developing the software project.

Intended Changes

Next month I will continue to develop my idea while also working on my project proposal document and begin my requirements specification.

I also need to do more research and learn more about coding. I have not been the biggest fan of coding throughout college, as I do not see myself wanting to enter an IT job that requires coding. However, I do not have the support of a group in this project this year so I need to do a lot of practising code wise.

Supervisor Meetings

We did not receive a supervisor this month therefore I cannot comment on any supervisor meetings.

Month: October

My Achievements

October saw my project pitch accepted at the beginning of the month. After the project was accepted, I began to draft my project proposal. This proposal gave a summary of the project; the aims of the project & how I would project manage to name but a few aspects. This project proposal was uploaded via moodle the 20th of October.

After uploading the project proposal document, I have now begun to work on the project specification document, which is due on the 11th of November.

The list of supervisors was also completed and given out to the class. Eamon has been assigned as my supervisor.

My Reflection

I am happy with the content within my project proposal. I feel that it covers the required aspects at the early stage of my project.

I am finding the project specification document difficult at the moment, it requires a lot of research. I am currently going back over project notes from previous years to revise my use cases.

I am also happy with my assigned supervisor, I have always had a good working relationship with Eamon and I feel that this will be a major advantage as the project continues.

Intended Changes

Early next month I intend to complete my project specification. I will do more research for my specification.

I also intend to create my GUI's and a basic interface early next month. This will signal a change from the documentation approach to a more hands on and practical approach.

Supervisor Meetings

I did not have a supervisor meeting this month. Eamon is my supervisor and we have our first meeting scheduled until on Tuesday 8th November at 17:30.

Month: November

My Achievements

November saw the start of important deliverables in this project module. In particular the project requirements specification was due in the middle of the month. Given the amount of CA's and other project work that needed to be undertaken during the month I am quite happy with the standard of my requirements specification. I feel that it covers all the required areas for my project.

I also began to develop my prototype for the mid-point presentation and this is a work in progress.

My Reflection

Currently I am quite pleased with my work and how the month and semester has gone in the module. I do feel that I would like to give more time to the project module and this was something that I lacked during what was an extremely busy month.

I also need to make more time outside of college for the project module and other modules. It is quite difficult to work a full day and then do more work at home and still be in college three times a week. Each week seems to run into the next at the moment.

Intended Changes

I intend to give more to the project over the month of December and going forward into January. With Christmas, time off work and exams there is no college for over a month, therefore this is the ideal time after and during study to progress the project. According to my project plan I intend to take a two week break during

exams however I feel this will now be one week so that I can get the most out of my time.

Supervisor Meetings

I have sat down with Eamon twice during the month before class. We have traded ideas and I have taken on board his advice with regards to my research and to carry out more business analysis.

I will also submit my work to Eamon for comment before I upload it. I feel that working alongside Eamon is benefiting me. He is full of ideas and enthusiasm for my project.

Month: December

My Achievements

December was an extremely busy month in terms of project work. Not only was there multiple projects to be delivered for other modules, the project module was the most important of all given the weighting attached to the mid-point presentation. December saw work begin on the technical report which will be handed up with the final project documentation however for the mid-point it was a requirement to have it updated to reflect the work done to date. My main achievement this month was the mid-point presentation which saw a presentation of a basic working prototype, from which I gained 18% out of the possible 25% for the presentation, including my documentation. I feel this was just rewards for the level of work I have put into the project to date.

My Reflection

I am extremely happy with my progress this month, I did very well in the mid-point presentation. I am also very happy to have produced a working prototype, although basic it provides an extremely valuable base to work on going forward. Reflecting on my documentation I think that I need some more detail in my technical report, to reflect my project idea, to clearly layout the idea so that someone reading the report knows straight away what the application does and who it is aimed towards.

Intended Changes

I intend to implement changes to my documentation as was suggested during the feedback portion of the mid-point presentation. As Eamon mentioned I need to be clear and concise in the project introduction. I need to as already mentioned state what the project is and what its uses and benefits are. I will introduce these points going forward. As this is the exam period I now intend to concentrate on my exams during January and then take the week off college work following exams, therefore allowing me to come back to college refreshed and ready to finish my degree.

Supervisor Meetings

I and Eamon have been meeting before and during our project class to discuss documentation and the prototype. We have also been in communication via email in relation to the upload of the technical report documents, with Eamon suggesting changes to the draft document that I had sent. I also gained feedback from Eamon during the feedback session in the mid-point presentation and I have taken his views on board and will implement the changes he thinks would benefit my project and documentation.

Month: January

My Achievements

January was an extremely busy month given that it was the exam period where I sat 3 written exams. As per my project plan the exam period and the immediate week after the exams were all pencilled in as break weeks given the exams were in process and a lot of time and energy was being put into these.

My Reflection

Following the exam period my project plan scheduled me to resume work on my project when college resumed at the end of January. I didn't follow this and took an extra week off from project work. Instead of resuming work I have listened carefully to the seminars and thinking how I can implement suggestions given in these seminars in my project.

Intended Changes

I intend to put more time into the practical side of my project. I have been thinking of extra ideas / external software that I can use for my project. I also plan to reflect any of these changes in my technical report.

I feel that my documentation is already at a high standard. My prototype I also feel was to a high standard but there are many issues to be addressed.

Supervisor Meetings

Myself and Eamon have met during class time. We will soon go through my mid-point feedback where I will gain more direction for the coming 3 months until the final presentation.

Month: February

My Achievements

There were no significant achievements in February in relation to the project. All semester 1 exams were passed which was an achievement in the overall sense. The project is a work in progress and there were no major milestones or goals achieved during the month.

My Reflection

Looking back on the month I feel that I'm not putting as much time or effort towards the project that I should be. There are other modules which are time consuming and as the semester enters its final period there is pressure coming in the forms of reports and documentation to be completed. I am in the mind-set that my project is to a good standard currently and that once this busy period is passed that I will be able to focus.

Intended Changes

I intend to complete more of the technical report. I have requirements and diagrams that need to be updated to reflect recent changes. I hope to put more time into my project but this is a very demanding time of the year and I think that once March is out of the way I will be in a position to do much more work.

Supervisor Meetings

Myself and Eamon have met during class time. We have talked about what has been done / needs to be done. We have also discussed testing.

Month: March

My Achievements

No major milestones were reached during March. There was a lot of work put in to perfecting my showcase profile. The description needed to be brief and to the point but also well put in only 40 words.

My Reflection

Looking back on the month I am happy at how the project has progressed. Work has been carried out on the project showcase profile alongside my technical report. The technical report is a vital piece of documentation. I have been updating ideas and brainstorming all with this report in my mind.

Our usability testing module has enabled me to set about creating my testing section and to commence testing. This will be of major benefit to me in the coming weeks as we near the end.

Intended Changes

I intend to complete the vast majority of my project before the start of May. I have a week block booked in April to code and implement coding changes to the technical report. I feel that given the high level prototype that I had for the mid-point that only minor additions need to be made.

Supervisor Meetings

Myself and Eamon have met during class time. We have talked about what has been done / needs to be done. We have also discussed testing, the final presentation and the project showcase.

6.4 Other Material Used