



Final Report

Project 137 - An Android version of a crowdsourcing app

Author

Corey Watson

Supervisor

Prof. Irena Spasic

Moderator

Dr Padraig Corcoran

Degree Scheme

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Abstract

As part of the CorCenCC project, a mobile application was recently built for iOS that allows Welsh language speakers to record conversations (as audio or video files) and upload them for inclusion in the proposed National Corpus of Contemporary Welsh. The aim of the corpus is to provide as much Welsh language data as possible - which can be studied later by researchers, linguists, publishers and so on. The purpose of the app is to allow users throughout Wales to upload spoken contributions to this dataset directly. The app's functionality includes the recording and upload of the audio and video files themselves, the collection of metadata about these recordings and their contributors, and the communication of this information and these uploads with our database. The goal of this project is to implement an Android version of the app.

Keywords: Android, corpus, crowdsourcing, mobile app, usability.

Table of Contents

Introduction	4
Outline	4
Aims and Objectives.....	4
Background	6
Analysis	7
Functional Requirements	7
Non-functional Requirements	14
Risk Analysis	15
Wireframe Designs of Android App	19
Evaluation of Wireframe Designs	28
Comparison of Android Wireframes against IOS User Interface.	28
Evaluation of User Interface using Nielsen’s Usability Heuristics.....	29
Suggested Improvements to User Interface	33
Survey of Suggested Improvements	36
Results	36
Design.....	37
UML Diagrams.....	37
Use Case Diagram	37
Activity Diagram	38
Implemented User Interface Screenshots	39
Splash screen/ Login/ No details dialog/ Incorrect details dialog/ No internet dialog.....	39
Registration/ Consent form/ Verification dialog/ Forgot password dialog	40
Recordings #1 – Missing profile information/ My recordings/ Recording overview/ Additional information (metadata)/ Upload to corpus	41
Recordings #2 – Recording uploaded dialog/ Consent required to record dialog/ New recording/ Add recording/ Additional information (metadata)	42
Recordings #3.....	43
Profile #1	44
Profile #2	45
Profile #3	46
About/ Settings #1	47
Settings #2/ Logout	48
Implementation	49
Testing.....	53
Exploratory Testing	53

Results	53
Functional Testing	55
Evaluation of Functional Testing	57
Non-Functional Requirements Testing	58
Usability Study	60
Participants	60
Questionnaires	60
Results	60
Future Improvements	64
Conclusion	65
Reflection on Learning	66
Appendix A	67
Appendix B – Test Cases	69
Appendix C -Test Cases IOS.....	84
Appendix D – Erroneous Test Cases.....	88
Appendix E – Usability Survey Questionnaires (Part 1, 2 & 3)	91
Appendix F – Questionnaire 1 Graphs	103
Appendix G – Questionnaire 3 Graph Results.....	104
Bibliography	108

Introduction

Outline

The aim of this project is to create an Android version of a crowdsourcing application that has already been built for the IOS platform as part of the CorCenCC (Corpws Cenedlaethol Cymraeg Cyfoes – The National Corpus of Contemporary Welsh) project. This £1.8 million project is led by the School of English, Communication and Philosophy at Cardiff University 1st March 2016 and is funded by the Economic and Social Research Council (ESRC) and the Arts and Humanities Research Council (AHRC) (<http://sites.cardiff.ac.uk/corcenccl/>). A corpus is a large collection of linguistic data, and the CorCenCC project aims to create the first general corpus to represent modern Welsh language and capture data from real life conversations. This will allow researchers, teachers, language learners and translators to study the data and identify how the Welsh language is used. An IOS app has already been developed with the aim to provide a seamless way for Welsh speakers to upload natural representations of their Welsh to the corpus by giving the users full control of the contributions they upload via the app.

The purpose of this project is to create an Android version of the IOS app to widen the reach of the CorCenCC project, as it was reported by the International Data Corporation that Android is by far the most popular mobile operating system accounting for 86.8% of the market share in comparison to IOS's 12.5% (IDC, 2017). Consequently, this means the upload of spoken contributions to the corpus is not exclusively limited to users of the IOS platform, which would greatly restrict the potential users of the CorCenCC crowdsourcing app. Providing both Android and IOS app will increase the accessibility of the project creating a larger base of potential users, which will hopefully increase the number of active users and in turn increase the quantity of data uploaded to the Corpus. The app's functionality includes the recording and upload of the audio and video files themselves, the collection of metadata about these recordings and their contributors, and their uploads into a database for their management and easy retrieval. The main objective of the project will be to create an Android app that will have the same functionality, flow, structure and be hosted by the same service as the existing IOS equivalent, whilst incorporating appropriate features that users of Android applications are used to. I envisage this to be a significant challenge since I have no previous experience of developing mobile apps, nor was there any taught modules for developing Android app's as part of the degree. In summary, the main aim is to provide a consistent and professional user interface for users across the IOS and Android platforms.

Ethical approval for the project is already in place and relevant disclaimers will also be displayed as user's personal data will be stored and processed.

Aims and Objectives

The main aim of the project is to develop an Android version of the CorCenCC crowdsourcing IOS app that supports the Android 5.0 Lollipop SDK. The sub aims are to maintain a consistent environment and user interface design across different operating systems (IOS & Android), but also use appropriate Android features where appropriate.

These aims will be achieved by completing the objectives listed below:

1. Analyse IOS app behaviour, interactions and user interface through exploratory testing.
2. Explore the different tools and technologies that are available to assist in implementing the solution.
3. Define a detailed requirements list for the CorCenCC crowdsourcing app.

4. Evaluate the user interface and interactions proposed for the Android app and suggest improvements.
5. Implement and develop the Android app, replicating all the functionality available on the IOS app and document any issues encountered.
6. Test the developed solution and analyse the results.
7. Conduct a usability study to evaluate the implemented user interface and, analyse the feedback given.
8. Review project and evaluate how it could be developed further.

Background

A key aspect of this project is the fact it's data is crowdsourced, which means that it relies solely upon voluntary input of data from the public. Many definitions exist in literature for the term 'crowdsourcing', but it was originally coined by Howe in a 2006 article titled "The Rise of Crowdsourcing" in Wired magazine, where he defines it as being able to 'tap the latent talent of a crowd' by 'outsourcing' work to the public (Howe, 2006). However, Howe's definition of crowdsourcing was provided from a business perspective and differs quite notably from that of an academic context. In business context, crowdsourcing is often thought of as outsourcing work to "Hobbyists, part timers and dabblers" for financial reward, as Howe states "The labor isn't always free, but it costs a lot less than paying traditional employees" (Howe, 2006). In contrast, crowdsourcing in an academic context is about creating or utilising online communities of volunteers to assist researchers in their research.

As this is an academic research project, the latter definition of crowdsourcing applies to the CorCenCC app, as it relies upon enthusiasts and volunteers who have a common interest in the revitalisation of the Welsh language. It can be argued that, even though crowdsourcing is thought of as a relatively new phenomenon in the business context, through the use of the online communities of interest it has existed for far longer with examples such as the Oxford English dictionary in 1858 where it is stated that "The number of people who contributed quotations to the First Edition of the *OED* runs into four figures." (Oxford English Dictionary, 2016). Due to the digital revolution and creation of the internet, a vaster and more accessible base of volunteers were made available to researchers and businesses. This in turn allowed for the creation of more notable examples of crowdsourcing such as Wikipedia in 2001, whose content relies entirely upon the input of the public and fanatics.

In more recent times, the widespread use of mobile devices that is integrated into everyday life has provided an exciting opportunity for business and academic lead projects to explore the use of crowdsourcing information through smartphone apps. Arguably, one of the most successful crowdsourced smartphone apps currently available would be Uber, but this app is still business focused as it attracts drivers to use their services by providing financial rewards through their customer base. An example of a more academic and research led crowdsourced smartphone app would be 'Dialäkt Äpp' (DÄ), which "crowdsources speech data" from the Swiss German language and "predicts users' dialects" (Leemann A, 2016). The success of the app is evident as "DÄ became the most downloaded free iPhone app in Switzerland", and their "linguistic analyses are based on data from nearly 60,000 speakers" (Leemann A, 2016). As both the CorCenCC crowdsourcing app and DÄ rely upon volunteer input to generate linguistic research data it can be seen how these apps are closely related, and this project hopes to imitate the success of the Swiss German app.

Analysis

This section of the report is used to define the project requirements and scope by analysing the functionality, behaviour and user interface of the existing IOS app.

In principle, when defining requirements for a project the MoSCoW(Must have, Could have, Should have, Won't have but would like) notation would normally be employed to prioritise the requirements. Since this project needs to incorporate all of the IOS app's behaviour and functional requirements detailed in the next section should be implemented.

Functional Requirements

Functional requirements can be described as defining "the internal workings of the software: that is, the calculations, technical details, data manipulation and processing, and other specific functionality that shows how the use cases are to be satisfied" (Stellman, 2005).

1. A user must be given the option of changing the language to Welsh or English on the login screen.

Acceptance Criteria

- Upon opening the app the user should be presented with an option to change language between Welsh and English.

Justification

- This requirement is necessary as the main user groups are likely to be Welsh speakers, so the app needs to consider and cater to their needs.

2. A user must be able to register an account.

Acceptance Criteria

- Upon opening the app the user should be presented with an option to register an account.
- After selecting this option, users should be presented with a page in which they can enter their email address and password.
- After entering their account information, users should be presented with a consent form.
- If a user accepts the consent form they should be sent a confirmation email and the app will revert back to the log in page.

Justification

- This requirement is necessary a user needs an account to sign in and use the features of the app.

3. Every account must be verified.

Acceptance Criteria

- When a user has registered an account a verification email must be sent to their email address and feedback presented on screen notifying the user.

Justification

- A verification email must be sent to stop malicious attacks, where individuals create accounts with invalid email addresses.
4. Users must be presented with appropriate declarations and consent forms, and agree to them before they can use the app.

Acceptance Criteria

- After users register and verify their accounts appropriate declarations and consent forms must be displayed, which they have to agree to in order to use the app.

Justification

- It is important that these declarations and consent forms are displayed to inform the users about what and how their data is going to be processed to address legal and ethical issues.

5. A user must be able log into their account.

Acceptance Criteria

- Upon opening the app users must be able to log into their accounts using their registered email address and password.

Justification

- This requirement is necessary as users need to log in to access the features of the app.

6. Users should be automatically logged into their account if they have not previously logged out on the device.

Acceptance Criteria

- Upon opening the app, if a user has not logged out of their account on the device they should be automatically logged in and presented with the home screen.

Justification

- This functionality will increase user satisfaction, as it will remove the need for users to do successive logins upon closing the app if they did not logout of the system.

7. A user must be able to log out of their account.

Acceptance Criteria

- There must be a facility that allows users to easily log out of their account.

Justification

- Users must be provided with the freedom to log into and out of their account, as if they could not log out it would restrict the amount of people that can sign into the app on a particular device.

8. Users must be able to provide and update their profile information.

Acceptance Criteria

- There should be a profile tab on the app that allows users to view their profile data and amend any details if they desire.
- The profile information a user can provide should include the following:
 - First name.
 - Surname.
 - Year of Birth.
 - Gender.
 - Where they live.
 - Occupation.
 - Job Title.
 - Which regions influenced the way they speak Welsh.
 - How much of their communication happens in Welsh.
 - How they would describe their welsh.
 - Where did they develop their welsh language skills.
 - Would they describe themselves as a learner of Welsh.
 - Most recent Welsh Course they participated in.
 - Add to project email list.

Justification

- Profile information will be used by analysts and researchers, along with submitted recordings and their associated information, to provide a richer data source to analyse.

9. Users must be able to record video and audio files.

Acceptance Criteria

- There must be a facility that allows users to choose whether they want to record an audio or video clip.
- There must be consent form displayed before the recording begins to ensure all individuals in the recording agree to the app's terms and conditions.

Justification

- Without this functionality, the users will not be able to record themselves speaking Welsh and therefore giving no purpose to the app.

10. The app must display thumbnails for new video recordings

Acceptance Criteria

- A thumbnail image of a recorded video must be displayed.

Justification

- The thumbnail will provide a visual cue to the users that the recording is a video and not an audio recording.

11. Users must be able to add additional information to a recording.

Acceptance Criteria

- The user must be presented with an option to add the following information to a recording:
 - Topic.
 - Setting.
 - Persons involved.
 - Additional information.

Justification

- The additional information added to recordings will provide a richer data set that will allow linguists and researches to analyse the data more extensively.

12. Users must be able to associate several audio/video recording files with a new recording they wish to save.

Acceptance Criteria

- There must be a mechanism to allow users to associate several audio/video recording files with a new recording they wish to save.

Justification

- This allows users to categorise and organise their recordings so that they can view and access them easily, as well as upload several related files at one time.

13. User must be able to save recordings.

Acceptance Criteria

- The user must be presented with an option to save a recording.
- The user must be able to associate a name with the recording they wish to save.
- Feedback must be displayed to verify the save operation was performed successfully.
- The newly saved recording must be displayed in the users saved recordings list.

Justification

- If the users are not able to view their saved recordings they will not be able to choose which ones they would like to upload to the database.

14. User must be able to play/pause new recordings.

Acceptance Criteria

- There must be a play button available to allow users to listen/watch new recordings.
- There must be a pause button available to allow users to pause new video/audio recordings.

Justification

- Users need to be able to listen/watch the contents of recordings so that they can easily identify which recordings they wish to save.

15. User must be able to delete new recordings.

Acceptance Criteria

- There must be a delete button available to allow users to delete new recordings.

Justification

- Users need to be able to delete new recordings to provide them with complete control over the recordings they wish to save.

16. Users must be able to view all saved audio and video recordings.

Acceptance Criteria

- When a user is logged into their account they should be presented with a list of saved recordings.

Justification

- Without being able to view saved recordings users cannot track or identify what conversations they have already uploaded or want to upload to the corpus.

17. Users must be able to view metadata about saved recordings.

Acceptance Criteria

- When a user selects a saved recording, they should be provided an option that will allow them to view its associated metadata.

Justification

- Without being able to view the metadata about saved recordings it may be difficult for the user to remember the context of the conversations in the recordings, and therefore may not choose to upload them to the corpus.

18. Users must be able to update metadata about saved recordings.

Acceptance Criteria

- When a user views the metadata about the recording they should have the ability to change and save the updates to the data.

Justification

- When a user reviews the metadata for a saved recording they may notice mistakes and should be given the ability to correct them.

19. Users must be able to play/pause saved recordings.

Acceptance Criteria

- There must be a play button available to allow users to listen/watch saved recordings.
- There must be a pause button available to allow users to pause saved video/audio recordings.

Justification

- The users need to be able to hear what was said in saved recordings so that they can easily identify what recordings they wish to upload to the database.

20. Users must be able to upload saved recordings audio/video files and the corresponding metadata.

Acceptance Criteria

- There must be an option to allow a user to upload saved recordings to the database when they have internet connection.

Justification

- Without the ability to upload saved recordings along with additional information about the recording the database would not contain any information and, the app would have no purpose.

21. Users must be able to view details about the app and the CorCenCC project.

Acceptance Criteria

- There must be a tab on the app that contains information about the app and the CorCenCC project.

Justification

- This requirement is necessary to provide context and information about the app so that users can better understand it's purpose.

22. Users must be able to view account details.

Acceptance Criteria

- There should be an account tab where users can change the following details:
 - The language the application is displaying.
 - Registered Email Address.
 - Password.

Justification

- To allow users to view the personal information that is held about them and check whether the data is accurate to abide by the Data Protection Act (GOV, 1998).
- As users' details may change over time and become outdated they must be provided the option to modify their account details accordingly to abide by the Data Protection Act (GOV, 1998).

23. Users must be given the option of changing the language to Welsh or English when signed into their account.

Acceptance Criteria

- When signed into their accounts users must be provided with an option to change language between Welsh and English.

Justification

- This requirement is necessary as the main user groups are likely to be Welsh speakers, so the app needs to consider and cater to their needs.

24. Users must be able to change the password to their account.

Acceptance Criteria

- They should be presented with feedback notifying them that their password was changed successfully.
- They should be logged out of the system.

Justification

- Users may wish to change their password information to avoid malicious attacks against their account that would provide attackers with access to personal and sensitive information held in their profile.

25. Users must be able to change their email address linked to their account.

Acceptance Criteria

- They should be presented with feedback notifying them that the change was successful.
- They should be sent a verification email to the new address.

- They should be logged out of the system.

Justification

- Users' details may change over time and become outdated so they must be provided the option to modify their account details accordingly to abide by the Data Protection Act (GOV, 1998).

26. Users must be able to reset their password if they have forgotten it.

Acceptance Criteria

- They should be presented with feedback notifying them that the change was successful.
- They should be sent an email containing the new temporary password.

Justification

- Users may forget their password so they should be provided with an option to reset it.

27. The app must support all software versions from Android Lollipop 5.1 API (API v22) onwards.

Acceptance Criteria

- All features and functions used in the apps development must be supported by at least the Lollipop 5.1 Android software.

Justification

- There are many different Android devices that run many different Android software versions and for this project it has been agreed with the supervisory and CorCenCC team that the app must support the software version stated in this requirement and onwards.

Non-functional Requirements

Non-functional requirements can be defined as imposing “constraints on the design or implementation (such as performance requirements, quality standards or design constraints)” (Stellman, 2005). It is important that the project meets the following non-functional requirements as they describe how the app should function:

1. Usability

Acceptance Criteria

- A user should be able to become familiar with all the app's functions after 5 minutes of use without training or help.
- The user interface should adhere to Nielson's heuristics but, also maintain a consistent theme with the IOS app's user interface and use appropriate Android features.

Justification

- The app's user interface must be easy to navigate and intuitive to use to enhance user experience but, also follow a similar theme to the IOS app to create a professional look across different operating systems (IOS & Android).

2. Performance

Acceptance Criteria

- The app should load on average within 10 seconds.

Justification

- Reliable performance is key to a mobile apps success as less time is spent waiting and avoids frustrating users.

3. Reliability

Acceptance Criteria

- The app should handle exceptions and unexpected input elegantly without crashing or impacting user experience and provide informative feedback.

Justification

- An excellent user experience is key to the success of an app, so it needs to ensure unexpected input does not cause exceptions to be thrown and negatively affect its normal operation.

Risk Analysis

It is important to conduct risk analysis so that potential threats that may hinder project progress can be identified before work on the app begins. These identified risks can then be monitored and addressed by well thought-out contingency plans if they arise.

Risk Analysis Table

	Low Impact	Medium Impact	High Impact
Low Risk	Changeability.	Incorrect expectations. Design Flaws.	Application getting denied. Absence.
Medium Risk		Planning.	Complexity. Requisite skill-set.
High Risk		Unrealistic Deadlines.	

I will utilise soft and hard deadlines throughout the project to ensure that deliverables are completed before the hard deadlines set out in the work plan to act as contingency plans for some project risks identified in the risk analysis table above.

1. Application getting denied from Google Play Store.

Steps to prevent.

Research into development guidelines for Android apps and develop adhering to the specifications.

Contingency Plan.

Utilise soft deadlines and beta release for app.

2. Unrealistic Deadlines.

Steps to prevent.

Implement soft deadlines for deliverables and use detailed task decomposition so that the workload can be more easily analysed and quantified.

Contingency Plan.

Reallocate resources and focus on major project requirements and deliverables that are falling behind and monitor progress.

3. Planning.

Steps to prevent.

Identify individual strengths and weaknesses and allocate more time to tasks that involve weak skills. Conduct research into the work involved into developing Android apps to provide a better understanding of the tasks that are required and result in accurate estimates for planning

Contingency Plan.

Dedicate extra hours to areas that involve weak skills and conduct thorough research into these weak areas.

4. Absence.

Steps to Prevent.

Monitor absence in relation to project progress and identify important project requirements.

Contingency Plan.

Reorganise tasks to prioritise delivering the major project requirements and dedicate extra hours to negate hours lost with absence.

5. Complexity

Steps to prevent.

Conduct thorough research into IOS app functionality and follow tutorials on developing Android apps using Android Development Studio to gain a greater understanding of the work that needs to be completed.

Contingency Plan.

Allocate more time into researching the development of Android apps and seek advice from supervisory team to refine the scope of the project.

6. Requisite Skill-set

Steps to prevent.

Spend sufficient time developing Android mobile app programming skill-set through completing online tutorials and research.

Contingency Plan.

Communicate with supervisory team effectively and relay any concerns so that the project scope can be adjusted accordingly to ensure critical functionality is implemented.

7. Incorrect expectations

Steps to Prevent.

Clearly define functional and non-functional requirements along with suitable deliverables to ensure that the app meets client expectations.

Contingency Plan.

Communicate frequently, clearly and effectively with supervisory team either via email or a meeting to prevent miscommunication of ideas and solve issues quickly.

8. Design Flaws

Steps to prevent.

Develop the app using a user centred design approach by thorough user and exploratory testing throughout the apps development, starting with the initial wireframes of the user interface. Also, perform a usability study to gain feedback on the user interface and identify any flaws.

Contingency Plan.

Utilise soft deadlines and arrange more rounds of user testing to test the usability of different features that implement the same functionality.

9. Changeability

Steps to Prevent.

As the functionality of the IOS app has already been identified the requirements for the Android app will be unlikely to change, but constant feedback and communication with supervisory team will help communicate these changes quickly.

Contingency Plan.

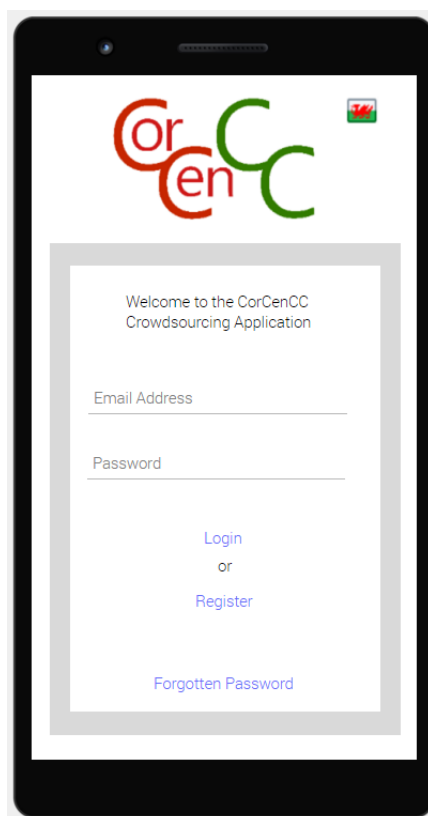
Dedicate extra hours to implement a change in functionality or design.

Wireframe Designs of Android App

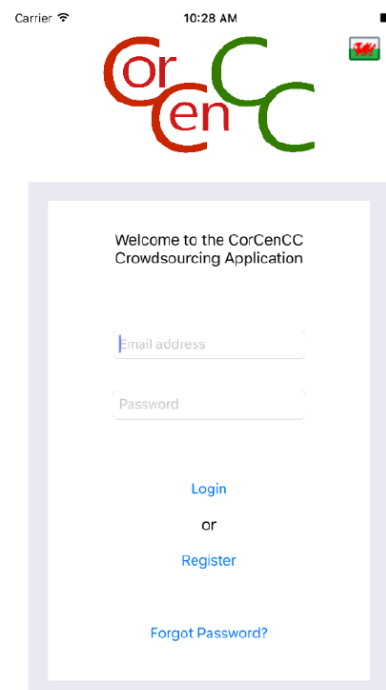
All android wireframes were developed using the free tool Justinmind Prototyper ver 7.6.0 to lower the development costs of the project. The IOS screenshots were provided by Dr Steve Neale research associate for CorCenCC - National Corpus of Contemporary Welsh.

Due to the limiting factors of this project such as time and experience, it was agreed with the supervisory and CorCenCC team that the Android app's user interface should match that of the IOS app as closely as possible, but use Android specific controls and icons where appropriate. This is to ensure a consistent environment and user interface (UI) is maintained across different operating systems (IOS & Android), whilst also incorporating platform specific features.

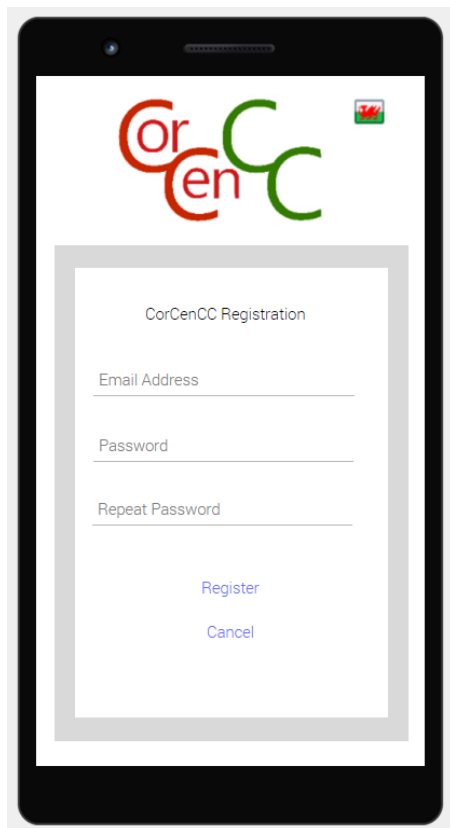
1A. Android - Login Screen



1a. IOS - Login Screen

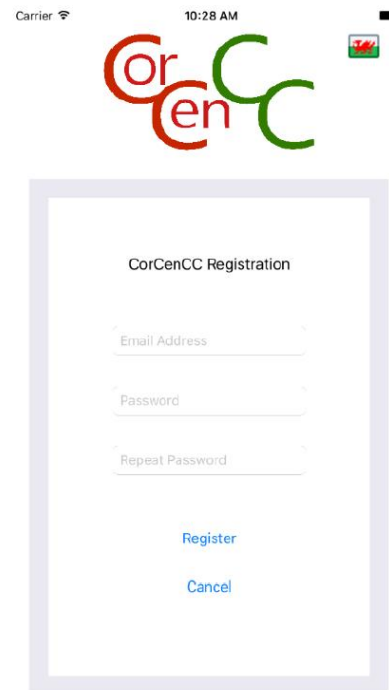


2A. Android - Registration Screen



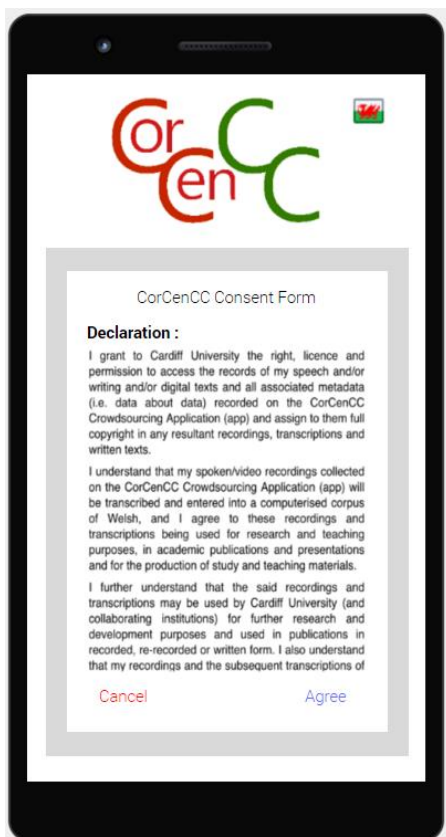
The Android registration screen features the CorCenCC logo at the top, which includes a Welsh flag icon. Below the logo, the title "CorCenCC Registration" is centered. The form contains three input fields: "Email Address", "Password", and "Repeat Password". At the bottom, there are two buttons: "Register" in blue and "Cancel" in blue.

2a. IOS - Registration Screen



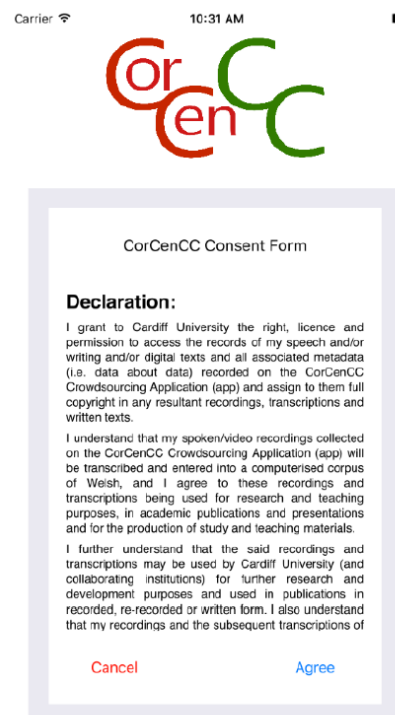
The IOS registration screen displays the CorCenCC logo at the top, including a Welsh flag icon. The title "CorCenCC Registration" is centered. The form has three input fields: "Email Address", "Password", and "Repeat Password". At the bottom, there are two buttons: "Register" in blue and "Cancel" in blue.

2B. Android - Declaration



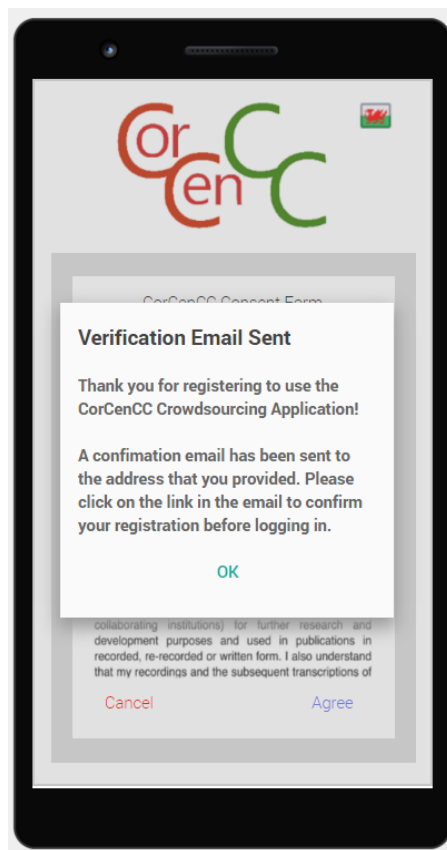
The Android declaration screen shows the CorCenCC logo at the top, including a Welsh flag icon. The title "CorCenCC Consent Form" is centered. Below the title, the section "Declaration:" is followed by a paragraph of text. The text states: "I grant to Cardiff University the right, licence and permission to access the records of my speech and/or writing and/or digital texts and all associated metadata (i.e. data about data) recorded on the CorCenCC Crowdsourcing Application (app) and assign to them full copyright in any resultant recordings, transcriptions and written texts." It then continues: "I understand that my spoken/video recordings collected on the CorCenCC Crowdsourcing Application (app) will be transcribed and entered into a computerised corpus of Welsh, and I agree to these recordings and transcriptions being used for research and teaching purposes, in academic publications and presentations and for the production of study and teaching materials." Finally, it states: "I further understand that the said recordings and transcriptions may be used by Cardiff University (and collaborating institutions) for further research and development purposes and used in publications in recorded, re-recorded or written form. I also understand that my recordings and the subsequent transcriptions of". At the bottom, there are two buttons: "Cancel" in red and "Agree" in blue.

2b. IOS - Declaration

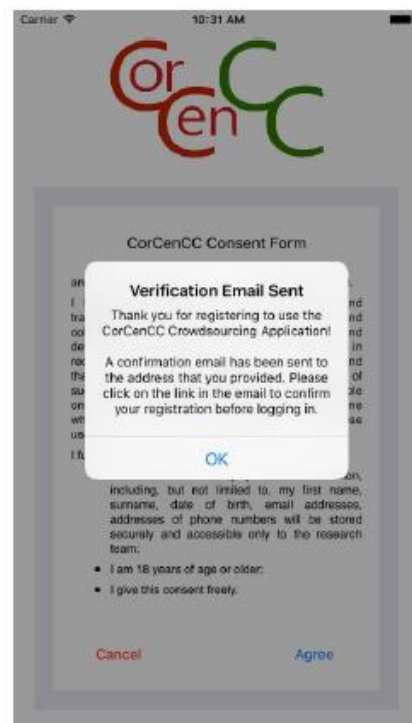


The IOS declaration screen displays the CorCenCC logo at the top, including a Welsh flag icon. The title "CorCenCC Consent Form" is centered. Below the title, the section "Declaration:" is followed by a paragraph of text. The text states: "I grant to Cardiff University the right, licence and permission to access the records of my speech and/or writing and/or digital texts and all associated metadata (i.e. data about data) recorded on the CorCenCC Crowdsourcing Application (app) and assign to them full copyright in any resultant recordings, transcriptions and written texts." It then continues: "I understand that my spoken/video recordings collected on the CorCenCC Crowdsourcing Application (app) will be transcribed and entered into a computerised corpus of Welsh, and I agree to these recordings and transcriptions being used for research and teaching purposes, in academic publications and presentations and for the production of study and teaching materials." Finally, it states: "I further understand that the said recordings and transcriptions may be used by Cardiff University (and collaborating institutions) for further research and development purposes and used in publications in recorded, re-recorded or written form. I also understand that my recordings and the subsequent transcriptions of". At the bottom, there are two buttons: "Cancel" in red and "Agree" in blue.

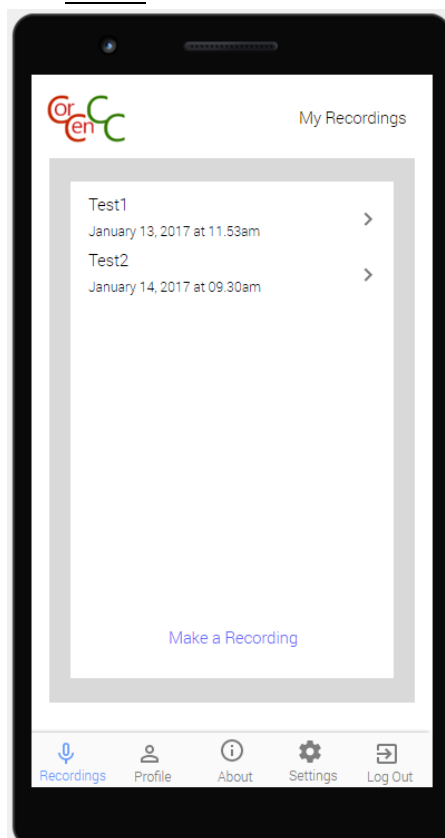
2C. Android - Declaration Confirmation



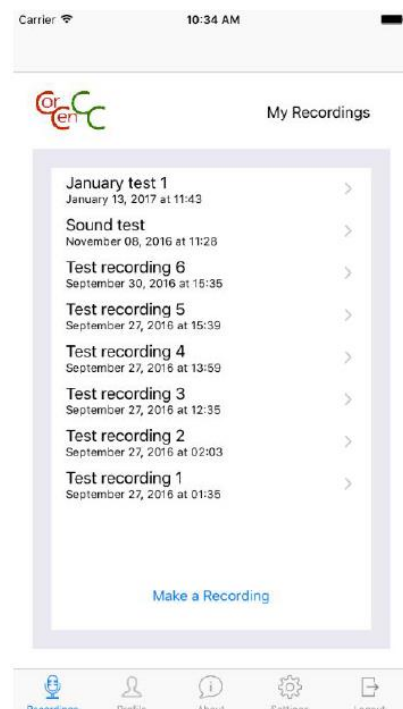
2c. IOS - Declaration Confirmation



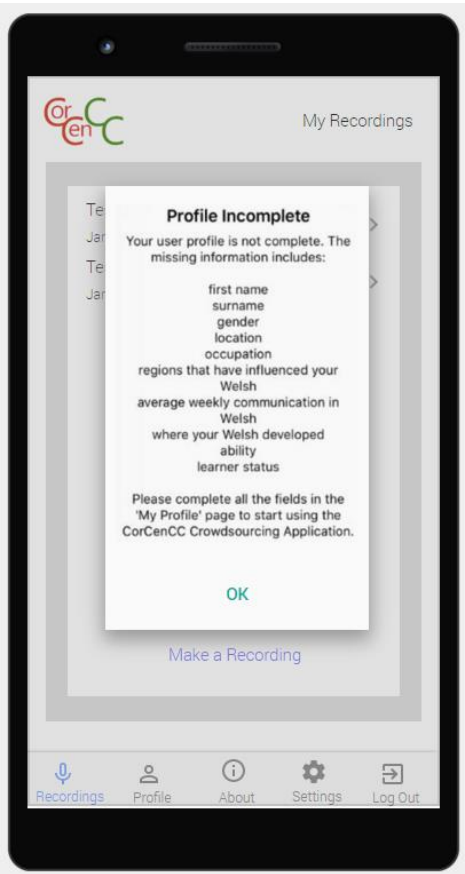
3A. Android - My Recordings Screen



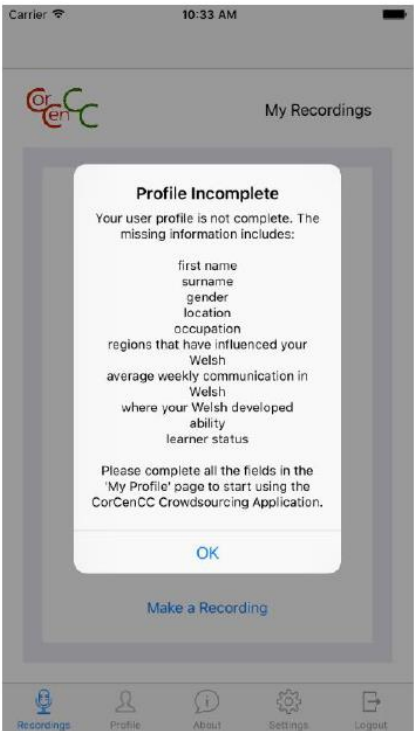
3a. IOS - My Recordings Screen



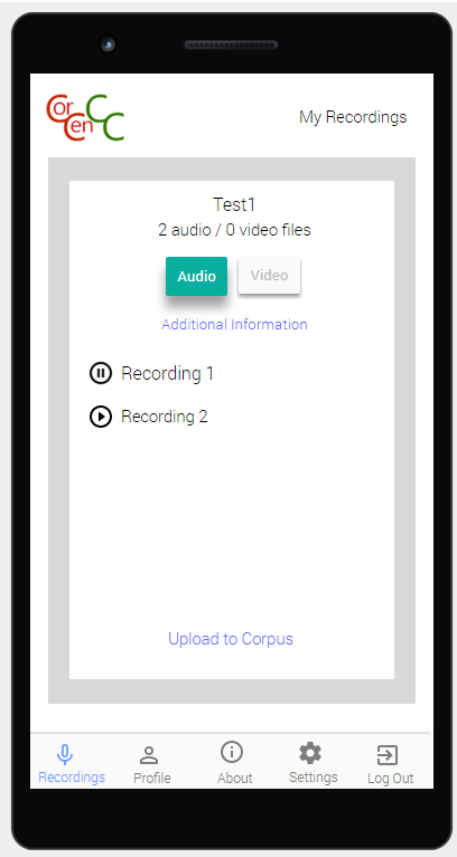
3B. Android - My Recordings
Profile Incomplete



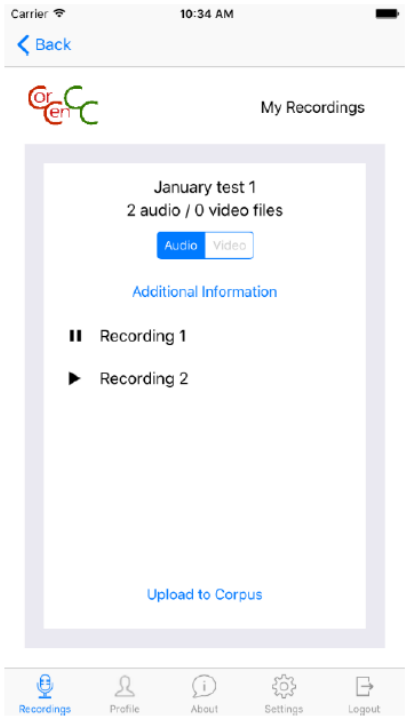
3b. IOS - My Recordings
Profile Incomplete



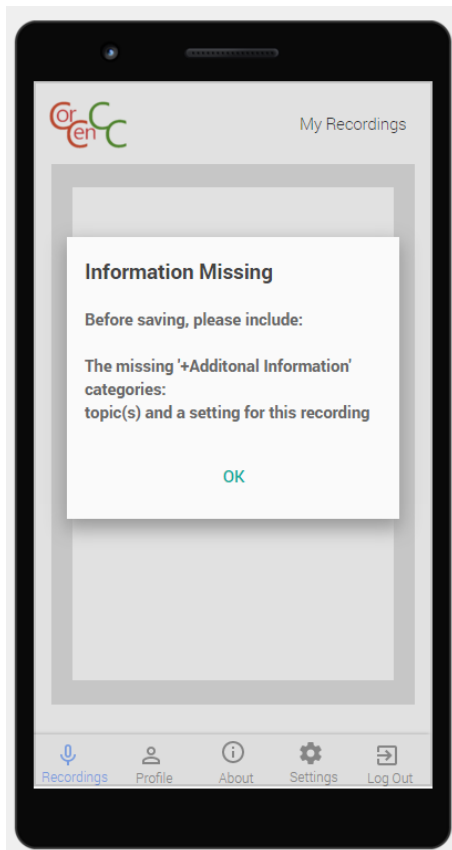
3C. Android - Recording



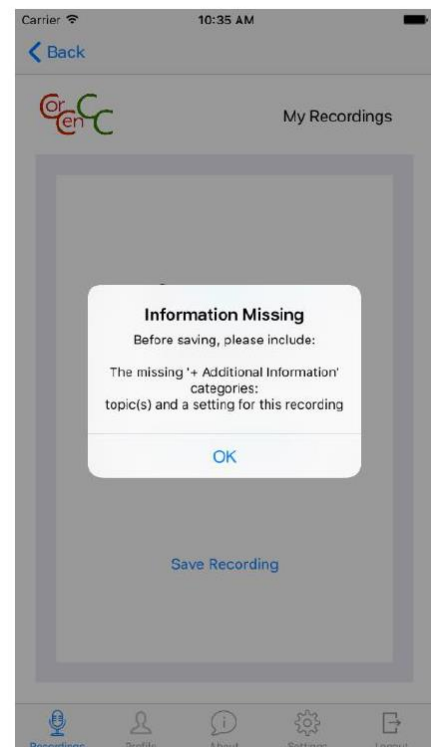
3c. IOS - Recording



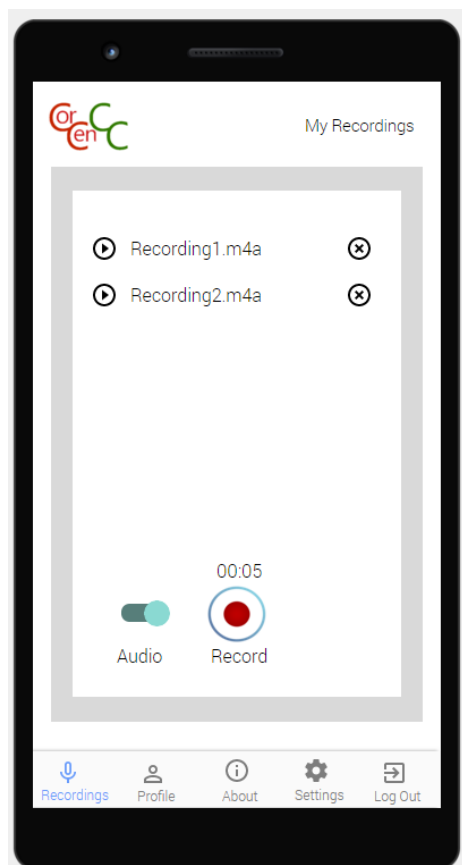
3D. Android - Add Recording Missing Information



3d. IOS - Add Recording Missing Information



3E. Android - Add Recording



3e. IOS - Add Recording



3F. Android - Additional Recording Information

Carrier 10:35 AM

Or en CC My Recordings

Topic of recording (enter one or more tags, separated by commas)

Type something

Setting of recording (e.g. in a cafe, at the pub etc.)

Type something

Who was involved? (tick all that apply)

Family

Family member(s)

Colleague(s)

Recordings Profile About Settings Log Out

3f IOS - Additional Recording Information

Carrier 10:35 AM

Or en CC My Recordings

Topic of recording (enter one or more tags, separated by commas)

Setting of recording (e.g. in a cafe, at the pub etc.)

Who was involved? (tick all that apply)

Friends

Family member(s)

Colleague(s)

Recordings Profile About Settings Logout

3G Android – Saved Recording Feedback

Carrier 10:36 AM

Or en CC My Recordings

Your recording has been saved

100.0%

Done

Recordings Profile About Settings Log Out

3g. IOS – Saved Recording Feedback

Carrier 10:36 AM

Or en CC My Recordings

Your recording has been saved

100.0%

Done

Recordings Profile About Settings Logout

4A. Android - My Profile Screen

My Profile

First Name
Corey

Surname
Watson

Year of Birth
1969
1970
1971

Recordings Profile About Settings Log Out

4a. IOS - My Profile Screen

My Profile

First name
Steve

Surname
Neale

Year of birth
1981
1982
1983
1984
1985
1986
1987
1988
1989

Recordings Profile About Settings Logout

4B. Android My Profile Save Screen

My Profile

Yes ☒
No ☐

If you have ticked 'Yes', please state the level of your most recent Welsh course:

The first level

If you would like us to add you to the project email list, to keep you updated on CorCenCC news and developments, please click here:

☒

Save Profile

Recordings Profile About Settings Log Out

4b. IOS My Profile Save Screen

My Profile

Yes ☒
No ☐

If you have ticked 'Yes', please state the level of your most recent Welsh course:

The first level

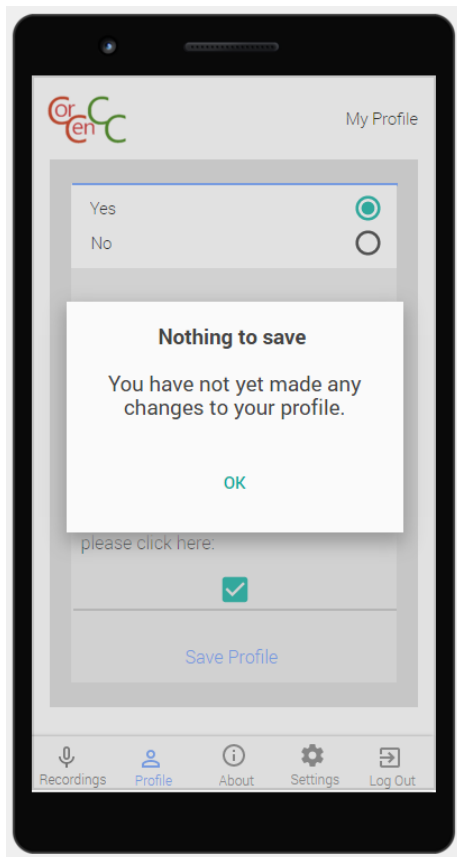
If you would like us to add you to the project email list, to keep you updated on CorCenCC news and developments, please click here:

☐

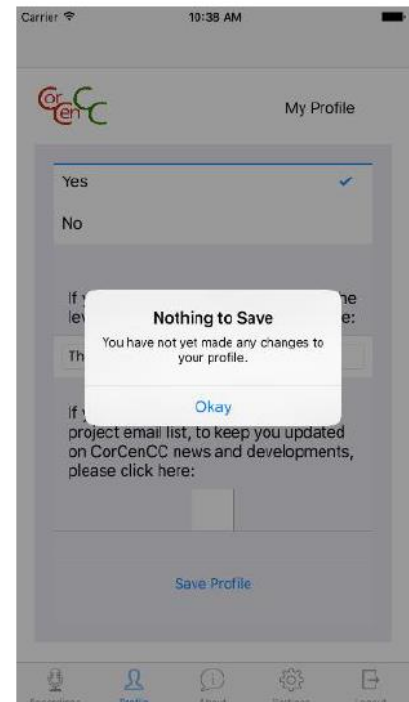
Save Profile

Recordings Profile About Settings Logout

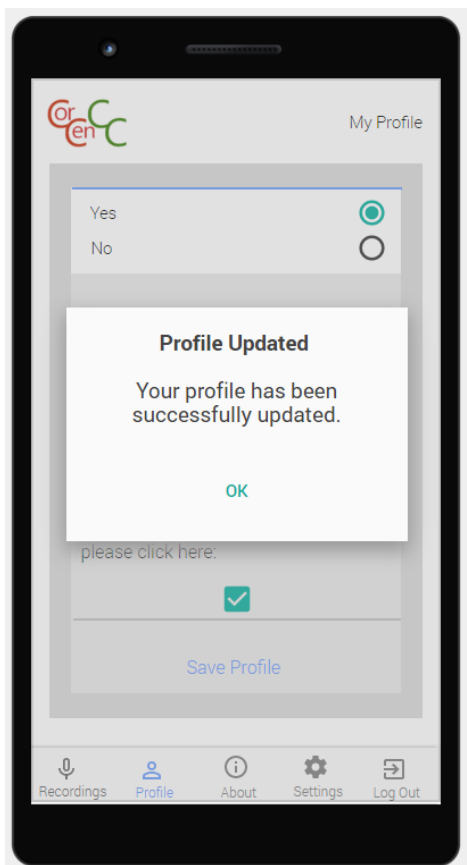
4C Android – Profile Nothing to save



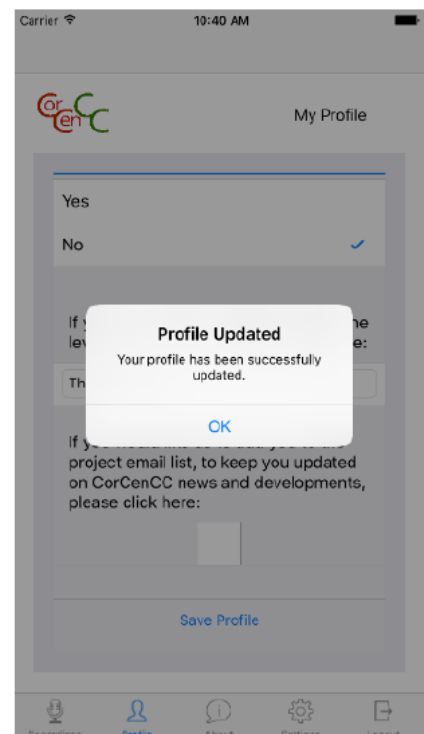
4c. IOS – Profile Nothing to save



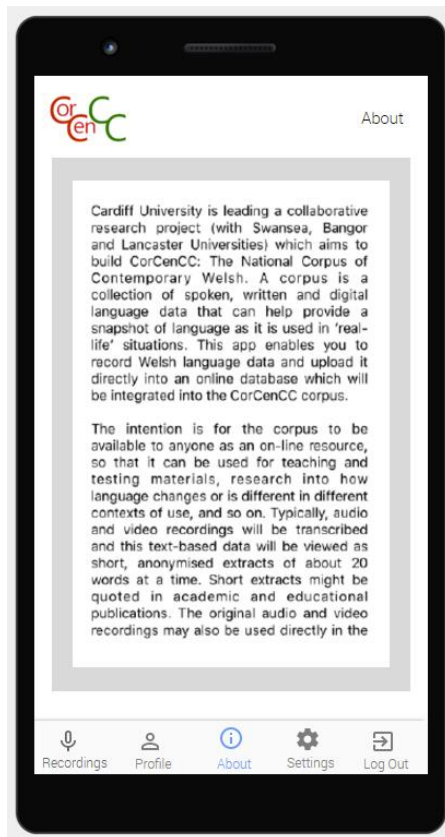
4D. Android – Profile Updated



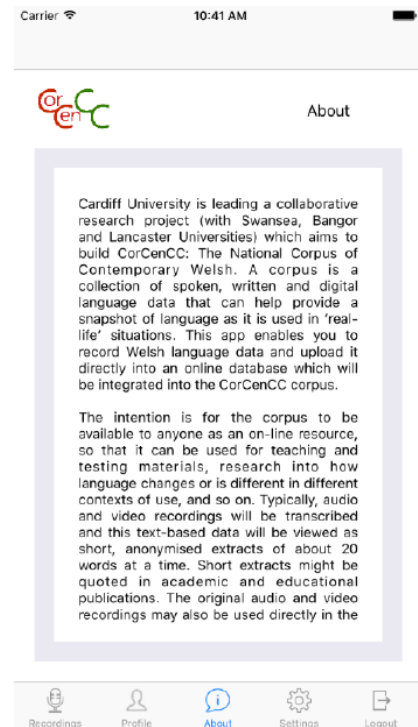
4d. IOS – Profile Updated



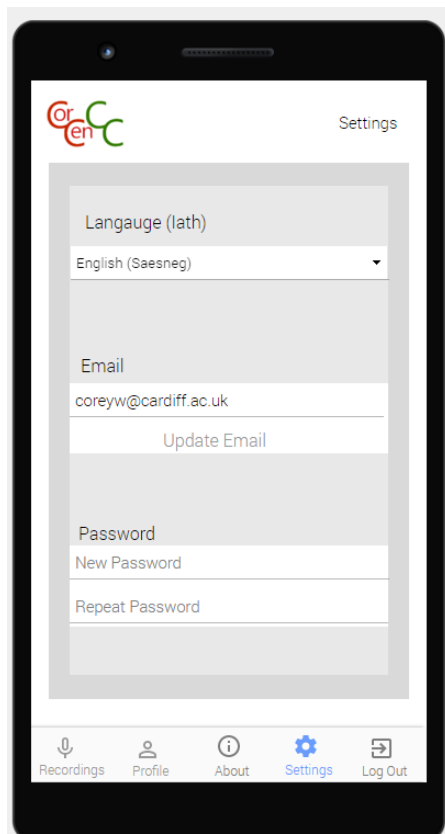
5A. Android About Screen



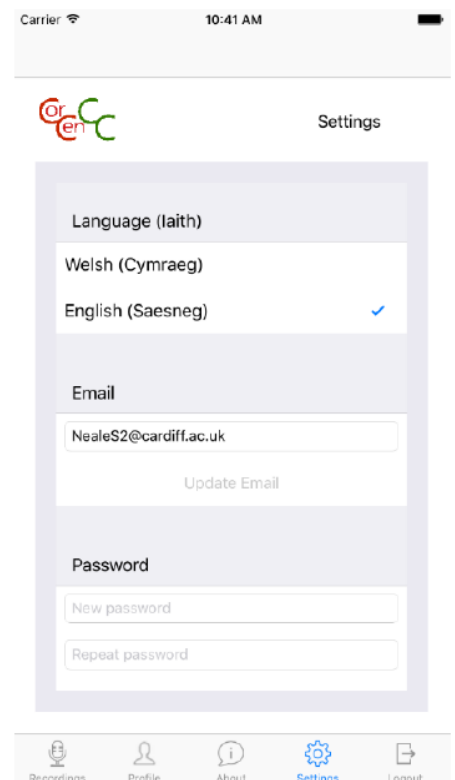
5a. IOS About Screen



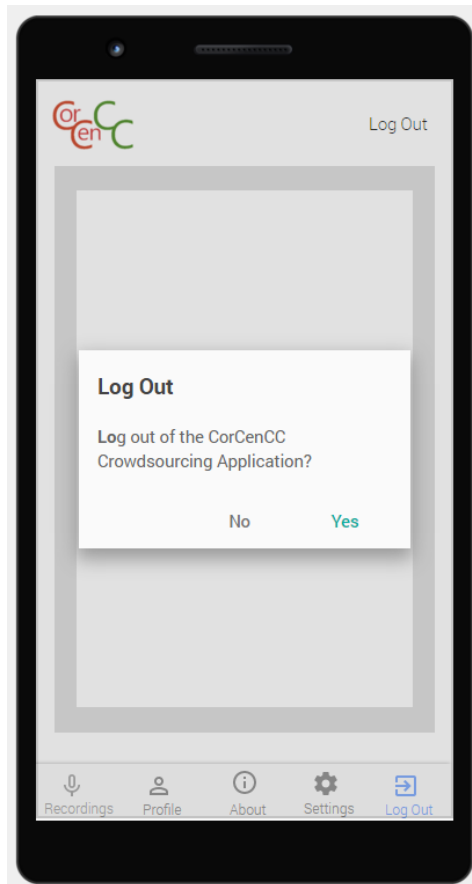
6A. Android Settings



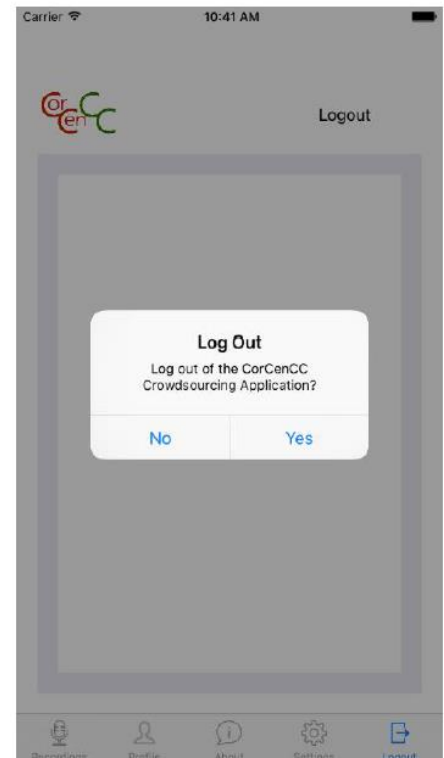
6a. IOS Settings Page



7A. Android Log Out



7a. IOS Log Out Screen



Evaluation of Wireframe Designs

Comparison of Android Wireframes against IOS User Interface.

Intuitive navigation plays a significant role in the usability of a mobile app as users will not have the time or patience to spend a long time searching for the right section of the app. For this reason, it is important to make the navigation tab prominent and visible for the Android app.

The major difference between the Android and IOS interface is the inclusion of a back button. The official Android developers web page states “All Android devices provide a *Back* button for this type of navigation, so your app should not add a Back button to the UI.” (Android, 2016a).

Another reoccurring difference between the IOS and Android user interfaces is the design and appearance of fundamental controls such as buttons and pop-up windows. These differences are a result of how the underlying framework renders controls and is a desired effect to be consistent with the underlying operating system.

This difference is made evident in the screen shot 7A where there is a notable difference in the Android and IOS pop-up windows. As seen in screen shots 6A, 4A and 3.d the editable text field appearances also differ for the same reason. The scrollable list used for year of birth in the profile tab (screen 4A) are also displayed differently by the operating systems.

The official icons for the IOS platform usually cost but, free icons were implemented instead for the IOS app to lower the costs. Although free icons were used for IOS it has been decided that as all official

Android material design icons are free and come as a set of scalable images, which can be downloaded from <https://github.com/google/material-design-icons/>, they will be used instead. There are two sets of icons available, one set for a dark theme and the other for a light theme. The light theme icons were used as the user interface of the IOS app is predominantly light coloured composed of a mix of white and light greys.

Evaluation of User Interface using Nielsen's Usability Heuristics

To evaluate and identify usability problems with UI's a heuristic evaluation is normally performed by examining the UI against a set of heuristics. Nielsen's heuristic's is arguably the most commonly used usability principles in the human-computer interaction field and will be used to evaluate the UI of the Crowdsourcing application. The principles were obtained from Nielsen's book *Usability Engineering* and are all listed below (Nielsen,1994):

1. Visibility of system status

Definition

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Evaluation

The screenshots in the [wireframe](#) section illustrate that the app's UI adheres to this principle, since feedback is given to the user every time an operation is performed to notify them of the system status. This is illustrated in screen shot 2c where a message is displayed to notify the user that a verification email has been sent. Screen shot 3f shows how the app will notify the user that the recording is in process by displaying a recording time and changing the appearance of the record button. Once a user saves a recording a message is displayed to inform the user that it has been saved successfully as shown in screen shot 3h. Another example of how the UI meets this heuristic principle can be seen in screen shot 4d as a notification is displayed once a user updates their profile information.

2. Match between system and the real world

Definition

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

Evaluation

Throughout the application familiar icons and intuitively designed controls are used to help users understand affordances and how to interact with components of the app. The navigation toolbar makes use of cultural traditions in its icons to allow users to easily identify where they can access features of the app.

It can be seen in the screen shots a microphone is the icon used to represent the recordings and implicitly indicates that this tab contains functionality to allow users to record conversations. The outline of person is displayed as the icon on the profile tab, which again provides an affordance that allows users to use knowledge from their cultural norms and identify that profile and account

information will be stored in that tab. The circular information icon is commonly used in the society to indicate useful information and, is displayed on the tab containing information about the app. The settings wheel icon is used to depict the settings page of the app and, is often used in both computer applications and mobile applications for the same purpose.

In addition to these familiar icons the selected tab is also rendered in a light blue state, providing a visual cue to the user to help them identify what tab they are in.

3. User control and freedom

Definition

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

Evaluation

In the IOS app it can be seen from several of the screenshots including 3.g and 3.f that there is an inbuilt back button into the application which obeys this principle as it allows users to immediately leave an unwanted state. In the corresponding Android screenshot's, the app does not include this back button. This is because all Android phones have an inbuilt back button and it is considered bad practice to also include this functionality in the app itself (Android, 2016a). Due to functionality of this inbuilt back button the Android app implicitly adheres to this usability principle.

User's freedom is provided in the app as users can navigate to the main screens via the tab control which is constantly available. Users can skip forward questions by scrolling the profile screen and can answer questions in any particular order, providing them with freedom when filling out their details.

However, neither of the app's interface include 'redo' functionality as there is no real need for it. Most of the user interaction is direct input via keyboard typing and the simple user interface can be navigated with one touch.

4. Consistency and standards

Definition

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Evaluation

As can be seen in the UI screenshots the same colours are used throughout the app's screens (white, dark grey and light grey) to provide a consistent and familiar interface to not only the app itself but, also across the Android and IOS platforms. Actionable text is always highlighted in a light blue colour, as seen in screenshots 3d, 3h and 4b. The same controls are used for data entry as well as the same pop up displays that relay valuable information to the users. The use of these consistent features provides the user with a familiar feel for the app and allows them to easily recognise and use features, as well as providing a professional and aesthetically pleasing interface.

5. Error prevention

Definition

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

Evaluation

Throughout the application, relevant error prevention messages are presented to the user to stop them from committing an erroneous action. This made evident in the screen shot 3e, when the user tries to save a recording without additional information a message is displayed to inform user of the incomplete fields and prevents them from progressing further.

However, the system lacks design implemented error prevention and relies fully on messages to prevent erroneous actions from being committed. Integrating design prevention methods such as greying out actionable text when all fields are not complete would create a better user experience and reduce the number of interrupts caused by message notifications. Other potential design improvements can be found in the [Suggested Improvements](#) section.

6. Recognition rather than recall

Definition

Minimise the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

Evaluation

The app's consistent intuitive interface allows users to easily identify and recognise actionable items and interactions rather than recalling them from memory. Using the light blue font throughout the application, as seen in screenshots 3a, 3c and 3d, to indicate to the user that a piece of text or control is actionable infers the recognition process. Another example of how the interface promotes recognition rather than recall is the way intentional white space is coupled with consistent appearance of the same data entry controls along with an attached description label as seen in screen shots 6 and 3g. Using these features, it allows the users to easily recognise where input is required. The use of the blue highlight on the selected tab also provides a visual aid to the user to indicate their location in the application and instinctively allows them to recognise how to navigate the application. It can be seen how these features promote the learnability of the app as the time it takes for a user to learn or relearn its functions is reduced.

7. Flexibility and efficiency of use

Definition

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Evaluation

As the app has a relatively small amount of functionality that can be easily navigated to through 1-2 screens there isn't a large need to cater to both experienced and inexperienced users. Since implementing features such as shortcuts and searches would not improve efficiency of use for experienced users due to small number of screens and quick navigation the app incorporates.

8. Aesthetic and minimalist design

Definition

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Evaluation

It can be seen from the screenshots that a minimalistic design is employed as only information essential to decision making is displayed on screen, which reduces clutter on the interface that may confuse and overwhelm users. All labels that are attached to data entry fields are brief and descriptive to inform the users of their purpose. Using distinctive icons that stand out from the background means that no excessive detail is used and exemplifies the minimalistic design approach. The combination of these features in the user interface for the app results in producing an aesthetically pleasing interface that only provides relevant information to the user at the point of need.

9. Help users recognise, diagnose, and recover from errors

Definition

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Evaluation

The UI of the app adheres to this principle as can be seen in screenshot 3b and 3e where descriptive solutions to errors are explained in plain language and not in codes. In screen shot 3b the error message displays all the necessary fields that the user needs to complete to progress further, which allows users to easily diagnose the problem. In screen shot 3e the error message displayed informs users of the steps that are necessary to perform a successful save of a recording and allows them to easily recover from their mistake by returning them to the correct screen.

10. Help and documentation

Definition

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Evaluation

As the app only has simple functionality it has been decided that inbuilt supporting help or documentation facilities in the app is not required. However, producing a small user guide may benefit

user experience, as users will be able to refer to this for further information and explanation of the app's facilities.

Suggested Improvements to User Interface

Material design was developed by Google in 2014 and has since been promoted by the Android development platform as being the golden standard of design in Android mobile apps. The main goal of materials design is to “Develop a single underlying system that allows for a unified experience across platforms and device sizes” (Google, 2014a). The main principles are about providing familiar tactile attributes to help users quickly understand affordances (Google, 2014b). Print based design is the underpinning theme of the materials design concept and fundamental elements such as grids, space, scale and colour create a visual guide for users. A hierarchy is shaped from defining a bold graphic interface composed of different surfaces and edges, along with intentional white space to centre user focus, provide meaning to objects and their interactions.

The interface of the app should try to follow the material design guidelines, but a complete redesign of the interface is out of the project scope due to the time constraint and has been agreed with the CorCenCC team as a potential future improvement.

However, a list of several suggested improvements along with a mock interface has been produced below as a result of cross examining the Material Design guidelines with the Android app's user interface:

Fig 1. Original Screen

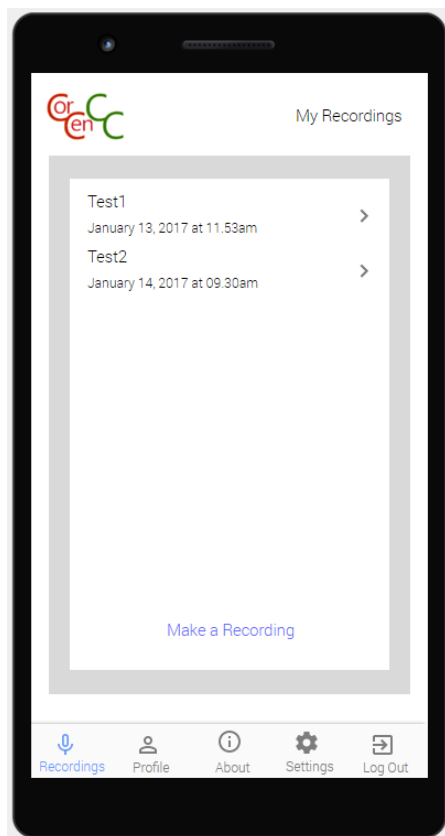


Fig 1A. Suggested Improvement 1

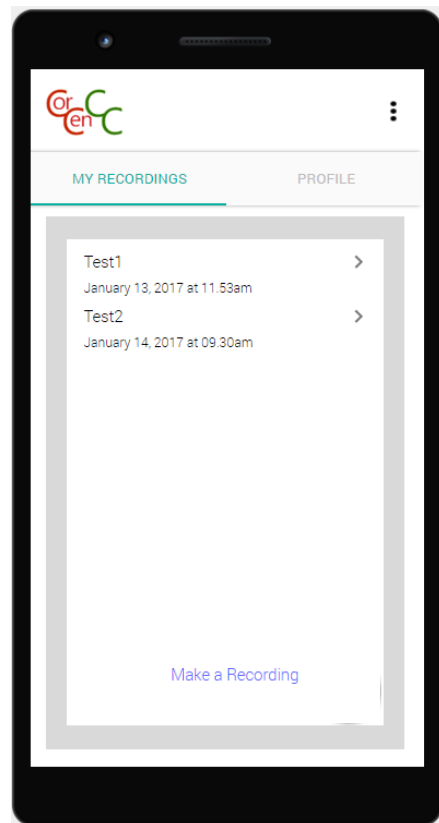
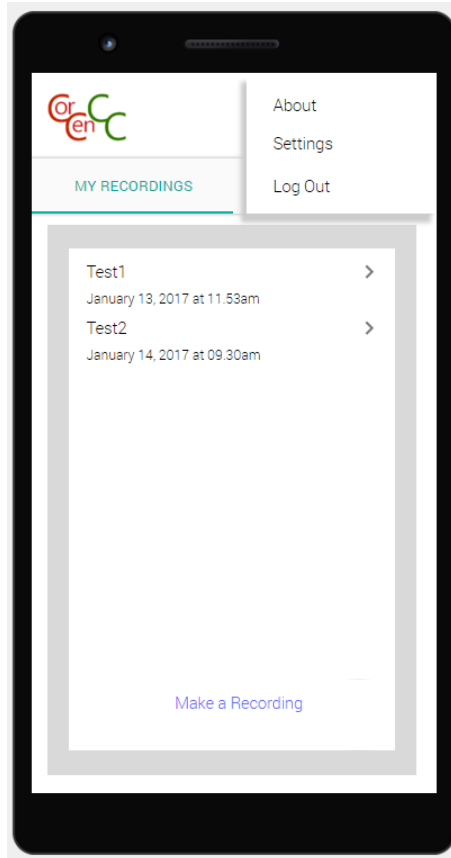


Fig 1B. Suggestion Improvement 1
Menu Open

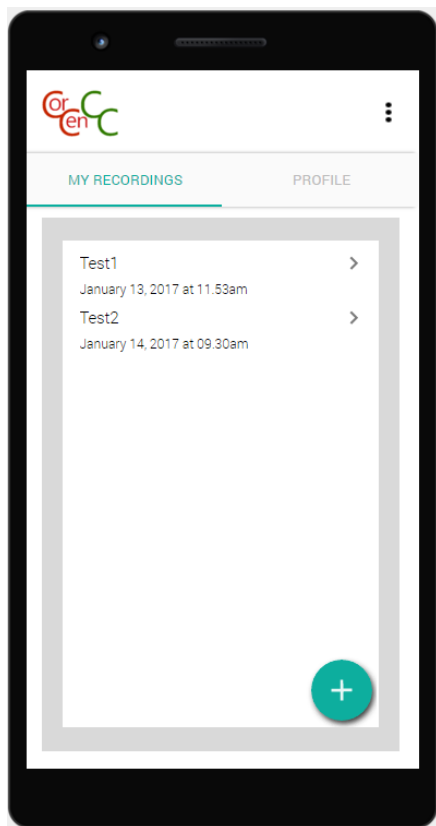


1. Redesign of Tab bar.

The tab control could be redesigned to only include Recordings and Profile information and a vertical drop down menu could then be used to contain links to settings, about and log out pages as shown in the Fig 1. A and B.

This redesign creates a simpler and clearer UI that is easier to navigate by removing less used functions such as settings, about and logging out and making frequently accessed features more available. The less accessed pages are hidden in the vertical menu bar located in the top right part of Fig 1B, which when clicked displays other options and adheres to the Materials Design guidelines by utilising a shadow to shift the users focus to the menu items displayed. This improvement will also better address Nielsen's 8th heuristic principle – aesthetic and minimalistic design, since it can be seen from the screen shots that the UI is less cluttered but still as intuitive to use.

Fig 2. Suggested Improvement 2



2. Replacing 'Make a Recording' text with a floating button.

Creating a floating + button to replace the 'Make a Recording' text would provide a more intuitive feature that would allow users to create new recordings as seen in Fig 1.C and B. The design of the button provides a visual cue that conveys its interactivity through the affordance of the + icon, the bold graphic design and its shadow. Making this improvement will also better address Nielsen's heuristic principles 6 recognition rather than recall, as the users will instinctively know what functionality the button provides and interactivity from its design.

3. Place an asterisk above any mandatory fields.

After evaluating the user interface against Nielsen's heuristic's I identified a flaw in the user interface design, being that mandatory fields are not marked so users are unaware of what fields are required to be filled out in the profile screen. Even though users are presented with an error message to stop them progressing further a better UI design would try to prevent the error from occurring rather than providing notification when it does.

4. Disabling and 'greying' out actionable text functionality until all necessary information has been provided.

Similarly, greying out and disabling actionable text such as 'Save Recordings' in screenshot 3d would prevent errors by stopping users from progressing further before all the required information has been supplied. It would also allow them to instinctively know that they are required to perform further steps before they can save a recording which better addresses [Nielsen's 8th Heuristic](#) principle.

Survey of Suggested Improvements

After consulting with the supervisory and CorCenCC team, it was decided that due to the limiting factors that influence the project, such as the time and developer ability, only the redesign of Tab bar should be implemented as part of this dissertation project.

Before implementing the improvement, it was decided that a small survey should be conducted with a group of 5 individuals to provide user feedback that could be evaluated to help determine whether the change should be applied. The navigation between screens for each interface was explained to users before the survey was conducted.

The questionnaire used can be found under appendix A.

Results

Original Interface - A

Proposed Interface - B

User No	Answer 1	Answer 2	Answer 3	Further comments
1	B	B	B	N/A
2	A	A	A	N/A
3	B	B	B	N/A
4	B	B	B	N/A
5	B	B	B	N/A

Evaluation

As can be seen from the results of the survey the large majority of users choose the improved user interface B over the original interface in all questions. Using the results of the survey along with the justification of its heuristic properties and coherence with Google's material design explained in [suggested improvements](#) section, it has been decided in conjunction with the supervisory team that the proposed interface should be implemented for the Android app as part of this dissertation project.

Design

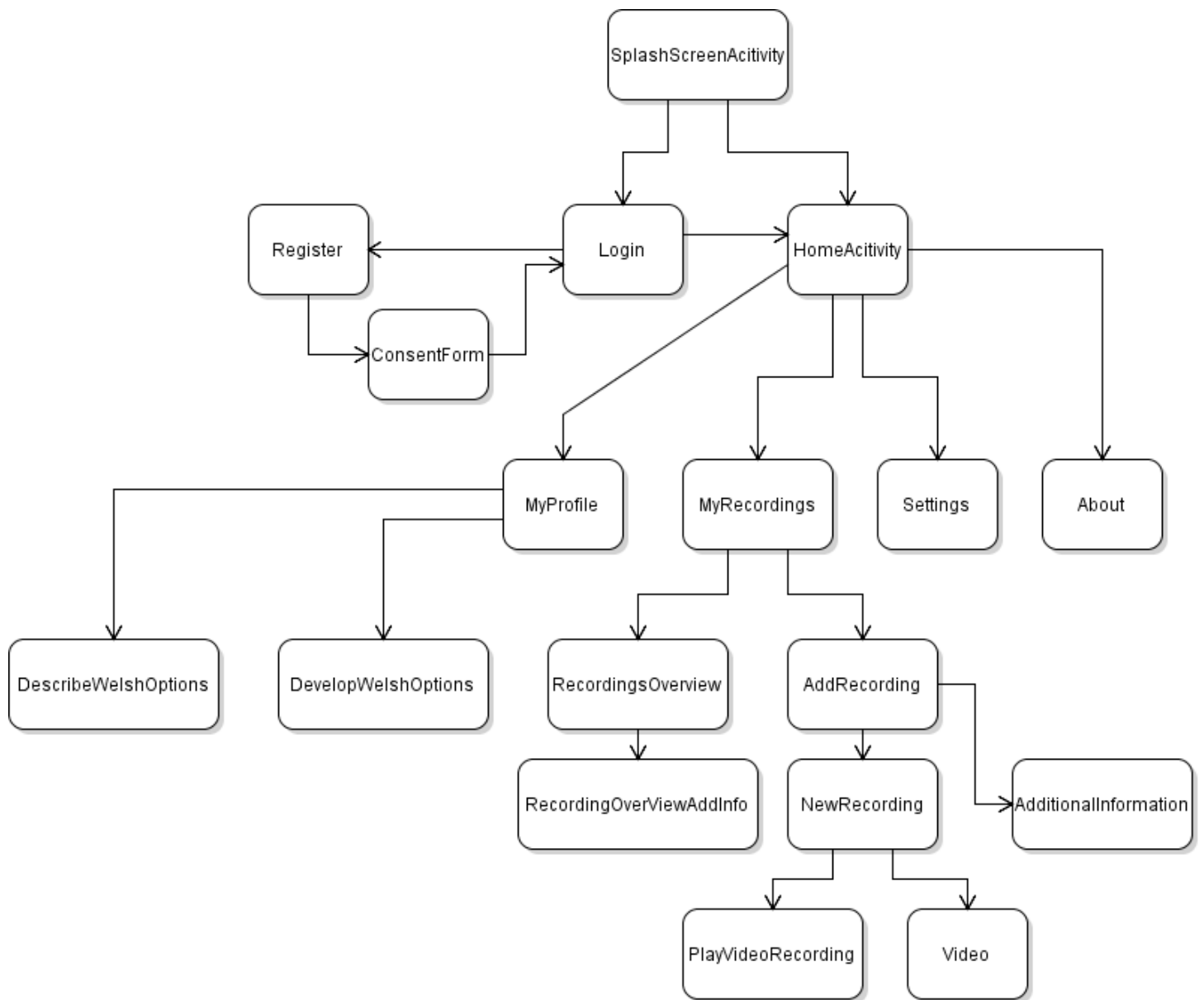
This section of the report describes the design of the Android app, including its user interface and structure.

UML Diagrams

Use Case Diagram

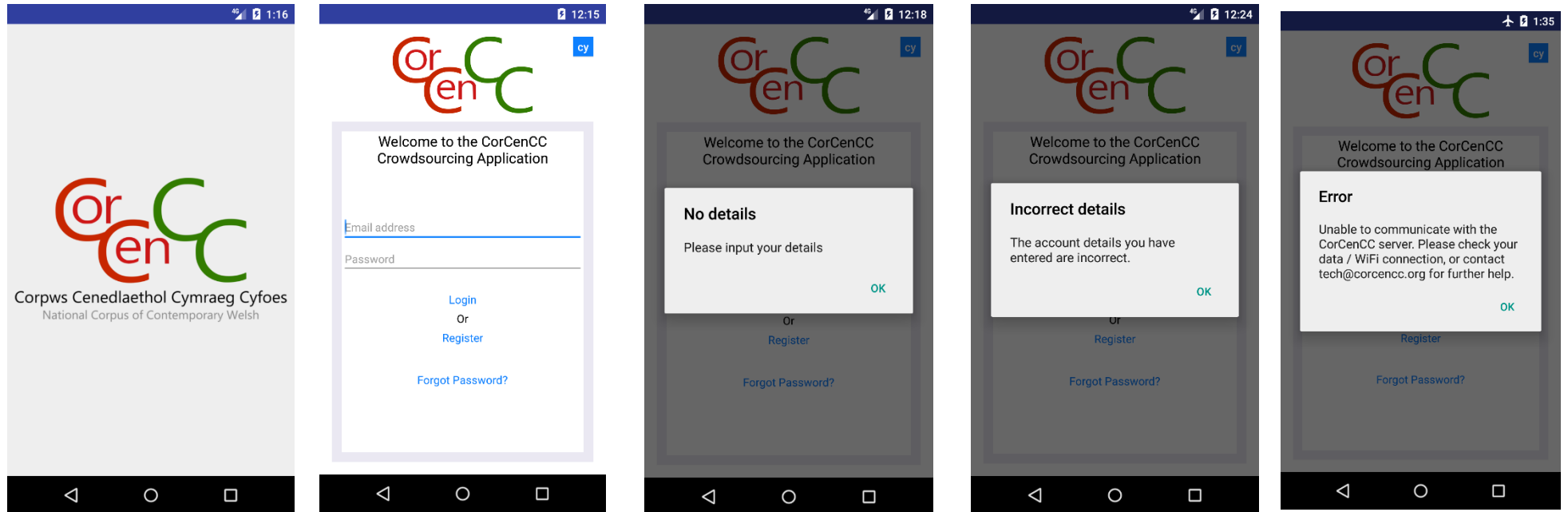


Activity Diagram

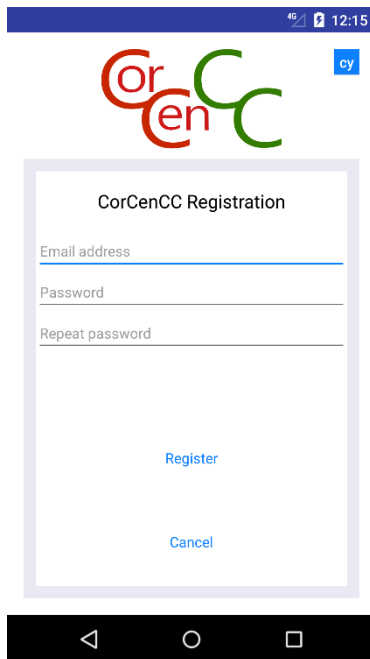


Implemented User Interface Screenshots

Splash screen/ Login/ No details dialog/ Incorrect details dialog/ No internet dialog



Registration/ Consent form/ Verification dialog/ Forgot password dialog



CorCenCC Registration

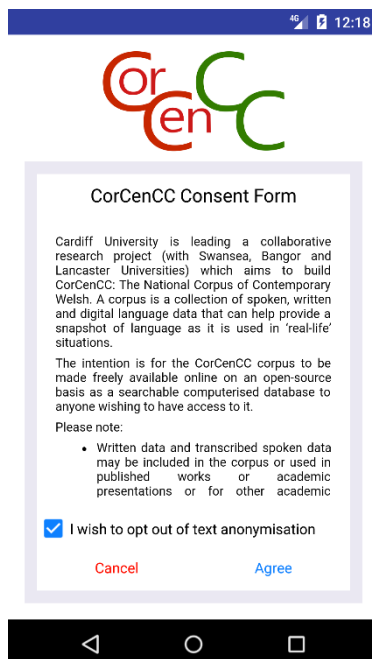
Email address

Password

Repeat password

Register

Cancel



CorCenCC Consent Form

Cardiff University is leading a collaborative research project (with Swansea, Bangor and Lancaster Universities) which aims to build CorCenCC: The National Corpus of Contemporary Welsh. A corpus is a collection of spoken, written and digital language data that can help provide a snapshot of language as it is used in 'real-life' situations.

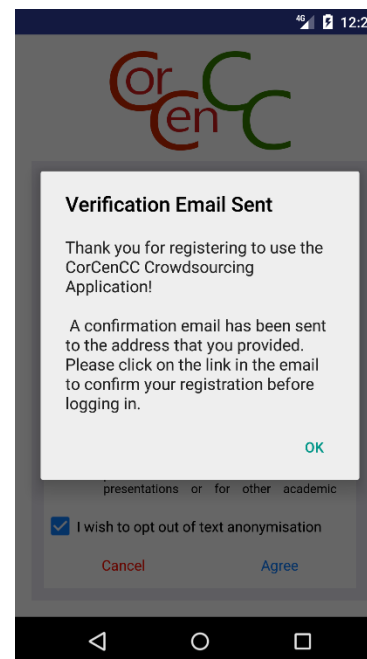
The intention is for the CorCenCC corpus to be made freely available online on an open-source basis as a searchable computerised database to anyone wishing to have access to it.

Please note:

- Written data and transcribed spoken data may be included in the corpus or used in published works or academic presentations or for other academic

☒ I wish to opt out of text anonymisation

Cancel Agree



CorCenCC

Verification Email Sent

Thank you for registering to use the CorCenCC Crowdsourcing Application!

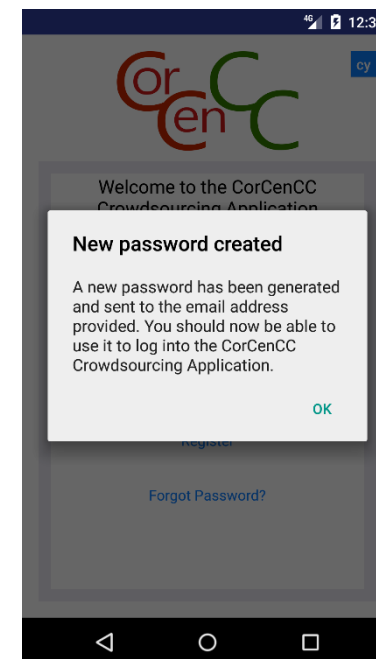
A confirmation email has been sent to the address that you provided. Please click on the link in the email to confirm your registration before logging in.

OK

presentations or for other academic

☒ I wish to opt out of text anonymisation

Cancel Agree



CorCenCC

Welcome to the CorCenCC Crowdsourcing Application

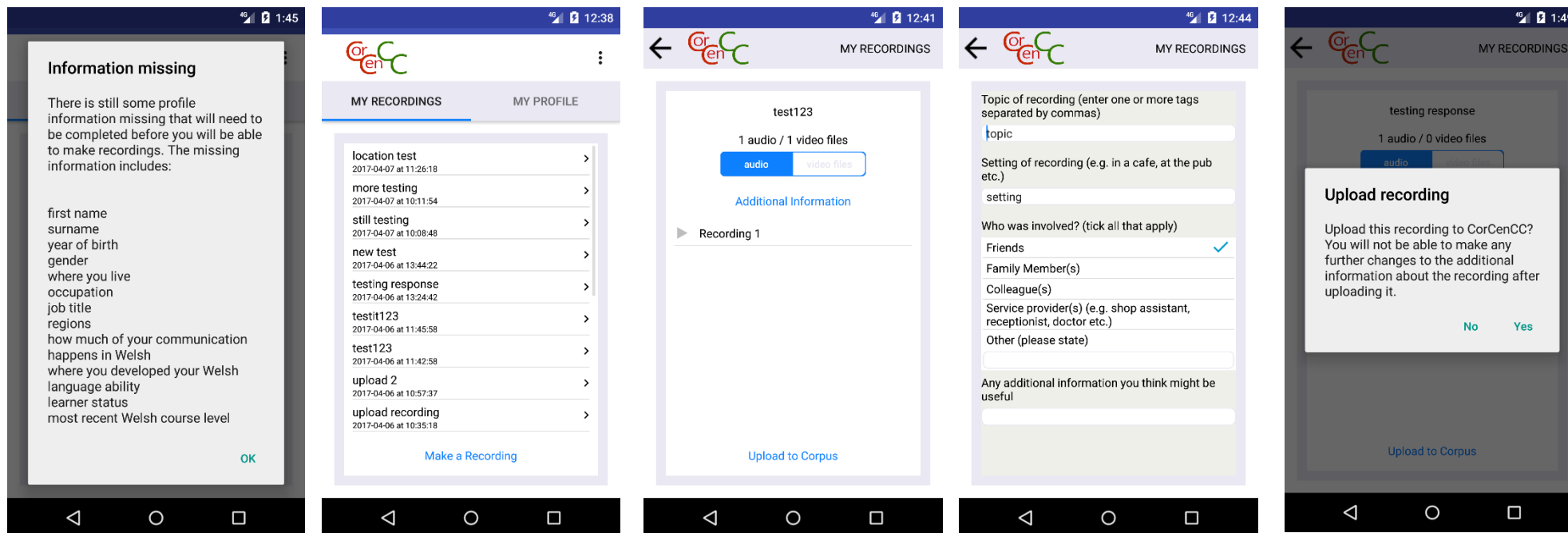
New password created

A new password has been generated and sent to the email address provided. You should now be able to use it to log into the CorCenCC Crowdsourcing Application.

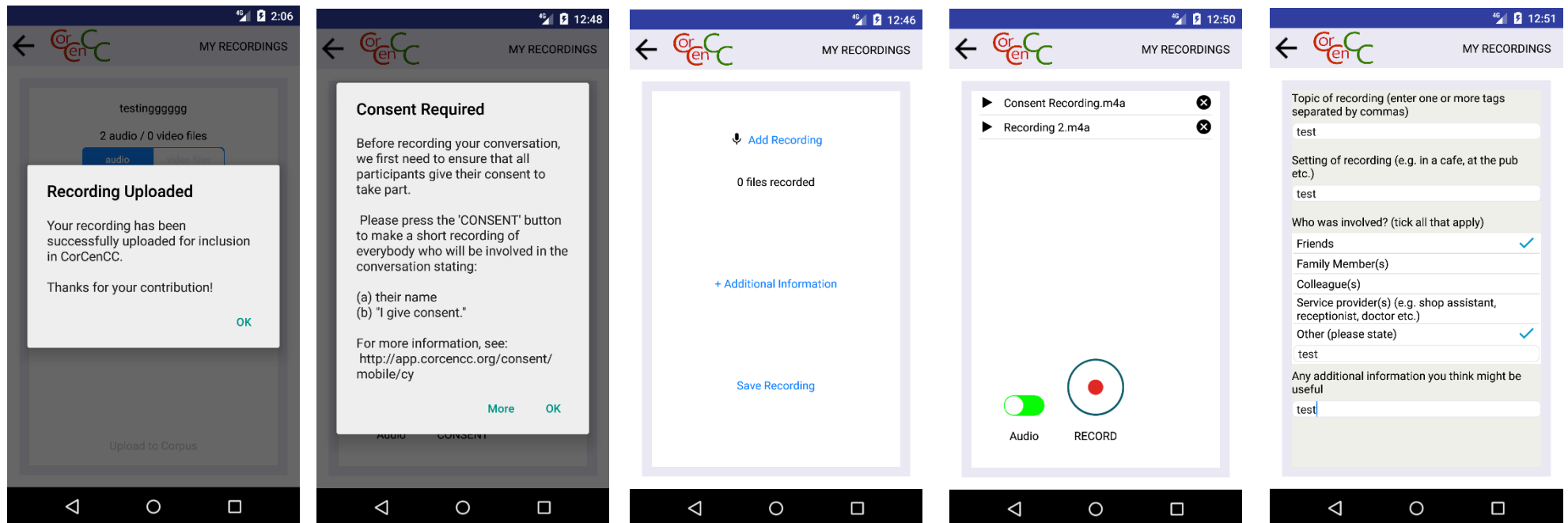
OK

Forgot Password?

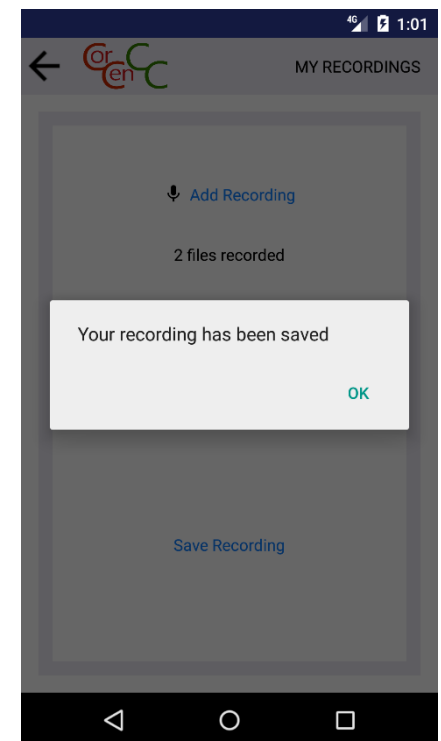
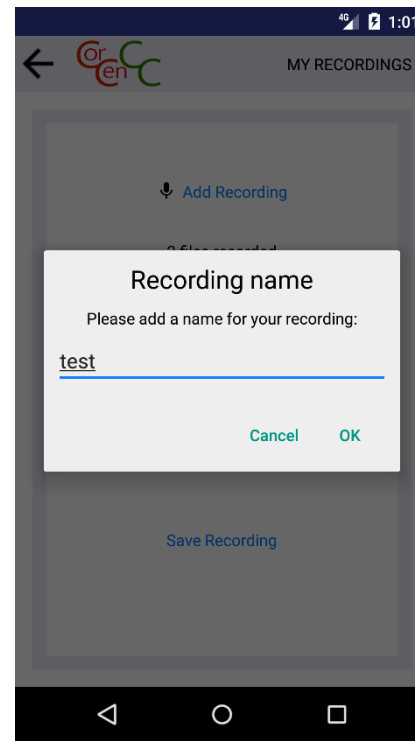
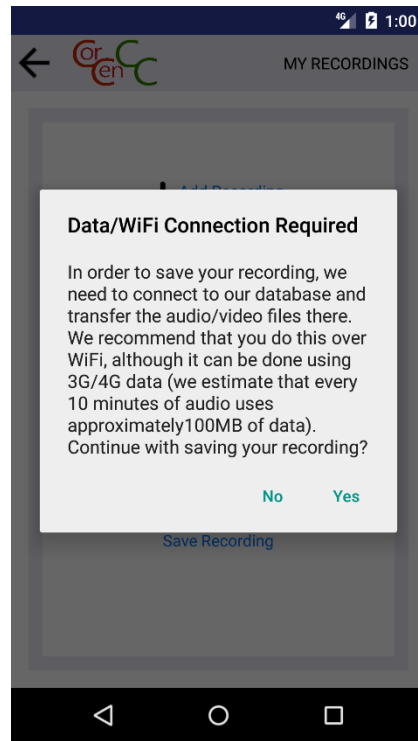
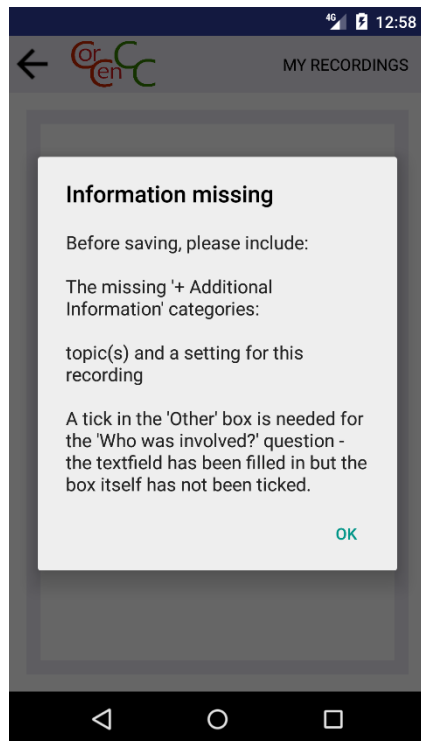
Recordings #1 – Missing profile information/ My recordings/ Recording overview/ Additional information (metadata)/ Upload to corpus



Recordings #2 – Recording uploaded dialog/ Consent required to record dialog/ New recording/ Add recording/ Additional information (metadata)



Recordings #3



Profile #1

MY RECORDINGS
MY PROFILE

First name
Corey

Surname
watson

Year of birth
1900
1901

Gender
Female ✓
Male

MY RECORDINGS
MY PROFILE

Gender
Female ✓
Male
Other
Prefer not to say

Where do you live?
Scotland
Rest Of The World

Occupation
Full-time student ✓

MY RECORDINGS
MY PROFILE

Occupation
Full-time student ✓
Never worked / Long-term unemployment
Employed / Retired / Short-term employment

If you are employed, retired or short-term unemployed, what is/was the full title of your main job
test

Which regions of Wales have most influenced the way you speak Welsh(Tick as many as apply)
North West ✓
North East
Mid Wales
South West
South East
Other (please give details) ✓

MY RECORDINGS
MY PROFILE

In general, how much of your communication happens in Welsh?
Up to 24% ✓
25-49%
50-74%
75%+

Where did you develop your Welsh language skills? (Tick as many as apply)
5 options selected >

How would you describe your Welsh
Option 3 >

Would you describe yourself as a learner of Welsh
Yes ✓

← MY PROFILE

At home and/or with my family, as a child
Welsh-medium nursery
Welsh-medium/bilingual primary school ✓
English-medium primary school ✓
Welsh-medium/bilingual secondary school
English medium secondary school ✓
College ✓
University
Welsh for adults course ✓
Self study
Other (please give details)

Profile #2

MY PROFILE

Option 1 - communicate fluently in almost all situations

Option 2 - communicate about a wide range of topics

Option 3 - communicate about familiar topics ✓

Option 4 - communicate basic information in everyday situations

Option 5 - use and understand everyday expressions and basic introductions

How would you describe your Welsh

Option 3 >

Would you describe yourself as a learner of Welsh

Yes ✓

No

If you have ticked 'Yes', please state the level of your most recent Welsh course:

Welsh Course GCSE

If you would like us to add you to the project email list, to keep you updated on CorCenCC news and developments, please click here:

✓

[Save Profile](#)

Nothing to save

You have not yet made any changes to your profile.

[OK](#)

Information missing

There is still some profile information missing that will need to be completed before you will be able to make recordings. The missing information includes:

first name
surname
regions
most recent Welsh course level

Save profile anyway?

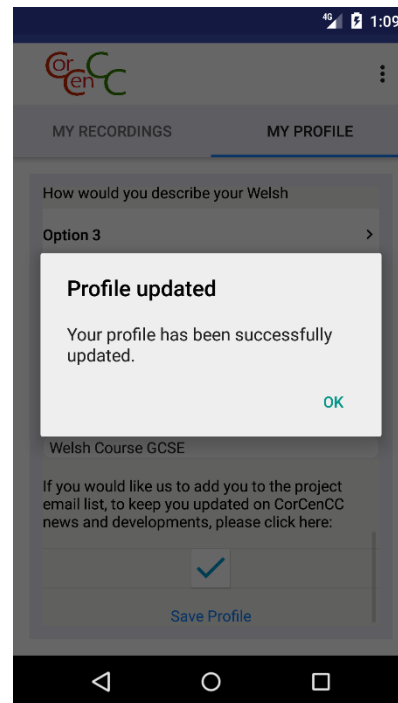
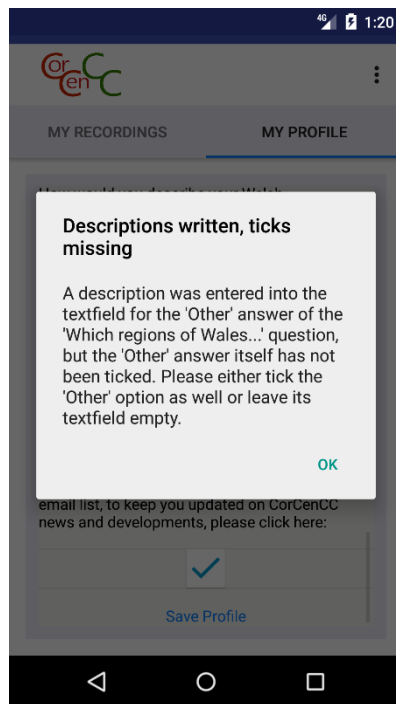
[No](#) [Yes](#)

Descriptions missing

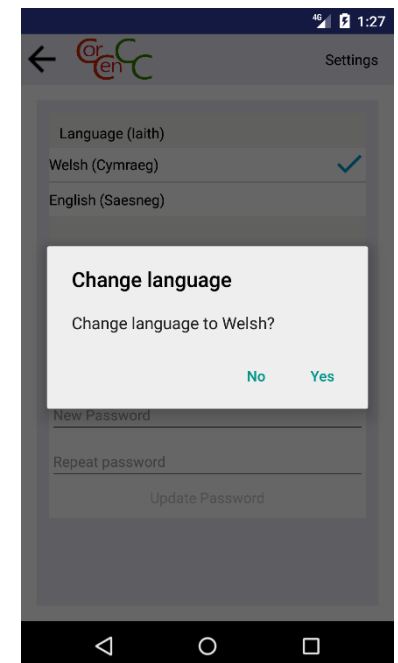
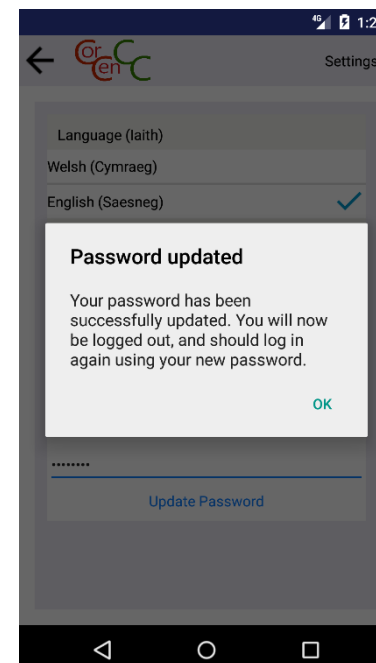
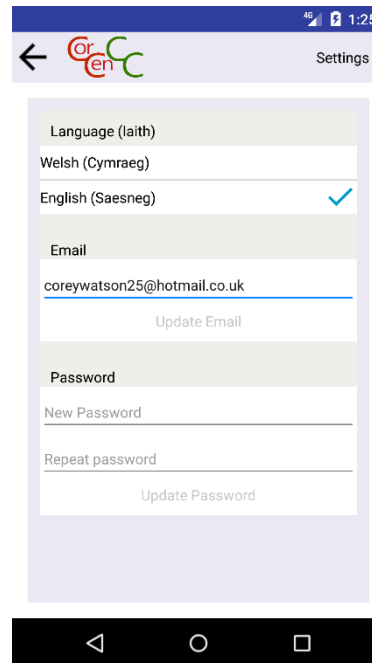
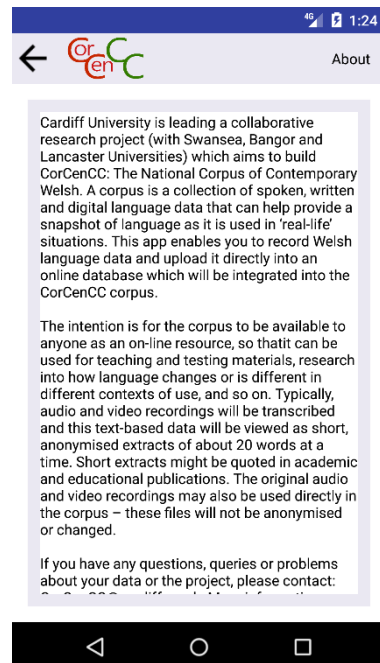
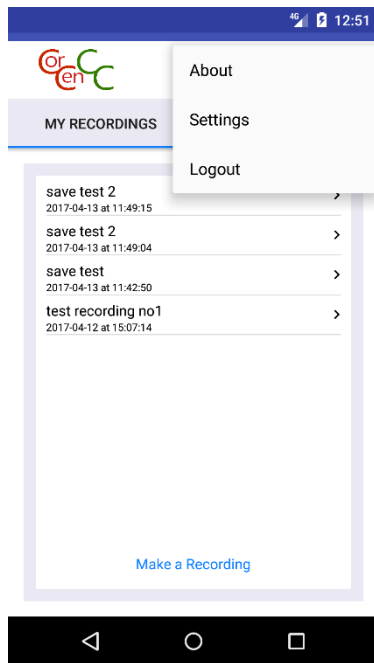
'Other' was selected for the 'Which regions of Wales...' question, but no description was entered into the textfield. Please complete the 'Other' field for this question.

[OK](#)

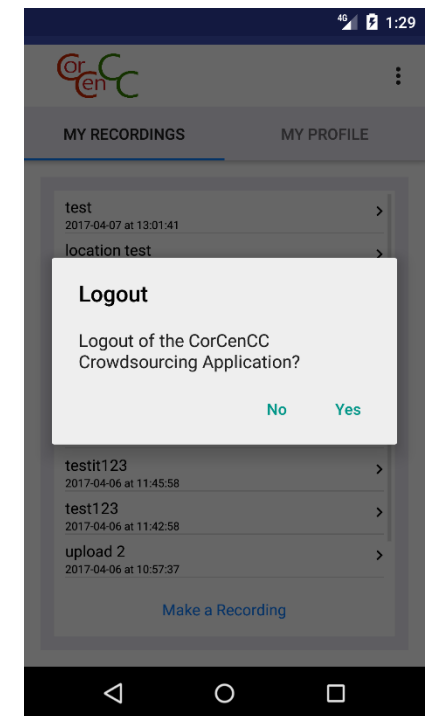
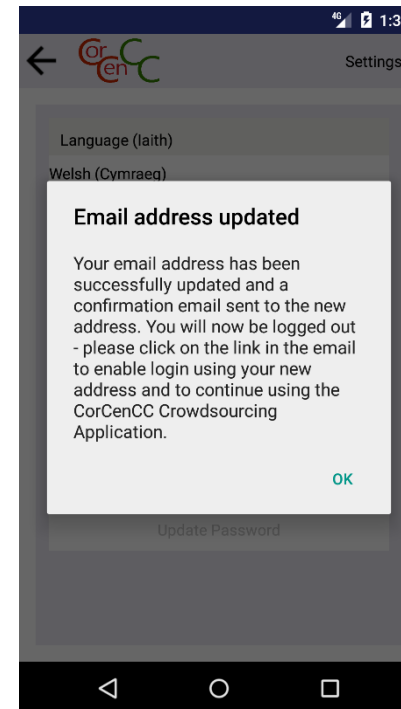
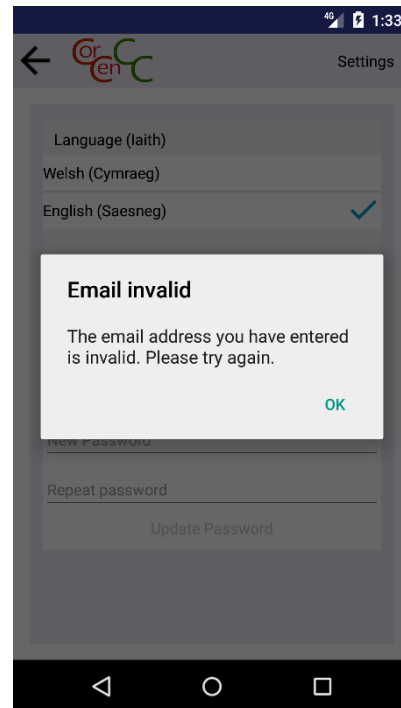
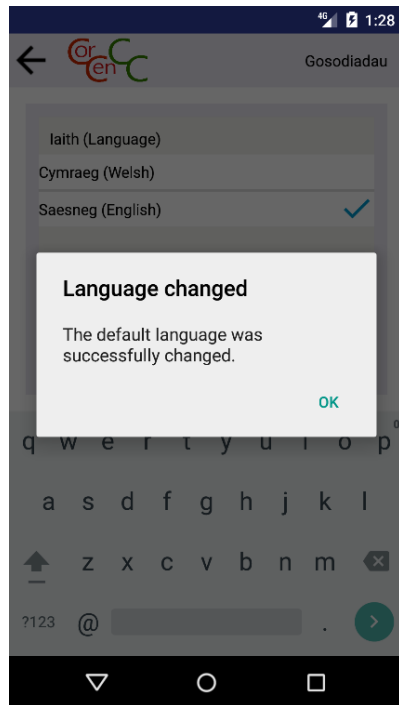
Profile #3



About/ Settings #1



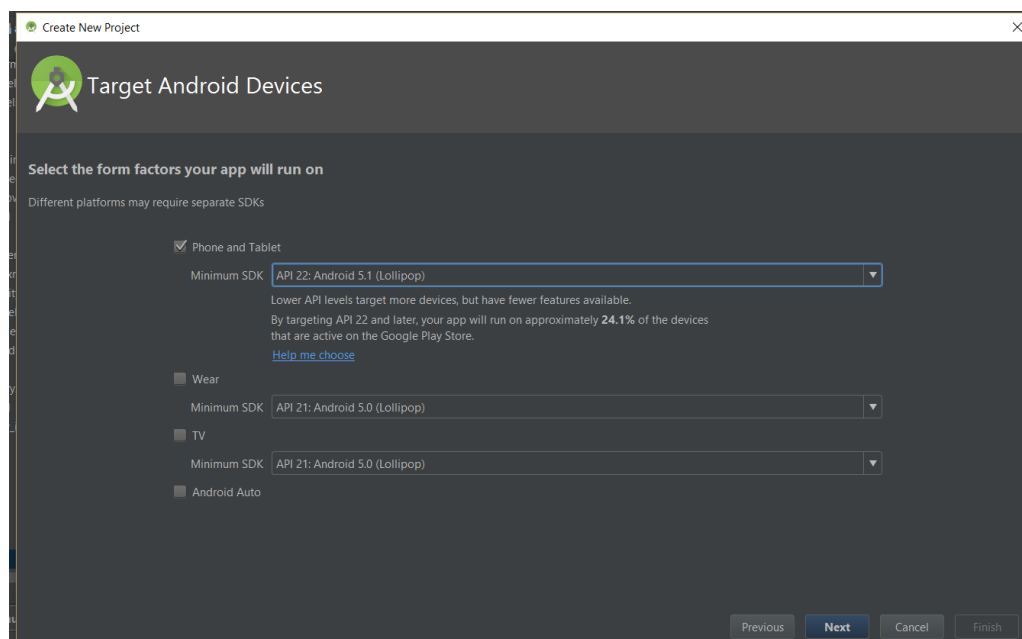
Settings #2/ Logout



Implementation

This section of the report details the software tools that were used to aid the development of the Android app, important implantation aspects and any interesting issues that arose during the development phase.

There are two integrated development environments (IDEs) that are available to develop Android apps, Eclipse and Android Studio. We decided to develop the app using Android Studio v3.2.1 as it is “The Official IDE for Android” (<https://developer.android.com/studio/index.html>). This IDE was chosen over Eclipse as it is “Based on the powerful, extensible IntelliJ IDEA Community Edition”, and provides many useful development tools such as “Advanced code refactoring” and an Android emulator (Ducrohet, X, 2013). Android Studio is also free and open source, making it cost effective and sensitive to the projects budget. Java is the primary development language for Android, along with XML which is used to define app resources. It is possible to create software components using C/C++, but as I have a proficiency in Java it was chosen as the primary language and given the short development time frame it was not feasible to learn an additional programming language within the project deadline. Using the IDE’s project creation feature, functional requirement 27 “The app must support all software versions from Android Lollipop 5.1 API (API v22) onwards.” was met by setting the minimum SDK to target API 22 Android v5.1 Lollipop as shown below:



Android Studio also provides a built-in emulator and a facility that allows developers to plug in their own Android devices via a USB cable to test and debug their app quickly and comprehensively. Throughout the development of the app both features were used in conjunction with each other, with the emulator using a Nexus 5 phone running APIs 22,23 and 24 and debugging via the USB using the LG G3 and Samsung Galaxy S7 edge running API's 22 and 24 respectively. These phones were used for development as they were readily available during the implementation phase and adhered to the projects aim of implementing the app for mobile devices with small-medium screen sizes. More information about how the devices and software versions were used for testing the app can be found under the [testing](#) section of this report.

Furthermore, to ensure that the app fulfilled functional requirement 25 it needed to implement functionality that would work for Android’s new runtime permission model that was integrated as

part of Marshmallow 6.0 API 23, as well as the old installation permission model (API < 23). The new run-time permission model was introduced with Marshmallow 6.0 API 23, to allow users to better understand why app's are requesting particular permissions so that users do not unknowingly accept all upon its installation. Android have stated "Beginning in Android 6.0 (API level 23), users grant permissions to apps while the app is running, not when they install the app." (Android, 2016b). This model aims to provide the user with more control over what permissions they grant an app, so that they can accept some permissions such as writing to external storage, but deny permission to access the phones GPS location.

The list of permissions that the app requests along with the reasoning for them have been provided below:

1. Access the device's audio input.

Permission Code: android.permission.RECORD_AUDIO

Reason

This permission is requested to allow the app to record audio that will contain spoken Welsh conversation which the user can then upload to the Corpus.

2. Access the device's camera.

Permission Code: android.hardware.camera

Reason

This permission is requested to allow the app to record video that will contain spoken Welsh conversation which the user can then upload to the Corpus.

3. Allows application to open network sockets.

Permission Code: android.permission.INTERNET

Reason

This permission is requested as the app needs to be able to post and get information from the server when user updates profile information, changes the apps language, updates their email address, updates their password, logs in, logs out, saves a recording, uploads a recording or changes a recording's metadata.

4. Access to information about device networks.

Permission Code: android.permission.ACCESS_NETWORK_STATE

Reason

This permission is requested by the app so it can evaluate whether the device is connected to the internet, which is required when logging in or communicating with the company's servers and therefore provide relevant feedback to users if they do not have an internet connection.

5. Write to the devices external storage.

Permission Code: android.permission.WRITE_EXTERNAL_STORAGE

Reason

This permission is requested when a user records audio/video the app needs to store the corresponding files locally before the user wants to upload them and does this by writing them to the device's external storage.

6. Read from the devices external storage.

Permission Code: android.permission.READ_EXTERNAL_STORAGE

Reason

This permission is requested as the app writes audio/video files recorded by the user to the device's external storage and therefore needs to be able to read from these locations when the user wants to listen/watch the recordings.

7. Access GPS location

Permission Code: android.permission.ACCESS_FINE_LOCATION

Reason

When the users save recordings containing audio/video files along with associated metadata the app requests whether the user would like to also supply location information which would help researchers when analysing this information in the Corpus.

The definitions of every permission list above can be found on the official Android website at <https://developer.android.com/reference/android/Manifest.permission.html>.

Retrofit 2.0.2 developed by Square, describe themselves as a "Type-safe REST client" and is used in the app to handle HTTP requests with the company's server (<http://square.github.io/retrofit/>). The free library was chosen as part of the app's development as it is easily integrated into Android Studio's build system Gradle, and a vast amount of free video tutorials and documentation exist online. These tutorials can be found at the links below:

- <https://futurestud.io/tutorials/retrofit-getting-started-and-android-client>
- <http://square.github.io/retrofit/>

Many other libraries are available for Android app development that implement similar functionality, such as okhttp3 and HttpClient, but the online help facility that Retrofit 2 provides is far more in-depth and comprehensive than the other libraries which directly addressed the identified project risk complexity. Also, Retrofit provides functionality such as "custom headers, multipart request body, file uploads and downloads" that can be utilised through a simple and intuitive Java API, all of which are essential for developing the Android app. This intuitive API proved to be very useful throughout the app's development since a major difficulty involved sending the correct HTTP request server and

creating the corresponding response body classes. This difficulty arose as I had to read through the source code of the IOS app written in the SWIFT programming language, with which I had no previous experience and determine what custom headers and parameters were sent to the server to gain the desired response. As the server often responded information in the JSON format, I also had to create appropriate Java classes that could store the response information sent by the server. To overcome this issue, I worked closely with the developer of the IOS app who also had access to the server's code and error logging, so that we could adjust the HTTP requests that the Android app was sending to supply the correct data.

An equally significant aspect of the app's implementation, is the use of the resource files to provide an extensible and responsive app. A key feature of the app is its ability to display all of its content in both the English and Welsh language. A mechanism was developed to support this functionality by swapping resource files at runtime that contained the English and Welsh translations of text that appeared in the apps user interface. To do this, two files were created with one containing the English translation and the other containing the Welsh translation and were then placed in separate folders. These files were composed of a set of matching keys that contained different values of the corresponding language translation. An example of the contents of these files is shown below:

English File

Key : value

LoginText : Welcome to CorCenCC Crowdsourcing Application

Welsh File

Key : value

LoginText : Croeso i Ap Torfoli CorCenCC

Each text displaying element of the app would then load a string by referencing a key in the app's resources linking to the strings.xml file that was currently loaded. At run-time when a user changes the language the correct values folder is loaded into the app's resources and then the desired language is displayed.

Additionally, extensibility is a key factor in app development as the app is likely to be used on a range of devices with differing screen sizes and densities, and to support this feature the app makes use of scalable icons. Using an Android Studio plugin 'Image Asset Studio' I imported every icon into the app's resource folder for several different screen densities such as low density-independent pixel (ldpi), medium density-independent pixel (mdpi) and high density-independent pixel (hdpi). Importing the icons as images for the different screen densities will allow the app to determine at runtime what icon to use depending on the device's screen size through inherited framework functionality.

Testing

This section of the report contains information about the types of testing that were conducted on the Android app along with the corresponding results, to evaluate whether the project requirements set out in the Analysis section of the report have been met.

Exploratory Testing

Firstly, I conducted exploratory testing to find edge use cases and bugs with the app by exploring the system's design and functionality. This testing technique has an emphasis on personal freedom of the tester to navigate and use the software to find unusual use case scenarios that may result in bugs. The testing was performed on the Android Studio emulator running API 22.

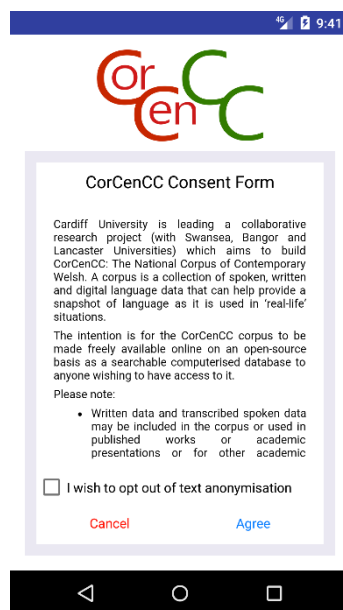
Results

After conducting exploratory testing the following bugs were found with the app, and were resolved before any further stages of testing was performed:

1. Vertical scrollbar on consent form text is not permanently visible.

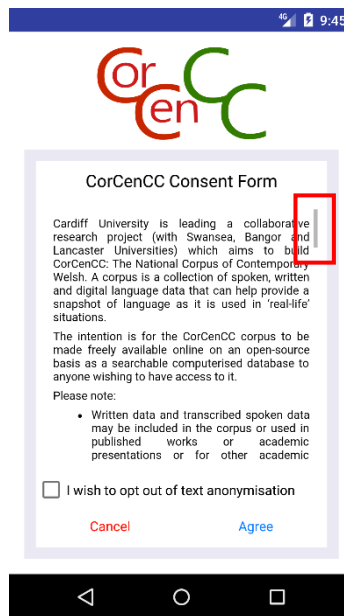
Description

In the ConsentForm activity there is a large section of text informing the user about the terms and conditions of the project, and the vertical scrollbar only renders when the user attempts to scroll the text. This means that by default when the activity is loaded it seems as though the text is cut off half way and does not provide any visual cue to the user that the text is scrollable as shown in the image below:



Solution

To make the user interface more intuitive for users the vertical scrollbar is always rendered when the text is scrollable. This provides a visual cue to the user that the text is actionable and can be scrolled as highlighted below:



2. Pressing the back-navigation button on device immediately after a user has logged into their account causes them to return to the log in page and become logged out of their account.

Description

Android devices come equipped with a back-navigation button inbuilt, and provides 'undo' functionality. Once a user logs into their account and is presented with the 'My Recordings' screen, if they then press the back-navigation button it will redirect them back to the Login screen. This functionality is not desired as user may find the app frustrating if they are logged out of their account after unintentionally pressing the back-navigation button.

Solution

The solution to the bug was to close the app if they had pressed the back-navigation button once they had logged onto the system. This solution was implemented as it does not block the functionality of the inbuilt back-navigation, but also does not log the user out of their accounts. To ensure this is desired behaviour I pressed the back-navigation button after logging into popular apps such as Facebook, Twitter and snapchat and they all matched the new behaviour of the CorCenCC crowdsourcing app mentioned above.

3. Pressing back-navigation button on device when presented with login screen causes app to become stuck on the splash screen.

Description

When the app is loaded the splash screen is the first screen presented to the user to allow the app to check whether the user is already signed into their account. If the user is signed into their account then the next screen loaded is 'My Recordings' screen, but if they are not signed into their account then the login screen is displayed. As Android devices come equipped with a back-

navigation button inbuilt which provides 'undo' functionality when this is pressed on the log in screen the previous activity is displayed, in this case the splash screen.

Solution

The app now closes if a user presses the back navigation button when presented with the log in screen.

4. Error message displayed when trying to save valid profile information.

Description

Selecting the 'No' option for the profile question 'Would you describe yourself as a learner of Welsh?', and not entering the latest welsh course would cause a message to be displayed when the user attempts to save their profile information informing them that they have not provided a 'learner status'.

Solution

The validation for the app was corrected to allow users to select themselves as not being Welsh learners.

5. Incorrect message presented to user when they first log into the app.

Description

When the users first log into the app a message should be presented informing them that their profile is incomplete and that they need to complete it before using other features of the app. Instead of informing the user that their profile is incomplete a message was displayed informing them that they are missing profile information, and asking whether they would like to save this information anyway.

Solution

The contents of the error message were changed to reflect the true state of the user's profile.

Functional Testing

The functional testing technique was employed to ensure that the app functions correctly according to the functional requirements outlined in the [Analysis](#) section of this report. The test cases used for the functional testing can be found under [Appendix B](#), and are based on the test cases used in the IOS apps development to ensure that apps on both platforms incorporate the same functionality. The test cases for the IOS app can be found under [Appendix C](#).

As functional requirement 27 states, "The app must support all software versions from Android Lollipop 5.1 API (API v22) onwards." all test cases were performed using Android Studio emulator running a Nexus 5 phone on API 22, 23 and the most recent android version 24. The results from the testing are displayed below:

Table 1.0 – Functional Requirements Results

Functional Requirement No	API 22	API 23	API 24
1	Pass	Pass	Pass
2	Pass	Pass	Pass
3	Pass	Pass	Pass
4	Pass	Pass	Pass
5	Pass	Pass	Pass
6	Pass	Pass	Pass
7	Pass	Pass	Pass
8	Pass	Pass	Pass
9	Pass	Pass	Pass
10	Pass	Pass	Pass
11	Pass	Pass	Pass
12	Pass	Pass	Pass
13	Pass	Pass	Pass
14	Pass	Pass	Pass
15	Pass	Pass	Pass
16	Pass	Pass	Pass
17	Pass	Pass	Pass
18	Pass	Pass	Pass
19	Fail	Fail	Fail
20	Pass	Pass	Pass
21	Pass	Pass	Pass
22	Pass	Pass	Pass
23	Pass	Pass	Pass
24	Pass	Pass	Pass
25	Pass	Pass	Pass
26	Pass	Pass	Pass
27	Pass	Pass	Pass

Table 1.1 – Test Case Results

Test Case No	API 22	API 23	API 24
1	Pass	Pass	Pass
2	Pass	Pass	Pass
3	Pass	Pass	Pass
4	Pass	Pass	Pass
5	Pass	Pass	Pass
6	Pass	Pass	Pass
7	Pass	Pass	Pass
8	Pass	Pass	Pass
9	Pass	Pass	Pass
10	Pass	Pass	Pass
11	Fail	Fail	Fail
12	Pass	Pass	Pass
13	Pass	Pass	Pass
14	Pass	Pass	Pass
15	Pass	Pass	Pass
16	Pass	Pass	Pass
17	Pass	Pass	Pass

Evaluation of Functional Testing

As can be seen from Table 1.0 and Table 1.1 all the requirements were satisfied for all different API versions other than functional requirement 19, which is defined as “Users must be able to play/pause saved recordings.” It can also be seen from Table 1.1 that all the test cases also passed on the different API versions other than test case 11, which failed as it was used to check whether functional requirement 19 had been implemented. As functional requirement 19 has not been implemented it means that the app cannot currently stream audio/video files from the server. After thorough investigation I found that the server was returning a 403 error response to the app when trying to retrieve stored media files. This error code is defined as being a forbidden error returned from the server, meaning that it is denying the app permission to access the media files stored on it.

To investigate the issue further I needed admin access to the server and its code, so that I could debug the problem and find the root cause. As the IOS app developer had the required permission level for the server I contacted him and arranged to work together in an attempt to resolve the issue. After working closely with the IOS app developer for several days we were still unable to resolve the problem, but identified the root cause of the problem. The issue is that when a user logs in using the Android app the server creates an instance of the user but when the file is requested the instance no longer exists, and so permission to access the file is denied.

The supervisory team and CorCenCC team are aware of the issue, but as further investigation requires admin access to the server and its code it would require both myself and the IOS developer to spend additional hours working alongside each other. Due to the limited time frame for this dissertation project it has been decided that it would not be possible to resolve this issue by the deadline. It is for these reasons it has been agreed the issue will be resolved as part of future work for the CorCenCC Android app.

Non-Functional Requirements Testing

Testing was conducted on the system to ensure that the non-functional requirements defined in the [Analysis](#) section were met.

Non-functional requirement: Usability

Acceptance Criteria

- A user should be able to become familiar with the main functions of the app after 5 minutes of use without training or help.
- The user interface should adhere to Nielson's heuristics but also maintain a consistent theme with the IOS app's user interface and use appropriate Android features.

Test Method

This non-functional requirement was satisfied as part of the Usability Study that was conducted as the app had a System Usability Scale(SUS) score of 82.5, which means the app has higher perceived usability than 80% of other systems. More information about SUS and the apps score can be found in [Questionnaire 3: Subjective User Preferences](#) section of the report.

Non-functional requirement: Performance

Acceptance Criteria

- The app should load on average within 5 seconds.

Test Method

Timing tests were performed to ensure that the app satisfied the acceptance criteria for the non-functional performance requirement. The timing tests used a logging function implemented in the apps code that recorded the time between when the app was launched and when the login screen was displayed. The tests were performed 10 times and an average was taken to improve the reliability of the results produced. The experiments were conducted on a Samsung Galaxy s7 edge running API 24 and the results are shown below:

Table 2 – Average Loading Times

Test No	Time(s)
1	0.83
2	0.76
3	0.72
4	0.84
5	0.61
6	0.68
7	0.91
8	0.82
9	0.87
10	0.74
Average Time: 0.78 seconds	

Evaluation of Results

As can be seen from table 2 the average loading time of the app was 0.78 seconds, which is well within the acceptance criteria of 5 seconds and therefore fulfils this requirement.

Non-functional requirement: Reliability

Acceptance Criteria

- The app should handle exceptions and unexpected input elegantly without crashing or impacting user experience and provide informative feedback.

Test Method

To ensure this non-functional requirement was fulfilled and that the app implemented suitable validation methods, erroneous test cases were performed and can be found under [Appendix D](#). The results from the tests are shown below:

Test Case No	Test Case Description	API 22	API 23	API 24
18	To check the user cannot log into the app with incorrect details.	Pass	Pass	Pass
19	To check the user cannot register with an invalid email address.	Pass	Pass	Pass
20	To check the user cannot reset a password using an invalid email address.	Pass	Pass	Pass
21	To check a user cannot upload a recording that is missing audio/video files along with mandatory metadata.	Pass	Pass	Pass
22	To check how the app handles incomplete profile information.	Pass	Pass	Pass

Evaluation of Results

As can be seen from the table all API versions passed all the erroneous tests, therefore this non-functional requirement is satisfied.

Usability Study

Following the initial app development, its comprehensive testing, and ethics approval, a usability study was conducted to evaluate the usability of the CorCenCC Crowdsourcing Android app. This usability study was based on one conducted for a TRACK app suite and is available at <http://www.researchprotocols.org/2015/4/e122/>.

Participants

A total of 5 participants was deemed suitable in the context of this usability study as it is argued that 5 participants would reveal 80% of usability problems (Nielsen J, 1993) (Bevan N, 2003). The participants were a mix of Android and IOS users, which should provide an insight into the views of different platform users on usability of the app on the Android platform. Eligibility criteria were (1) they had no domain knowledge about the app or its implementation so that a fair review of its usability could be given, (2) they owned a smartphone or tablet, and (3) aged 16 years or older, as we targeted adolescence/adult users. No incentives were offered for participation in the study. Potential participants were excluded if they (1) did not speak the English language with native-like proficiency.

Questionnaires

Usability questionnaires were developed to collect both qualitative and quantitative information about the Android app that could then be analysed to identify the usability themes: design, feedback, format, instructions, navigation, terminology, and learnability.

The questionnaires were divided into 3 parts: (1) Questionnaire 1: computer and Internet usage; (2) Questionnaire 2: task completion; and (3) Questionnaire 3: subjective user preferences. All 3 questionnaires were accessible online and can be found under [Appendix E](#). Patients were instructed to complete Questionnaire 1 first, followed by 2 and 3 respectively. Each Questionnaire was completed at the participant's home as the app is not available in the market place, so a demo device had to be supplied. Before the second questionnaire was given out to users they were provided with a quick introduction to the app to inform them of its purpose and to provide context when conducting the usability study. Each participant was then given 10 minutes to explore the app to allow them to make a connection between information provided in the introduction and the user interface. All participants complete Questionnaires 1,2 and 3. Of the 5 participants, 3 were men and 2 were women, whose average ages were 27.7 years and 33 years, respectively.

Results

Questionnaire 1: Computer and Internet Usage

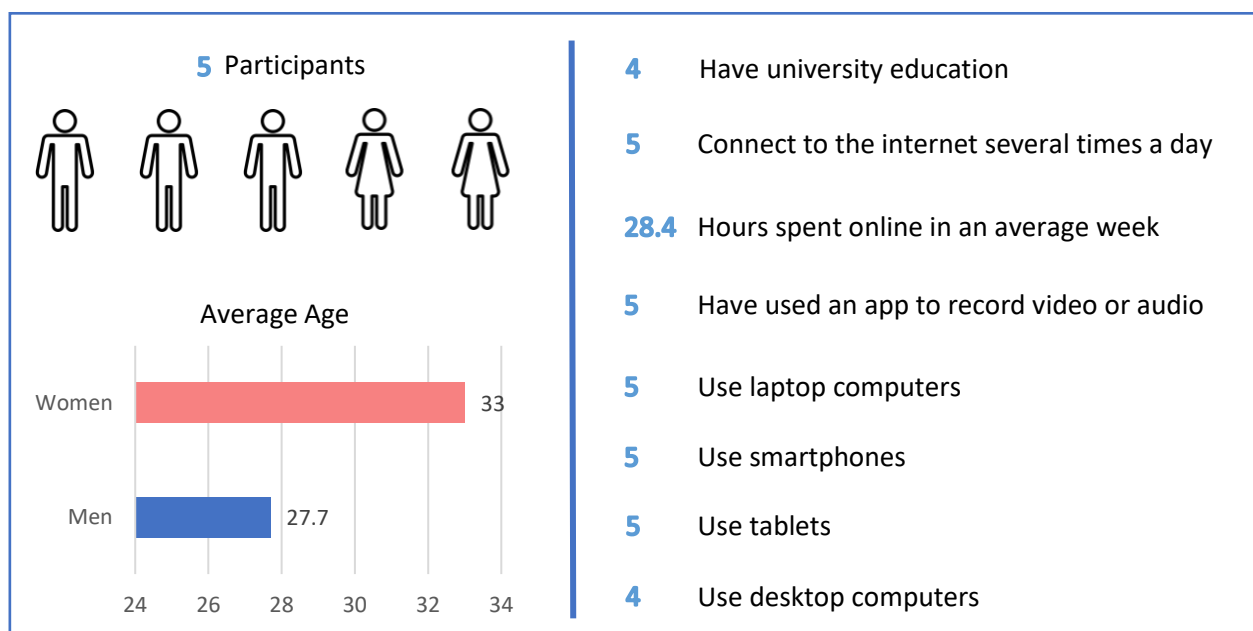
Questionnaire 1 consisted of 16 questions whose main purpose was to verify the computer literacy of the participants as part of the inclusion criteria, but also to try and relate the response to task-based questions to different levels of computer literacy. [Fig 3.0](#) shows a summary of responses to Questionnaire 1 and corresponding graphs can be found under [Appendix F](#).

Of 5 participants who completed Questionnaire 1, all had at least secondary education out of which 4 had a university degree. All of them were accessing the Internet several times a day (on average 28.4 hours per week) at home mostly via a laptop (100%, 5/5) and smartphone (100% 5/5). All 5 patients accessed the Internet most often from home, were using it to find information via the internet (100% 5/5), go online just for fun (100% 5/5) and send instant messages (100% 5/5). The participants

preferred to access the internet via smartphone (40% 2/5) and tablet (40% 2/5), with one preferring to access it via a desktop computer.

Out of the five participants three were Android users and two were IOS users, all of which had used an app to record audio or video files, mostly occasionally (3/5). The most popular video and audio recording apps used by participants were Snapchat (3/5) and WhatsApp (3/5). Participants mainly liked that the apps were easy to use, had a simplistic design and the ability to replay content, but they disliked slow and confusing interfaces, bugs, cost and poor quality recordings.

Fig 3.0



Questionnaire 2: Task Completion

As part of completing Questionnaire 3, participants were asked to complete a series of prespecified tasks using the app. A total of 15 tasks were defined in order to test the usability of all aspects of the app. The behaviour of each user was studied in an individual session and any difficulties the user had were recorded by myself.

All five participants successfully completed Questionnaire 2 and most of whom completed all the tasks associated with the questions. Every participant successfully registered and logged into their account without any issues. Every participant was also able to successfully save profile information about themselves, make a new recording session, append an audio and video file to the recording session and play the appended audio and video files. However, it was noted that some of the users struggled with playing the recordings due to size of the play and pause icons.

The majority of participants (80%, 4/5) were not able to add 'Additional Information' to the recording session, since they misinterpreted the question and thought they were required to add information to one of the recording files they had just appended. All participants successfully saved the recording session, changed the 'Additional Information' about a saved recording and uploaded a saved recording to the corpus. The majority of users (80%, 4/5) were able to change the language from English to

Welsh, with the one participant failing to do so as they were unable to identify the drop-down menu in the top right hand corner. Once it was explained to the participant how to perform the task they responded saying they 'did not recognise the dotted menu', which could be explained by the fact they were an IOS user, and so did not recognise the functionality of the conventional Android drop down menu. All participants completed the final task and logged out of their accounts.

Questionnaire 3: Subjective User Preferences

Questionnaire 3 was created to highlight subjective user preferences about the Android app including its general usability, user perception, and appropriateness in the context of recording audio and video files containing conversations. The first section of the Questionnaire is about general usability and was based on the System Usability Scale (SUS), which is a questionnaire for assessing the perceived usability of interactive systems (Brooke J, 1996). It consists of 10 questions using a 5-point Likert scale (1=strongly disagree, 5=strongly agree). In comparison to other commonly used questionnaires, it was shown to be the simplest and most reliable in determining apps usability and is the most frequently used type of questionnaire for measuring perception of usability (Tullis TS, 2004).

Since the SUS questionnaire has been used by many systems to evaluate their usability it provides the ability to assess the usability of a given system against these other systems that employ the same questionnaire. The overall SUS score is calculated on a range of 0-100, with the average score being considered 68. The SUS score calculated from participants' responses was 82.5 for the CorCenCC Crowdsourcing app, which falls within the percentile range of 80-84%. This means that the app has higher perceived usability than 80% of other systems and can be interpreted as "Grade B" on a scale from A to F (Sauro J, 2012). The summary of results for Questionnaire 3 can be found under [Appendix G](#).

Most participants (80%, 4/5) neither agreed or disagreed that they would use this app frequently, which is most likely as none were Welsh speakers and as the app requires Welsh spoken conversation it may not appeal to their needs. None of the participants found the app unnecessarily complex, inconsistent, cumbersome, difficult to learn, not easy to use, not well integrated or thought they would need technical support from a technical person to use it. All of the participants agreed that they found the app easy to use, that the app's functions were well integrated, would imagine most people would learn to use the app very quickly, that they were able to find the information they were looking for, liked the overall layout of the app and liked the overall presentation of the app. Every participant also said that they would recommend the app to someone who speaks Welsh.

In the Questionnaires section 'Appropriateness in the context of recording files containing spoken conversation' only one of the participants were concerned about the privacy or security of the app, and go onto explain they were concerned that if they upload a recording to the corpus by accident that they would be unable to remove or modify them. Another participant also expressed that they would like to be provided with more control over saved and uploaded recordings. These concerns were relayed to the CorCenCC team to be reviewed and determine whether any change in functionality is required. All five participants also agreed that they would like to be able to delete saved recordings and/or their associated audio/video files. Most of the participants (80%, 4/5) agreed that they did not want to be able to sign into the app using a social media account.

In addition, one of the participants said they would like the play icons to be bigger as they found it difficult to press them due to their size. This issue has been corrected as a result of the usability study, and the play/pause icons are now larger. The same participant also stated that they would like to be able to play saved recordings, which is a known limitation of the app and has been assigned as future

work for the Android app. Two participants also commented that they encountered some confusion when making a new recording, which corresponds with the same number of people who failed to complete that task.

Future Improvements

The major improvement that would be made to the Android app in the immediate future as mentioned in the [functional testing](#) section of this report would be, the ability to stream saved audio and video files. This functionality is specified in functional requirement 19 for the project and therefore, will have to be implemented before the app can be released to Google Play Store for use by the public.

As a result of testing and comments provided by participants in the usability study a number of proposed changes are currently being reviewed by the CorCenCC team and are listed below:

1. Disable saved recording text when no files are added.
2. Welcome screen should show option of login or register and when a user selects an option the relevant textboxes appear.
3. Provide functionality that allows users to delete saved recordings.
4. Provide functionality that allows users to remove uploaded recordings from the corpus.

Conclusion

In conclusion, the main aim of the project has been met as an Android version of the CorCenCC crowdsourcing App that supports the Android 5.0 Lollipop SDK has been successfully developed. Also, the sub-aims of the project have been fulfilled since a consistent environment and user interface has been maintained across operating systems whilst implementing appropriate Android features such as the new switch tab and are evident in the screenshots provided in the [design](#) section of the report.

One of the main reasons that I choose this project was to gain experience in mobile app development and I believe that I have made excellent progress with the project considering I had no previous experience in this area. Working on this project has increased my interest in mobile app development enormously and I know wish to pursue this career path in the software engineering industry.

An issue that was encountered whilst implementing the Android app means that objective 5 has not been completely fulfilled because the Android app cannot stream saved recordings, meaning that not all of the functionality of the IOS app has been implemented. However, as this issue has been agreed to be implemented as part of future work for the Android app and all other objectives have been met, I think that it deems this project a success.

Reflection on Learning

Developing the CorCenCC crowdsourcing Android app has provided me with an excellent opportunity to significantly enhance both my professional and technical skill-set that will aid me in my future software development career. Since the project required me to implement an Android app that replicated the functionality of an existing IOS app, I had to communicate effectively with the IOS developer in a professional manner throughout the development of the app. This continuous communication throughout the project with the IOS developer allowed me to significantly improve my communication and team-working skills.

Also, when I encountered a potential server issue that prevented the Android app from streaming saved recordings I arranged a meeting with the IOS developer who had admin access to the server to try and resolve the issue. I worked closely with the IOS developer for several days, but we still couldn't resolve the issue so it was decided by the supervisory team that the functionality would be implemented as part of future work. Even though we were unable to resolve the issue I think it was one of the most valuable experiences and key learning points I gained whilst developing the app. This experience allowed me to develop my interpersonal and team-working skills by working closely alongside another developer, as well as enhancing my programming skills by debugging server side code to identify the problem. A key learning point I gained from this set back in the project was that there are certain risks that will affect a project that cannot always be foreseen regardless of the amount of project planning that is performed, but it is important that when these issues are identified they need to be communicated quickly to the client and project leads to manage expectations and adjust the project scope accordingly.

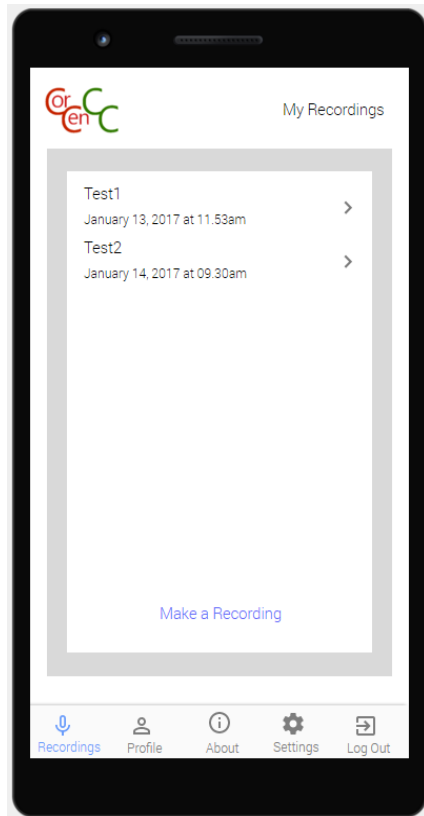
In addition, I feel that my project management skills such as planning and task management have improved drastically since starting this project. Before I began the project, I would often begin work on a project without any real plan, meaning I would attempt to implement functionality and features of software without much thought. This would often mean I would feel overwhelmed when faced with a large or complex problem, but now I am able to efficiently decompose a problem in smaller more manageable tasks that I am able to complete frequently in order to resolve the larger issue. An example of such development would be the initial project plan I created that had clearly defined aims, objectives and work plan that enabled me to make steady progress in the project by working towards clear goals.

Furthermore, I feel I have gained valuable experience and knowledge in communicating effectively and correctly when working on a project. I have realised that communicating effectively in an appropriate manner is imperative to a project's success, and when I encounter a problem I first need to analyse the situation and evaluate my options before requesting help or guidance on it. The development of this skill was highlighted when I began to write this report as I would often send multiple emails to my supervisor in an attempt to resolve an issue, whereas now I identify potential solutions and evaluate their appropriateness in the context of the problem before seeking further advice. It is for these reasons that I think the experience gained in my industrial placement coupled with the final year project has provided me with an excellent skill-set that has made me more employable and competent in the software development industry.

Appendix A

CorCenCC Crowdsourcing Application User Interface Questionnaire

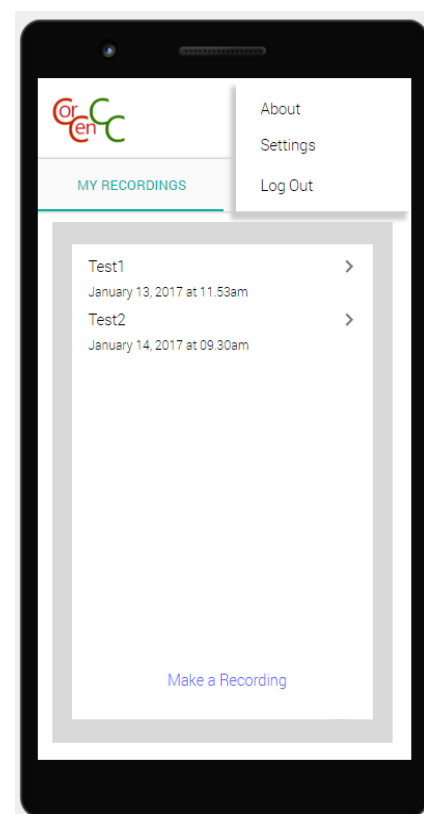
A



B i



B ii



Please circle the option you wish to select.

1. Which interface do you find the most visually appealing?

A / B

2. Which user interface do you feel provides easier access to the different features of the app?
(Recordings, Profile, Settings, About and Logout)

A / B

3. Which interface would you prefer to see in the app?

A / B

Any further comments.

Appendix B – Test Cases

Test Case ID: 1		Test Purpose: To check that the app meets functional requirement 1.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: None.			
Test Case Steps: Ensure user can change language on the Login screen.			
Step No	Procedure	Response	Pass/Fail
1	Click language button titled 'en'.	Language was changed to English.	Pass
Comments:			
Related Tests:			
Functional requirement(s) met: 1			

Test Case ID: 2		Test Purpose: To check that the app meets functional requirement 2, 3 & 4.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: None.			
Test Case Steps: Ensure user can register an account.			
Step No	Procedure	Response	Pass/Fail
1	Click 'Register' text	The registration screen was displayed.	Pass
2	Enter email address.	The email address textbox contained the words 'mitchellwatson21@hotmail.co.uk'.	Pass
3	Enter password.	The password textbox displayed * characters.	Pass
4	Enter repeated password.	The repeat password textbox displayed * characters and matched the contents of the password textbox.	Pass
5	Click the 'Register' text at the bottom of the page.	The ConsentForm screen was displayed.	Pass
6	Click the 'Agree' text at the bottom of the page.	A dialog was displayed confirming the registration process had been completed successfully and a confirmation email was sent to 'mitchellwatson21@hotmail.co.uk'. The user is then redirected to the Login screen.	Pass
7	Click on the link sent to 'mitchellwatson21@hotmail.co.uk'.	You are directed to the CorCenCC webpage that displays a message	Pass

	confirming the successful registration.	
Comments:		
Related Tests:		
Functional requirement(s) met: 2, 3 & 4.		

Test Case ID: 3		Test Purpose: To check that the app meets functional requirement 5.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' has been successfully registered with the CorCenCC system.			
Test Case Steps: Ensure users can log into their account.			
Step No	Procedure	Response	Pass/Fail
1	Enter the email address 'mitchellwatson21@hotmail.co.uk'.	The email address textbox displayed the text 'mitchellwatson21@hotmail.co.uk'.	Pass
2	Enter password the accounts password.	The password textbox displays * characters.	Pass
3	Click the 'Login' text.	The Login screen is displayed. A message is displayed that informs the user they have to complete their profile information before continuing.	Pass
4	Click the 'OK' text displayed in the pop up window.	The user is redirect to the Profile page.	Pass
Comments:			
Related Tests:			
Functional requirement(s) met: 5			

Test Case ID: 4		Test Purpose: To check that the app meets functional requirement 6.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account ‘mitchellwatson21@hotmail.co.uk’ must already be logged into the system and the app must be closed.			
Test Case Steps: Ensure that users who do not log out of their account on the device are automatically logged back into the system when reopening the app.			
Step No	Procedure	Response	Pass/Fail
1	Click on the CorCenCC app.	The splash screen is displayed to the user. Following this the user is	Pass

		logged into their account and the 'My Recordings' screen is displayed.	
Comments:			
Related Tests:			
Functional requirement(s) met: 6			

Test Case ID: 5		Test Purpose: To check that the app meets functional requirement 7.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: All of the steps in test case 3 need to be followed before performing this test as the email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system.			
Test Case Steps: Ensure that users are able to log out of their accounts.			
Step No	Procedure	Response	Pass/Fail
1	Click on drop down menu in the top right hand corner.	A list of menu items is displayed.	Pass
2	Click the menu item labelled 'Logout'.	A pop up window is displaying asking the user to confirm whether they wish to log out.	Pass
3	Click the 'Yes' option displayed in the pop up window.	The user is logged out of the system and the Login screen is displayed.	Pass
Comments:			
Related Tests: 3			
Functional requirement(s) met: 7			

Test Case ID: 6		Test Purpose: To check that the app meets functional requirement 7.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: All of the steps in test case 3 need to be followed before performing this test as the email account ‘mitchellwatson21@hotmail.co.uk’ must already be logged into the system.			
Test Case Steps: Ensure that users can save profile information about themselves			
Step No	Procedure	Response	Pass/Fail
1	Enter the “Mitchell” into the first name textbox.	The first name textbox displays the text “Mitchell”.	Pass
2	Enter the “Watson” into the surname textbox.	The first name textbox displays the text “Watson”.	Pass
3	Select the year “1990” from the ‘Year of birth’ scrolling wheel.	The ‘Year of birth’ scrolling wheel displays “1990” as the selected year.	Pass

4	Click on the checkbox labelled 'Male'.	The checkbox labelled 'Male' renders a tick mark to show its selected.	Pass
5	Select the place "Swansea" from the 'Where do you live' scrolling wheel.	The 'Where do you live' scrolling wheel displays the value "Swansea" as the selected value.	Pass
6	Click on the 'Employed/ Retired/ Short term employment' checkbox.	The checkbox labelled 'Employed/ Retired/ Short term employment' renders a tick mark to show its selected.	Pass
7	Enter the text 'Engineer' into the job title textbox.	The job title textbox displays the text 'Engineer'.	Pass
8	Click on the checkboxes 'South West' and 'South East'.	The checkboxes labelled 'South West' and 'South East' both render tick marks to show they are selected.	Pass
9	Click on the radiobutton labelled 'Up to 24%'.	The radiobutton labelled 'Up to 24%' renders a tick mark to show it is selected.	Pass
10	Click on the button labelled 'Where did you develop your Welsh language skills'	A screen is displayed containing 11 different options.	Pass
11	Click on the checkboxes labelled 'Welsh-medium/bilingual primary school' and 'Welsh-medium/bilingual secondary school'	The checkboxes labelled 'Welsh-medium/bilingual primary school' and 'Welsh-medium/bilingual secondary school' both render tick marks to show they are selected.	Pass
12	Click on the back arrow button in the top left hand corner.	The 'My Profile' screen is displayed with the 'Where did you develop your Welsh language skills' button contain the text "2 Options selected".	Pass
13	Click on the button labelled 'How would you describe your Welsh'.	A screen is displayed containing 5 different options.	Pass
14	Click on the checkbox labelled 'Option 5 – use and understand everyday expressions and basic introductions'.	The checkbox labelled 'Option 5 – use and understand everyday expressions and basic introductions' renders a tick mark to show it is selected.	Pass
15	Click on the back arrow button in the top left hand corner.	The 'My Profile' screen is displayed with the 'How would you describe your Welsh' button contain the text "Option 5".	Pass
16	Click on the radiobutton containing the text 'Yes' under the radiobutton group labelled 'Would you describe yourself as learner of Welsh'	The radiobutton labelled 'Yes' renders a tick mark to show its selected.	Pass

17	Enter the text "GCSE Welsh" into the textbox labelled 'If you have ticked 'Yes', please state the level of your most recent Welsh course'.	The textbox labelled 'If you have ticked 'Yes', please state the level of your most recent Welsh course' displays the text "GCSE Welsh".	Pass
18	Click the checkbox at the bottom of the page to be added to the CorCenCC email list.	The checkbox displays a tick mark to show it is selected.	Pass
19	Click the 'Save' text at the bottom of the page.	A pop up is displayed to the user information that their profile information has been saved.	Pass
Comments:			
Related Tests:3			
Functional requirement(s) met: 7			

Test Case ID: 7		Test Purpose: To check that the app meets functional requirements 9, 10, 11, 12 & 13.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: All of the steps in test case 3 need to be followed before performing this test as the email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system, and the 'My Recordings' screen must be displayed.			
Test Case Steps: Ensure that users are able to save a new recording by adding audio/video files along with the associated metadata.			
Step No	Procedure	Response	Pass/Fail
1	Click on the 'Make a Recording' textview.	The 'AddRecroding' activity screen is displayed.	Pass
2	Click on the 'Add Recording' textview.	The 'NewRecording' activity screen is loaded. A pop up message is also displayed asking that a short recording be made where all participants clearly identify themselves and state that they agree to being recorded.	Pass
3	Click 'OK' in the pop up window.	The pop up window closes and the 'NewRecording' activity is displayed with the text above the record button showing 'Consent'.	Pass
4	Click on the circular record button.	The record button changes colour and the inner circle changes to a square.	Pass
5	Click on the square shaped record button.	The recording stops and a pop up window is displayed informing the user that the consent has now been recorded.	Pass

6	Click 'OK' in the pop up window.	The pop up window closes and the new consent recording appears on the screen.	Pass
7	Click the recording format switch.	The thumb of the switch animates from the left-most position to the right-most position. The text below the switch changes from 'Audio' to 'Video'.	Pass
8	Click the recording button.	The devices camera in video mode. At this point the user records they're video using their devices media player, and once complete selects 'OK' the 'NewRecording' activity screen is displayed with the new video recording added as 'Recording 2', accompanied by a video thumbnail on its right hand side.	Pass
9	Click the back arrow located in the top left hand corner.	The 'AddRecording' screen is displayed, along with text notifying the user of the number of files that have been recording, (in this case 2).	Pass
10	Click on the 'Additional Information' textview.	The 'AdditionalInformation' activity screen is displayed	Pass
11	Enter "test topic" into the first textbox.	The first textbox contains the text "test topic".	Pass
12	Enter "test setting" into the second textbox.	The second textbox contains the text "test setting".	Pass
13	Click on the checkbox labelled 'Friends'.	The checkbox labelled 'Friends' renders a tick mark to show it is selected.	Pass
14	Click on the back arrow located in the top left hand corner.	The 'AddRecording' activity screen is displayed.	Pass
15	Click the 'Save Recording' textview.	A popup window appears notifying the user that data/wifi connection is required to save the reording.	Pass
16	Click 'OK' in the pop up window.	Another pop is displayed asking to provide a name for the recording.	Pass
17	Enter 'test recording no1' into the textbox in the pop up window.	The textbox in the pop-up window contains the word 'test recording no1'.	Pass
18	Click 'OK' in the pop-up window.	A pop-up window is presented notifying that the recording was successfully saved.	Pass
19	Click 'OK' in the pop-up window.	This closes the pop-up window and displays the 'My Profile' screen, with the recording '.	Pass
Comments:			

Related Tests:3
Functional requirement(s) met: 9,10, 11, 12 & 13

Test Case ID: 8		Test Purpose: To check that the app meets functional requirement 14.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. The steps 1-8 in test case 7 must be followed first before performing this test.			
Test Case Steps: Ensure that users are able to play and pause new recordings.			
Step No	Procedure	Response	Pass/Fail
1	Click on the play icon next to the first item in the recording list 'Consent Recording' audio file.	The recording plays through the devices speakers and the play icon is changed to a pause icon.	Pass
2	Click on the pause icon next to the first item in the recording list 'Consent Recording'.	The recording stops playing the pause icon is changed to a play icon.	Pass
3	Click on the play icon next to the second item in the recording list 'Consent Recording' video file.	The 'PlayVideoRecording' activity screen is displayed and the video begins playing. The user has the ability to stop the recording through their devices media player that is displayed on screen.	Pass
4	Click the back arrow located in the top left hand corner.	The 'NewRecording' activity screen is displayed.	Pass
Comments:			
Related Tests: 7			
Functional requirement(s) met: 14			

Test Case ID: 9		Test Purpose: To check that the app meets functional requirement 15.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. The steps 1-8 in test case 7 must be followed first before performing this test.			
Test Case Steps: Ensure that users can delete new recordings.			
Step No	Procedure	Response	Pass/Fail
1	Click on the 'x' icon next to the first item in the recording list 'Consent Recording' audio file.	A pop up window is displayed asking user to confirm that they want to delete the consent recording.	Pass

2	Click 'Yes' in the pop up window	The pop up window is closed and the 'Consent Recording' file is deleted and removed from the new recordings list. A new pop up window is also displayed informing the user that they have to first record an audio file containing each users consent. The text below the recording button changes to from 'Record' to 'Consent'.	Pass
3	Click on the 'x' icon next to the video recording name 'Recording 2'.	A pop up window is displayed asking the user to confirm if they want to delete the Recording.	Pass
4	Click 'OK' in the pop up window.	The pop up window is closed and the recording file is deleted and removed from the new recordings list.	Pass
Comments:			
Related Tests: 7			
Functional requirement(s) met: 15			

Test Case ID: 10		Test Purpose: To check that the app allows users to delete a new recording they do not wish to save, including the recordings files and the associated metadata	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. The steps 1-14 in test case 7 must be followed first before performing this test.			
Test Case Steps: Delete a new recording before saving, along with all the recording files and the associated metadata.			
Step No	Procedure	Response	Pass/Fail
1	Click the back arrow located in the top left corner.	A pop up window is displayed asking user to confirm that they wish to return to the list of recordings and lose all unsaved data.	Pass
2	Click 'Yes' in the pop up window.	The pop up window is closed and the 'My Recordings' screen is displayed.	Pass
Comments:			
Related Tests: 7			
Functional requirement(s) met: N/a			

Test Case ID: 11		Test Purpose: To check that the app meets functional requirements 16, 17, 18 & 20.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: All of the steps in test case 7 need to be followed before performing this test as the email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system, and the 'My Recordings' screen must be displayed.			
Test Case Steps: View saved recordings and their associated metadata.			
Step No	Procedure	Response	Pass/Fail
1	Click on the recording named 'save test 2'.	The 'RecordingOverview' activity screen is displayed. This screen presents the user with information about the recording, such as the number of video (1) and audio (2) files recorded along with the recording title. By default the audio files are displayed to the user as the file format switch located near the top of the screen is set to 'audio'.	Pass
2	Click on the text 'video files' in the switch located near the top of the screen.	All video files are now displayed in the list of recordings.	Pass
3	Click on the text 'Additional Information'.	The 'RecordingOverviewAddInfo' screen is displayed, containing all the metadata associated with the saved recording.	Pass
4	Change the text in the first text box from 'test topic' to 'new test topic'.	The text in the first textbox changes from 'test topic' to 'new test topic'.	Pass
5	Click on the checkbox labelled 'Family Member(s)'.	The checkbox labelled 'Family Member(s)' renders a tick to show it is selected.	Pass
6	Click the back arrow located in the top left corner.	A pop up is displayed asking the user if they wish to save changes made to their metadata.	Pass
7	Click 'Yes' in the pop up window.	The pop up window is closed and the 'RecordingOverview' screen is displayed.	Pass
8	Click on the text 'Additional Information'.	The 'RecordingOverviewAddInfo' screen is displayed, containing all the changes 'new test topic' and the checkbox 'Family Member(s)'.	Pass
9	Click the back arrow located in the top left corner.	The 'RecordingOverview' screen is displayed.	Pass
10	Click on the text 'Upload to Corpus'.	A pop up is displayed asking to confirm if the user wants to upload	Pass

		the recording to the corpus as they will not be able to change any metadata after they do so.	
11	Click 'Yes' in the pop up window.	The pop up closes and another pop up is displayed informing the user that the upload was successful.	Pass
12	Click 'OK' in the pop up window.	The pop up window closes and text views 'Additional Information' and 'Upload to Corpus' are displayed and render in a grey colour.	Pass
Comments: It can be seen in screen shot one that the user is able to save two recordings with the same name. This is may be a potential bug with the server as it accepts two recordings with the same name, and will be reported to the relevant personal as a result of this testing.			
Related Tests: 7			
Functional requirement(s) met: 16,17,18 & 20.			

Test Case ID: 12		Test Purpose: To check that the app meets functional requirement 19.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. All of the steps in test case 7 must be followed first before performing this test.			
Test Case Steps: Play/pause saved recording files.			
Step No	Procedure	Response	Pass/Fail
1	Click the recording labelled 'save test 2'.	The 'RecordingOverview' activity screen is displayed. This screen presents the user with information about the recording, such as the number of video (1) and audio (2) files recorded along with the recording title. By default the audio files are displayed to the user as the file format switch located near the top of the screen is set to 'audio'.	Pass
2	Click the play icon located next to 'Recording 1'	The icon does not change and no audio is played. See comments section of test for explanation.	Fail
Comments: The app currently cannot stream audio/video files from the server. This is to do with a 403-forbidden error returned from the server, meaning that it is denying the app permission to access the media files stored on it. I have worked closely with the IOS app developer who has access to the server's code for several days to identify the problem, but were unable to resolve it. When a user logs into the system the server creates an instance of that user, and when a user requests access to a file the server checks whether that instance exists, and if so grants permission to access the file. The issue is that when a user logs in using the Android app an			

instance is a created but when file access is requested the instance no longer exists, and so permission to access the file is denied. The supervisory team and the CorCenCC team are aware of the issue, but as further investigation requires debugging and access to the server's code it is outside of this dissertation projects scope. It is for these reasons it has been agreed the issue will be resolved as part of future work for the CorCenCC android app.
Related Tests: 7
Functional requirement(s) met: 19 was not met.

Test Case ID: 13		Test Purpose: To check that the app meets functional requirement 21.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. All the steps in test case 6 must be followed first before performing this test.			
Test Case Steps: View details about the CorCenCC project.			
Step No	Procedure	Response	Pass/Fail
1	Click the on the drop-down menu in the top right hand corner.	A menu is opened containing a list of items.	Pass
2	Click item in the menu labelled 'About'.	The 'About' activity screen is displayed containing information about the CorCenCC project.	Pass
3	Click the back arrow located in the top left hand corner of the screen.	The 'My Recording' screen is displayed.	Pass
Comments:			
Related Tests: 6			
Functional requirement(s) met: 21.			

Test Case ID: 14		Test Purpose: To check that the app meets functional requirement 22 & 23.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. All the steps in test case 6 must be followed first before performing this test.			
Test Case Steps: Ensure that user can view account details and change the language of the app.			
Step No	Procedure	Response	Pass/Fail
1	Click the on the drop-down menu in the top right hand corner.	A menu is opened containing a list of items.	Pass
2	Click item in the menu labelled 'Settings'.	The 'Settings activity screen is displayed containing account information and the current language(English) is shown by the tick mark placed next to the item in the list name 'Language (iaith)'.	Pass

3	Click on the list item labelled 'Welsh (Cymraeg)'.	A pop up is displayed asking the user if they wish to change their language to Welsh.	Pass
4	Click 'Yes' in the pop up window.	The pop up window is closed. A new pop up window is displayed informing the user in new language that the update has been successful.	Pass
5	Click 'lawn' in the pop up window.	The pop up window is closed and app's language is now changed and all text now displays in Welsh.	Pass
6	Click the back arrow in the top left hand corner of the screen.	The 'My Recordings' screen is now displayed with all text rendering in Welsh.	Pass
Comments:			
Related Tests: 6			
Functional requirement(s) met: 22 & 23.			

Test Case ID: 15		Test Purpose: To check that the app meets functional requirement 24.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. All the steps in test case 6 must be followed first before performing this test.			
Test Case Steps: Ensure that users can change their password.			
Step No	Procedure	Response	Pass/Fail
1	Click the on the drop-down menu in the top right hand corner.	A menu is opened containing a list of items.	Pass
2	Click item in the menu labelled 'Settings'.	The 'Settings activity screen is displayed containing account information.	Pass
3	Enter "corey123" into the textbox containing the words 'New Password'.	8 * characters appear in the 'New Password' textbox.	Pass
4	Enter "corey123" into the textbox containing the words 'Repeat Password'.	8 * characters appear in the 'Repeat Password' textbox. The text 'Update Password' is now enabled and changes colour from grey to blue.	Pass
5	Click on the text 'Update Password'.	A pop up window is displayed informing the user that their password has been changed and they are going to be logged out of the system.	Pass

6	Click 'OK' in the pop up window.	The user is logged out of the system and the 'Login' activity screen is presented.	Pass
7	Enter 'mitchellwatson21@hotmail.co.uk' into the email address textbox.	The email address textbox contains the text 'mitchellwatson21@hotmail.co.uk'.	Pass
8	Enter 'corey123' into the password textbox.	The password textbox now contains the text 'corey123' and displays eight * characters.	Pass
9	Click on the 'Login' text.	The 'My Recordings' screen is displayed and the user is now logged into the app.	Pass
Comments:			
Related Tests: 6			
Functional requirement(s) met: 24			

Test Case ID: 16		Test Purpose: To check that the app meets functional requirement 25.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The email account 'mitchellwatson21@hotmail.co.uk' must already be logged into the system. All the steps in test case 6 must be followed first before performing this test.			
Test Case Steps: Ensure that users can change their registered email address.			
Step No	Procedure	Response	Pass/Fail
1	Click the on the drop-down menu in the top right hand corner.	A menu is opened containing a list of items.	Pass
2	Click item in the menu labelled 'Settings'.	The 'Settings activity screen is displayed containing account information.	Pass
3	Enter "tracywatson0@gmail.com" into the first textbox containing 'mitchellwatson21@gmail.com'.	The first textbox contains the text "tracywatson0@gmail.com". The text 'Update Email' is now enabled and changed from a grey to a blue colour.	Pass
4	Click the text 'Update Email' text.	A pop up window is displayed informing the user that the email address has been updated. An email has now been sent to the user asking them to confirm the change of email.	Pass
5	Click 'OK' in the pop up window.	This closes the pop up window, logs the user out of the system the 'Login' activity screen is displayed.	Pass

6	Open the email sent to new email address and click on the link provided.	You are presented with a screen that confirms the new email address is now registered.	Pass
7	Enter the new email address 'tracywatson0@gmail.com' into the first textbox in the 'Login' activity screen.	The first textbox now contains the text 'tracywatson0@gmail.com'.	Pass
8	Enter the password "corey123" into the second textbox in the 'Login' activity screen.	The second textbox now contains the text "corey123" and displays 8 * characters.	Pass
9	Click on the text 'Login'.	The user is now logged into the account and the 'My Recordings' page is displayed.	Pass
10	Click the on the drop-down menu in the top right hand corner.	A menu is opened containing a list of items.	Pass
11	Click item in the menu labelled 'Settings'.	The 'Settings activity screen is displayed and the new email address is shown in the email address textbox.	Pass
Comments:			
Related Tests: 6			
Functional requirement(s) met: 25			

Test Case ID: 17		Test Purpose: To check that the app meets functional requirement 26.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The user must be logged out of their account and opened the CorCenCC app.			
Test Case Steps: Ensure that users can reset their password.			
Step No	Procedure	Response	Pass/Fail
1	Enter 'tracywatson0@gmail.com' into the email address textbox.	The email address textbox contains the text 'tracywatson0@gmail.com'.	Pass
2	Click the on the text 'Forgot Password?'.	A pop up is displayed informing the user that their password has been reset and they can access the temporary password in the email that was just sent to their account.	Pass
3	Click 'OK' in the pop up window.	The pop up window is closed and the 'Login' activity screen is displayed.	
4	Open the email sent the account 'tracywatson0@gmail.com'.	The email contains the new temporary password for the account 'tracywatson0@gmail.com'.	Pass

5	Enter the temporary text "D1Vfkt07" into the password textbox.	The password textbox now contains the text "D1Vfkt07" and displays 8* characters.	Pass
6	Click the text 'Login'	The user is now logged in and the 'My Recordings' screen is displayed. A pop up is also displayed suggesting that the user change the temporary password.	Pass
7	Click 'OK' in the pop up window.	The pop up window closes.	Pass
Comments:			
Related Tests:			
Functional requirement(s) met: 26			

Appendix C -Test Cases IOS

CorCenCC Crowdsourcing Application Test Flight Test Cases

The following is a list of test cases that should be able to be worked through in order and completed successfully to ensure that the functionality of the CorCenCC Crowdsourcing Application for iOS is working as it should. Please work through the test cases and contact Steve Neale (NealeS2@cardiff.ac.uk) to report any problems.

Registering and Logging In

- Click the flag icon to change the initial language to English.
- Click 'Register'.
- Enter an email address and a password (twice) and then click 'Register'.
- Click 'Continue' at the bottom of the 'CorCenCC Permissions' page.
- Click 'Agree' at the bottom of the 'CorCenCC Consent Form'.
 - You should have received a confirmation email at the address you used to register.
 - The app will revert back to the 'Login' page.
- Click on the link in the email you received.
- Back on the app, enter your email address and password, and click 'Login'.
 - If you try to do this before clicking on the link in the email, you will be notified that you need to do that first.
- You should now be logged into the app, and will see a message about having to complete your profile in order to continue. Click 'OK' and you will now be on the 'My Profile' page.

Completing Your Profile

- Go to the 'My Profile' page and complete the fields there:
 - Type in your first name.
 - Type in your surname.
 - Use the scrolling wheel to select your year of birth.
 - Click on your gender.
 - Use the scrolling wheel to select where you live.
 - Click on the answer most appropriate to describe your occupation.
 - If you selected that you are 'Employed / Retired / Short-term unemployed', type in the full title of your main job.
 - Select which regions of Wales have most influenced the way you speak Welsh. You can click on as many options as you want for this question.
 - If you select the 'Other' option, enter something in the textfield provided.
 - Click on the answer most appropriate to describe how much of your communication generally happens in Welsh.
 - Click to go to a list of options for where you have developed your Welsh language skills.
 - Select which of the options have been important in developing your Welsh language skills. You can click on as many options as you want for this question.
 - If you select the 'Other' option, enter something in the textfield provided.
 - When you are finished, press 'Back' on the top-left of the screen to go back to the main 'My Profile' page.
 - Click to go to a list of options for how you would describe your Welsh.
 - Click on the answer most appropriate to describe your Welsh.
 - When you are finished, press 'Back' on the top-left of the screen to go back to the main 'My Profile' page.
 - Click on whether you would describe yourself as a learner of Welsh ('Yes' or 'No').

- If you ticked yes, type the level of your most recent Welsh course.
 - Click on the box if you would like to be added to the project mailing list.
- Click on the 'Save Profile' button at the bottom of the page, or click on any of the tabs along the bottom of the screen to try and move to another page.
 - If you entered 'Other' for the questions about 'Which regions of Wales have influenced your Welsh' or 'Where did you develop your Welsh', but you did not enter anything in the textfields, you will be shown a message telling you that a description is required for 'Other'. Clicking 'OK' will return you to the 'My Profile' page.
 - If you have changed any of the fields on the 'My Profile' page as described above:
 - If you clicked the 'Save Profile' button:
 - You will be shown a message telling you that the changes made to your profile were saved.
 - If there is still some outstanding information, you will be shown a message telling you which fields are still to be completed and asked whether you want to save the information changed so far.
 - If you clicked on one of the tabs along the bottom of the screen to try to move to another page:
 - you will be shown a message telling you that your profile information has been changed and asking if you would like to save it.
 - Click 'No' to return to the 'My Profile' page and to keep updating the information.
 - Click 'Yes' to save your profile. You will be shown a message telling you that the changes made to your profile were saved.
 - If there is still some outstanding information, you will be shown a message if and when you navigate to the 'My Recordings' page stating that your profile is not complete. Clicking 'OK' will return you to the 'My Profile' page to complete the missing information.

Changing Settings (Language, Email Address and Password)

- Click on the 'Settings' tab at the bottom of the screen to move to the 'Settings' page.
- Click on 'Welsh' and click 'Yes' on the message that appears to change the language to Welsh.
 - Notice that the language on the page and the tabs has been changed to Welsh. Click on the 'Profile' tab (now called 'Proffil') to see that other pages have been changed as well.
 - Click on the 'Settings' tab ('Gosodiadau' in Welsh) to go back to the 'Settings' page, and return the language to English.
- Enter a new password under the 'Password' heading. Enter the password again in the second textfield to make the 'Update Password' button go live. Click the 'Update Password' button.
 - A message will appear to notify you that your password has been updated, and you will be logged out of the app.
- Use your new password to log back into the app.

Logging Out of the App

- Click on the 'Logout' tab at the bottom of the screen to bring up a message asking if you want to log out of the app.
- Click no to return to the previous page – click yes to return to the 'Login' page.

Resetting a Forgotten Password

- Click on the 'Forgot Password?' button on the 'Login' page to reset a password.
 - If you had not entered your email address on the 'Login' page when you clicked the 'Forgot

- Password?' button, a message will appear telling you that this is a requirement.
 - If you had entered your email address when you clicked the 'Forgot Password?' button, a message will appear telling you that a new password has been generated for you and sent to you in an email.
- Use the temporary password in the email you received to log into the app.
 - Assuming your profile is still incomplete, the default ('My Recordings') page will show you a message telling you that your profile must be completed, and then take you to the 'My Profile' page. On this page, the 'About' page and the 'Settings' page, you will be shown a message telling you that you are using a temporary password and to change it as soon as possible. In the event that your profile is completed, the message would be shown on the 'My Recordings' section as well.
- Go to the 'Settings' page and change your password.

Making a Recording

- Click on the 'Recordings' tab at the bottom of the screen to go to the 'My Recordings' page.
- Click 'Make a Recording' at the bottom of the page.
- Click the 'Add Recording' button in the middle of the page.
- You will be shown a message asking that a short recording be made where all participants clearly identify themselves and state that they agree to being recorded. Click 'OK' to continue.
- Click the big red 'CONSENT' button to add a short audio recording, where you and anybody else with you would state your name and that you give consent to be recorded. Click the button again to stop recording.
 - You will be shown a message thanking you for giving consent and instructing you that you can now record your Welsh language conversation. Click 'OK' and you will see that the 'Consent Recording' is now at the top of the list that makes up the bulk of the page.
- Click the big red 'RECORD' button to begin making an audio recording. Click the button again to stop recording.
- The recording now appears below the consent recording on the list that makes up the bulk of the page. Click on the play icon to the left of the recording's name to listen to the audio recording.
- Click on the green slider to change the input type to 'Video', then click the 'RECORD' button again to open the video recording screen. Click on the big red button to start recording a video, and click the button again to stop the recording. Press the triangle button to watch the recorded video back, press 'Retake' to try again, or press 'Use Video' to indicate that you are happy with the video and to go back to the previous page.
- The video recording appears next on the list, including a thumbnail. Click the play icon to the left of the recording's name to load up a video player to view the recording.
- Record one more video, then switch the green slider icon back to 'Audio' and make a further two audio recordings. You should now have 6 recordings – 1: consent recording (audio), 2: audio, 3: video, 4: video, 5: audio, 6: audio.
- Click back in the top left corner of the screen. Notice that the label under the 'Add Recording' button tells us that there are 6 files recorded.
 - If you try to press back again, you will be shown a message warning you that you have unsaved audio and/or video files, and that going back (pressing 'Yes') will delete these. Press 'No' in order to continue working on the recording.
- Click 'Add Recording' to go back to the list of recordings.
- View and listen to the recordings again to ensure that they are still the same ones.
- Click on the 'X' to the right of the third (first video) and fifth (second audio, not including the consent recording) recordings names to delete them. There should now be 4 recordings: 1: consent recording (audio), 2: audio, 3: video (the second one originally recorded), 4: audio (the last one originally recorded).
 - When you click on the 'X' next to a recording, you will be shown a message asking if you are

- sure that you want you to delete it. Click 'Yes' to continue with the deletion.
- View and listen to the three remaining recordings again to ensure that they are the correct ones (and that the correct ones were deleted).
- Click back in the top left corner of the screen. Notice that the label under the 'Add Recording' button tells us that there are 4 audio and/or video files recorded.
- Click on the '+ Additional Information' button to enter some additional metadata about the recording:
 - Type in the topic(s) of the recording, separated by commas if more than one.
 - Type in a setting for the recording.
 - Select who was involved in the recording. You can click on as many options as you want for this question.
 - If you select the 'Other' option, enter something in the textfield provided.
 - Optionally, type in any additional information that you think might be useful.
- Click back in the top left corner of the screen.
- Click on 'Save Recording'
 - If you did not fill in the metadata categories ('+ Additional Information'), you will be shown a message telling you that this needs to be done.
- You will be shown a message asking you to enter a name for the recording. Enter a name and then click 'OK'. You will then be taken to the 'Save' page.
- Assuming the progress bar gets to 100%, the label on the page will say 'Your recording has been saved' and the 'Done' button at the bottom of the page will become active. Click on the 'Done' button to return to the 'My Recordings' main page.
- You will now see the recording you added at the top of the list. Click on the recording to view it in more detail.
- Use the 'Audio/Video' toggle to switch between the audio and video files that you recorded, and play them to check that they are all working properly.
- Click on the 'Additional Information' button just below the 'Audio/Video' toggle to move to a page where the additional metadata for the recording can be tweaked (you should see that the fields are already completed with the information you used when you first saved the recording):
 - You can type in the topic(s) of the recording, separated by commas if more than one.
 - You can type in a setting for the recording.
 - You can select who was involved in the recording. You can click on as many options as you want for this question.
 - If you select the 'Other' option, enter something in the textfield provided.
 - Optionally, you can type in any additional information that you think might be useful.
- Press back in the top left corner of the screen to go back to the main page of the recording in question.
 - If you changed any of the additional information, you will be shown a message stating that the information has been changed and asking if you want to save the changes. Click 'Yes' to save the changes or 'No' on editing the information.
 - If you clicked 'Yes', you will be shown a message confirming that the additional information for this recording has been updated.
- Back on main page for the recording in question, click 'Upload to Corpus' to officially contribute the entry to CorCenCC (we will not actually use any of the uploads made during this testing in the corpus).
 - You will be shown a message explaining that the recording is now going to be uploaded for inclusion in the corpus, and that this is final (subject to a 50 day window). Click 'Yes' to complete the upload of this recording to the corpus.
 - You will be shown a message stating that the recording was successfully uploaded to the corpus. Notice that the 'Additional Information' button and the 'Upload to Corpus' button are now greyed out, as no more information about a recording can be tweaked following an upload.

Appendix D – Erroneous Test Cases

Test Case ID: 18		Test Purpose: To check the user cannot log into the app with incorrect details.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The CorCenCC Android app must be opened.			
Test Case Steps: Ensure that users cannot log in with incorrect data.			
Step No	Procedure	Response	Pass/Fail
1	Click the 'Login' textview.	A pop up window is presented to the user informing them that they are missing details.	Pass
2	Click 'OK' in the pop up window.	The pop up window closes.	Pass
3	Enter 'tracywatson0@gmail.com' into the email address textbox	The text 'tracywatson0@gmail.com' is displayed in the email address textbox.	Pass
4	Enter 'incorrectpassword' into the password textbox.	The password textbox contains the text 'incorrectpassword' and renders * characters.	Pass
5	Click the 'Login' textview.	A message is presented to the user informing them that they have provided incorrect details	Pass
Comments:			
Related Tests:			

Test Case ID: 19		Test Purpose: To check the user cannot register with an invalid email address.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The CorCenCC Android app must be opened.			
Test Case Steps: Ensure app does not allow users to register with an unrecognised email address.			
Step No	Procedure	Response	Pass/Fail
1	Click the 'Register' textview.	The 'Register' activity screen is displayed.	Pass
2	Enter 'fakeemailaddress' into the first textbox.	The first textbox contains the text 'fakeemailaddress'	Pass
3	Enter 'password' into the textbox labelled 'Password'.	The 'Password' textbox contains the text 'password' and renders * characters.	Pass
4	Enter 'password' into the textbox labelled 'Repeat Password'.	The 'Repeat Password' textbox contains the text 'password' and renders * characters.	Pass
5	Click the 'Register' textview.	A pop up window is presented to the user informing them that they have provided an invalid email address.	Pass

6	Click 'OK' in the pop up window.	The pop up window and the 'Register' screen is displayed.	
Comments:			
Related Tests:			

Test Case ID: 20		Test Purpose: To check the user cannot resend a password using an invalid email address.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The CorCenCC Android app must be opened.			
Test Case Steps: Ensure app does not allow users to resend passwords to invalid email address.			
Step No	Procedure	Response	Pass/Fail
1	Enter 'invalidemail' into the email address textbox.	The 'Register' activity screen is displayed.	Pass
2	Click the textview 'Forgot Password?'	The first textbox contains the text 'fakeemailaddress'	Pass
3	Click 'OK' in the pop up window.	The 'Password' textbox contains the text 'password' and renders * characters.	Pass
4	Enter 'invalidemail@hotmail.co.uk' into the email address textbox.	The 'Repeat Password' textbox contains the text 'password' and renders * characters.	Pass
5	Click the textview 'Forgot Password?'	A pop up window is presented to the user informing them that they have provided an invalid email address.	Pass
6	Click 'OK' in the pop up window.	The pop up window and the 'Login' screen is displayed.	
Comments:			
Related Tests:			

Test Case ID: 21		Test Purpose: To check a user cannot upload a recording that is missing audio/video files along with mandatory metadata.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The user must be logged into the system and the 'My Recordings' screen must be displayed.			
Test Case Steps: Ensure app does not allow a recording to be saved that is missing crucial data.			
Step No	Procedure	Response	Pass/Fail
1	Click the text 'Make a Recording'	The 'NewRecording' activity screen is displayed.	Pass

2	Click the text 'Save Recording'	A pop up is presented to the user informing them they are missing data that is required before saving the recording.	Pass
3	Click 'OK' in the pop up window.	The pop up window closes and the 'NewRecording' screen is displayed.	Pass
Comments:			
Related Tests:			

Test Case ID: 22		Test Purpose: To check how the app handles incomplete profile information.	
Environment: Using Android Studio emulator running Nexus 5 API 22, 23 & 24.			
Preconditions: The user must be logged into the system and the 'My Profile' screen must be displayed.			
Test Case Steps: Ensure app does not allow a recording to be saved that is missing crucial data.			
Step No	Procedure	Response	Pass/Fail
1	Clear the text from the textbox labelled 'First name'.	The 'First name' textbox is empty.	Pass
2	Clear the text from the textbox labelled 'Surname'.	The 'Surname' textbox is empty.	Pass
3	Clear the text from the 'Job Title' textbox.	The 'Job Title' textbox is empty.	Pass
4	Click on the button labelled 'Where did you develop your Welsh language skills?'	The 'DevelopedWelsh' activity screen is displayed, with the selected options rendering tick marks.	Pass
5	Unselect all options.	None of the options render a tick.	Pass
6	Click the back arrow located in the top left hand corner.	The 'My Profile' screen is displayed with the button 'Where did you develop your Welsh language' containing the text "0 options selected".	Pass
7	Clear the text from the textbox containing the most recent Welsh course.	The textbox for the most recent Welsh course is empty.	Pass
8	Click the textview 'Save Recording'	A message is displayed to the user informing them they are missing information.	Pass
9	Click 'No' in the pop up window.	The pop up window is closed. No changes are made and the 'My Profile' screen is presented to the user.	Pass
Comments:			
Related Tests:			

Appendix E – Usability Survey Questionnaires (Part 1, 2 & 3)

CorCenCC Crowdsourcing App - Part 1

This questionnaire is part of a study of computer and Internet use for the CorCenCC Crowdsourcing App. Your participation in this study is voluntary and your answers will form part of a statistical study and will not identify you as an individual. There is a total of 16 questions. The questionnaire should take around 5-10 minutes to complete.

*** Required**

1. Please enter the code given to you when recruited for the survey. *

2. Which of the following best describes your educational level? *

Mark only one oval.

- ☐ None
☐ Primary School
☐ Secondary School
☐ University

Internet access

3. Which of the following devices do you use to connect to the Internet? *

Check all that apply.

- ☐ Desktop computer
☐ Laptop computer
☐ Tablet computer
☐ Smart phone
☐ Other: _____

4. Which of the following devices do you most prefer to use to connect to the Internet? *

Mark only one oval.

- ☐ Home
☐ Laptop computer
☐ Tablet computer
☐ Smart phone
☐ Other

5. 5. Where do you use the Internet? *

Check all that apply.

- ☐ Home
- ☐ Friend's home
- ☐ Work
- ☐ School
- ☐ Cybercafé
- ☐ Outside
- ☐ Coffee shop
- ☐ Library
- ☐ Other: _____

6. 6. Where are you most often when you use the Internet? *

Mark only one oval.

- ☐ Home
- ☐ Friend's home
- ☐ Work
- ☐ School
- ☐ Cybercafé
- ☐ Outside
- ☐ Coffee shop
- ☐ Library
- ☐ Other

7. 7. How often do you access the Internet? *

Mark only one oval.

- ☐ Once a month or less
- ☐ Once a week
- ☐ Several times a week
- ☐ Every day
- ☐ Several times a day

8. 8. In a typical week, how many hours do you spend online? *

9. 9. In a typical week, do you use the Internet most often for work, for personal reasons, or about an equal amount on both? *

Mark only one oval.

- ☐ Much more often for work
- ☐ Somewhat more often for work
- ☐ About an equal amount for work and personal reasons
- ☐ Somewhat more often for personal reasons
- ☐ Much more often for personal reasons

10. 10. Which of the following activities do you use the Internet for? *

Check all that apply.

- ☐ Use a search engine to find information
- ☐ Send or read e-mail
- ☐ Search for a map or driving directions
- ☐ Check the weather
- ☐ Get news
- ☐ Go online just for fun or to pass the time
- ☐ Buy or sell a product
- ☐ Watch a video on a video-sharing site such as YouTube
- ☐ Use a social networking site such as Facebook, LinkedIn or Google Plus
- ☐ Make travel bookings
- ☐ Do online banking
- ☐ Send instant messages
- ☐ Download music files
- ☐ Rate a product, service or person using an online rating system
- ☐ Play online games
- ☐ Categorize or tag online content like a photo, news story or blog post
- ☐ Post comments to an online news group, website, blog or photo site
- ☐ Make a phone call online using a service such as Skype

11. 11. If you could use the Internet for only one of the following activities, which activity would you choose? *

Mark only one oval.

- ☐ Use a search engine to find information
- ☐ Send or read e-mail
- ☐ Search for a map or driving directions
- ☐ Check the weather
- ☐ Get news
- ☐ Go online just for fun or to pass the time
- ☐ Buy or sell a product
- ☐ Watch a video on a video-sharing site such as YouTube
- ☐ Use a social networking site such as Facebook, LinkedIn or Google Plus
- ☐ Make travel bookings
- ☐ Do online banking
- ☐ Send instant messages
- ☐ Download music files
- ☐ Rate a product, service or person using an online rating system
- ☐ Play online games
- ☐ Categorize or tag online content like a photo, news story or blog post
- ☐ Post comments to an online news group, website, blog or photo site
- ☐ Make a phone call online using a service such as Skype

App use

12. 12. What type of phone do you have? *

Check all that apply.

- ☐ Android
- ☐ iPhone
- ☐ Blackberry
- ☐ Other: _____

13. 13. Have you ever used an app to record audio or video files? (e.g. Snapchat / Instagram) *

Mark only one oval per row.

	Never	Occasionally	Monthly	Weekly	Daily
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. 14. If so, which apps did you use?

Leave blank if the answer to Question 13 was "Never".

15. 15. If so, what three things did you like about your favourite app?

Leave blank if the answer to Question 13 was "Never".

16. 16. If so, what three things did you dislike about your least favourite app?

Leave blank if the answer to Question 13 was "Never".

CorCenCC Crowdsourcing app - Part 2

This questionnaire is part of a usability study. Your participation in this study is voluntary and your answers will form part of a statistical study and will not identify you as an individual. There is a total of 15 questions. The questionnaire should take around 10-20 minutes to complete.

*** Required**

1. 1. Please enter the code given to you when recruited for the survey. *

2. 2. Register an account. *

Were you able to do it? (Mark only one circle)
Mark only one oval.

☐ Yes

☐ No

3. 3. Log into the account you just registered with. *

Were you able to do it? (Mark only one circle)
Mark only one oval.

☐ Yes

☐ No

4. 4. Add and save profile information about yourself. *

Were you able to do it? (Mark only one circle)
Mark only one oval.

☐ Yes

☐ No

5. 5. Make a new recording session. *

Were you able to do it? (Mark only one circle)
Mark only one oval.

☐ Yes

☐ No

6. 6. Append an audio recording to the new recording. *

Were you able to do it? (Mark only one circle)
Mark only one oval.

☐ Yes

☐ No

7. 7. Play the audio recording you just appended to the recording session. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

8. 8. Append a video recording to the recording session. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

9. 9. Play the video recording you just appended to the recording session. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

10. 10. Add 'Additional Information' to the recording session. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

11. 11. Save the recording session. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

12. 12. Change the 'Additional Information' about a saved recording. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

13. 13. Upload a saved recording to the Corpus. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

14. 14. Change the language from English to Welsh. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

15. 15. Log out of your account. *

Were you able to do it? (Mark only one circle)

Mark only one oval.

☐ Yes

☐ No

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CorCenCC Crowdsourcing App - Part 3

This questionnaire is part of a usability study. Your participation in this study is voluntary and your answers will form part of a statistical study and will not identify you as an individual. There is a total of 19 questions. The questionnaire should take around 5-10 minutes to complete.

* Required

1. 1. Please enter the code given to you when recruited for the survey. *

General usability

2. 2. I think that i would like to use this app frequently. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. 3. I found the app unnecessarily complex. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. 4. I thought the app was easy to use. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. 5. I think that I would need the support of a technical person to be able to use this app. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. 6. I found the various functions in this app were well integrated. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. 7. I thought there was too much inconsistency in this app. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. 8. I would imagine that most people would learn to use this app very quickly. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. 9. I found the app very cumbersome to use. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. 10. I felt very confident using the app. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. 11. I needed to learn a lot of things before I could get going with this app. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

User perception

12. 12. I was able to easily find my way around the app to complete the tasks. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. 13. I was able to easily find my way around the app to get the information I was looking for. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. 14. I like the overall layout of the app. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. 15. I like the overall presentation of the app. *

Mark only one oval per row.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appropriateness in the context of recording files containing spoken conversations

16. 16. Would you recommend the app to a friend, colleague or family member who speaks Welsh. *

Mark only one oval.

- ☐ Yes
☐ No

17. 17. What personal information do you think is stored by the app? *

18. 18. Were you concerned about the privacy or security regarding the app use? *

Mark only one oval.

☐ Yes

☐ No

19. 19. Would you like to be able to delete saved recordings and/or their associated audio/video files? *

Mark only one oval.

☐ Yes

☐ No

20. 20. Would you like to be able to sign into the app using a social media account? (e.g Facebook) *

Mark only one oval.

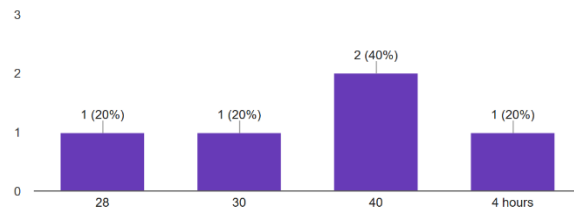
☐ Yes

☐ No

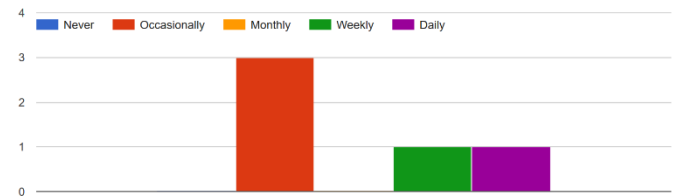
21. 21. Any other comments?

Appendix F – Questionnaire 1 Graphs

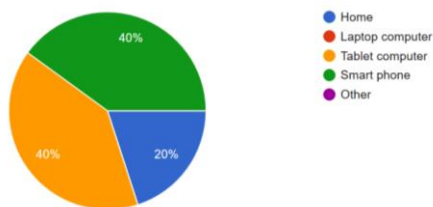
In a typical week, how many hours do you spend online? (5 responses)



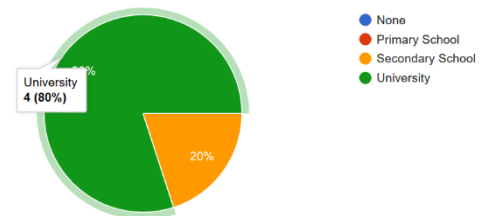
13. Have you ever used an app to record audio or video files? (e.g. Snapchat / Instagram)



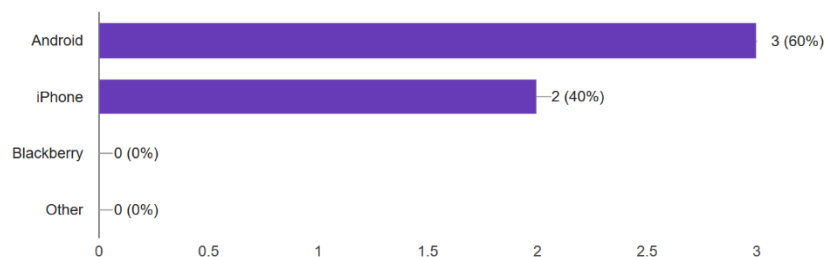
4. Which of the following devices do you most prefer to use to connect to the Internet? (5 responses)



Which of the following best describes your educational level?

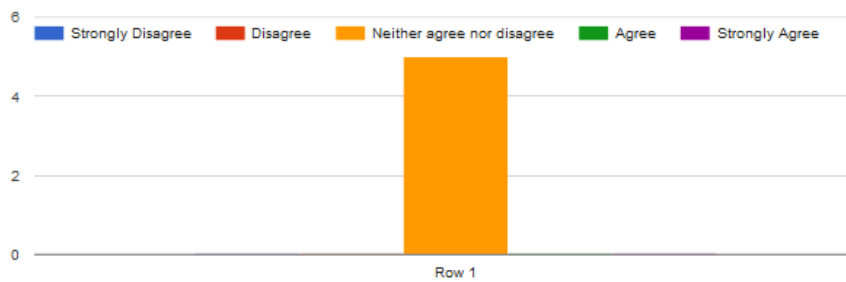


12. What type of phone do you have? (5 responses)

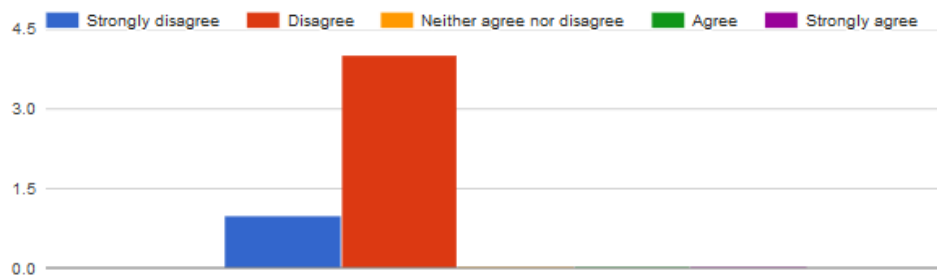


Appendix G – Questionnaire 3 Graph Results

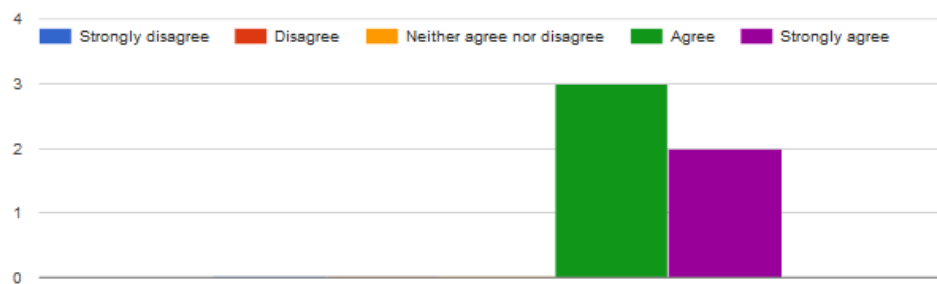
2. I think that i would like to use this app frequently.



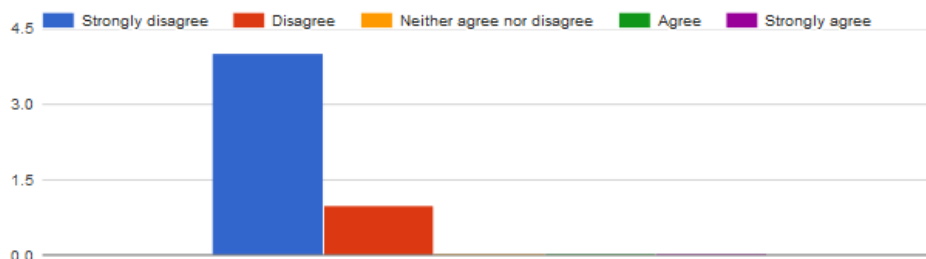
3. I found the app unnecessarily complex.



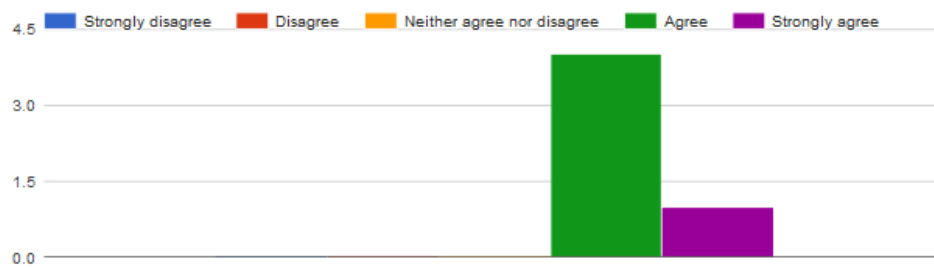
4. I thought the app was easy to use.



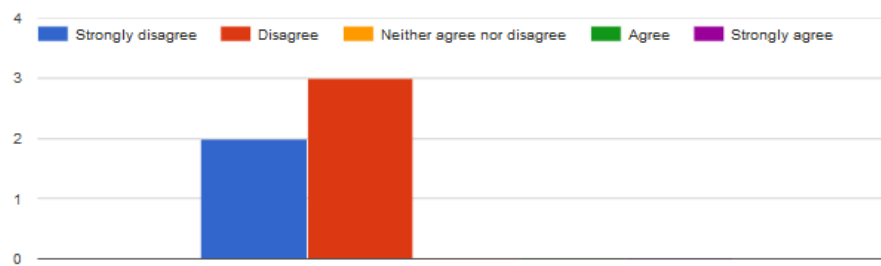
5. I think that I would need the support of a technical person to be able to use this app.



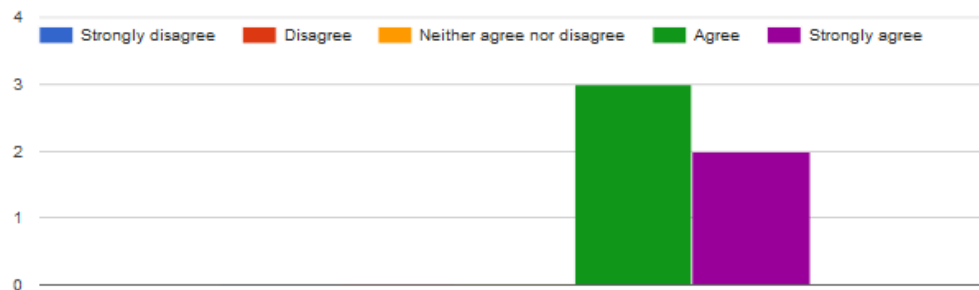
6. I found the various functions in this app were well integrated.



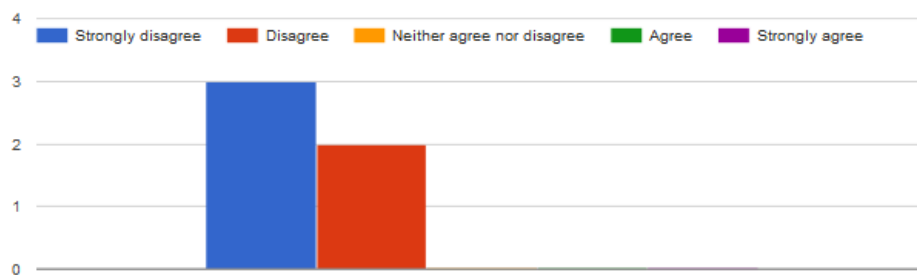
7. I thought there was too much inconsistency in this app.



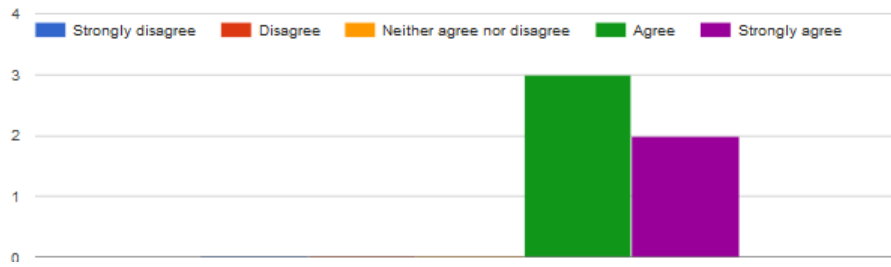
8. I would imagine that most people would learn to use this app very quickly.



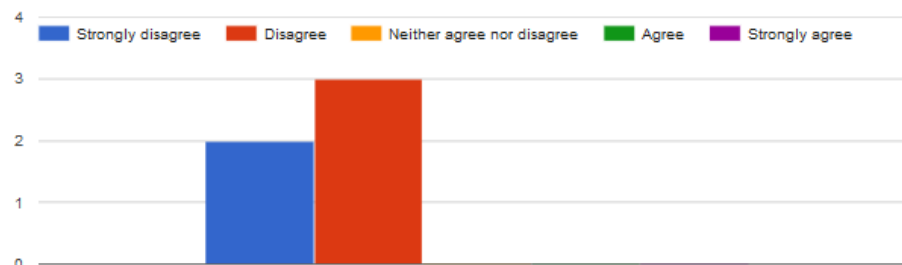
9. I found the app very cumbersome to use.



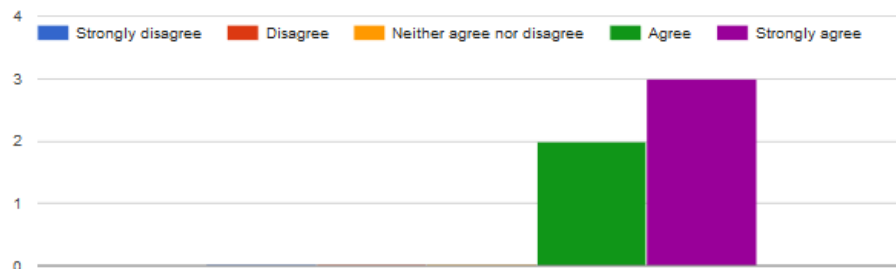
10. I felt very confident using the app.



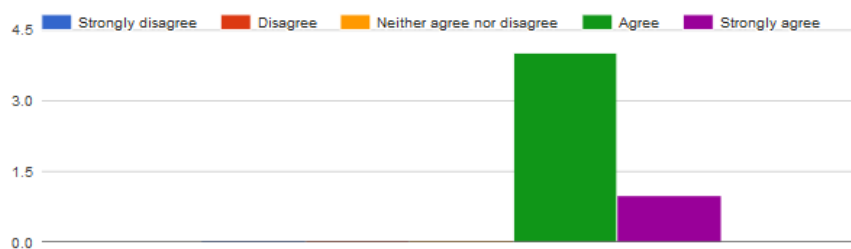
11. I needed to learn a lot of things before I could get going with this app.



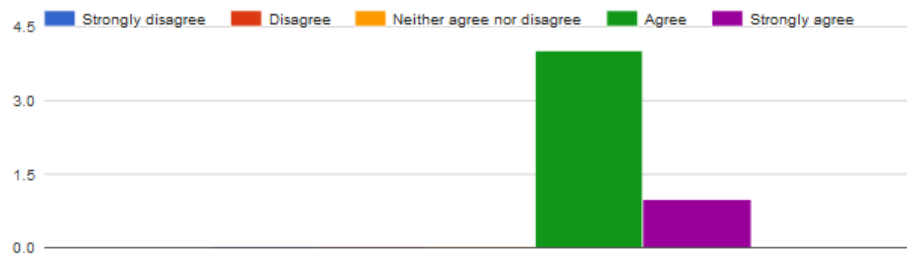
12. I was able to easily find my way around the app to complete the tasks.



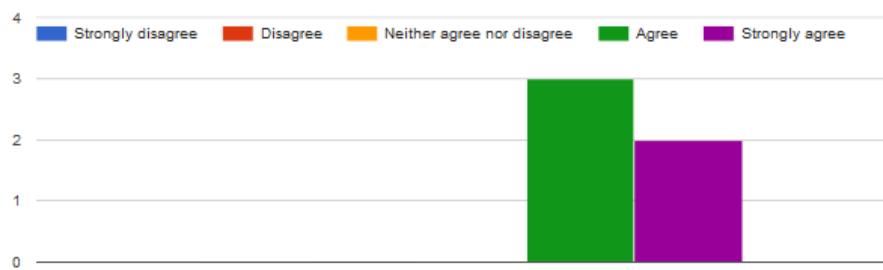
13. I was able to easily find my way around the app to get the information I was looking for.



14. I like the overall layout of the app.



15. I like the overall presentation of the app.



Bibliography

- Android. (2016a). *Providing Proper Back Navigation | Android Developers*. [online] Available at: <https://developer.android.com/training/implementing-navigation/temporal.html> [Accessed 5 Apr. 2017].
- Android. (2016b). *Requesting Permissions at Run Time | Android Developers*. [online] Developer.android.com. Available at: <https://developer.android.com/training/permissions/requesting.html> [Accessed 8 Apr. 2017].
- Bevan N, Barnum C, Cockton G, Nielsen J, Spool J, Wixon D. (2003). The "magic number 5": Is it enough for web testing? 2003 Presented at: The CHI 2003 Conference on Human Factors in Computing Systems; Fort Lauderdale, FL p. 698-699. [CrossRef]
- Brooke J. (1996). SUS: A quickdirty usability scale. In: Jordan PW, Thomas B, Weerdmeester BA, editors. Usability Evaluation in Industry. London , UK: Taylor & Francis.
- Ducrohet, X; Norbye, T; Chou, K (May 15, 2013). Android Studio: An IDE built for Android. [Blog] *Android Developers Blog*. Available at: <https://android-developers.googleblog.com/2013/05/android-studio-ide-built-for-android.html> [Accessed 10 Apr. 2017].
- Google. (2014a). Introduction-Goals. [online] Available at: <https://material.io/guidelines/#introduction-goals> [Accessed 6 Apr. 2017].
- Google. (2014b). Introduction-Principles. [online] Available at: <https://material.io/guidelines/#introduction-principles> [Accessed 6 Apr. 2017].
- GOV (1998). *Data protection - GOV.UK*. [online] Available at: <http://www.legislation.gov.uk/ukpga/1998/29/section/7> [Accessed 01 Mar. 2017].
- Howe, J. (2006). *The Rise of Crowdsourcing*. [online] Wired.com. Available at: <https://www.wired.com/2006/06/crowds/> [Accessed 24 Mar. 2017].
- IDC. (2017). *IDC: Smartphone OS Market Share*. [online] Available at: <http://www.idc.com/promo/smartphone-market-share/os> [Accessed 10 Feb. 2017].
- Leemann A, Kolly M-J, Purves R, Britain D, Glaser E (2016) Crowdsourcing Language Change with Smartphone Applications. PLoS ONE 11(1): e0143060. [online] Available at: <https://doi.org/10.1371/journal.pone.0143060> [Accessed 28 Mar. 2017].
- Nielsen, Jakob (1994). *Usability Engineering*. San Diego: Academic Press ,pp. 115–148
- Nielsen J, Landauer TK. (1993). A mathematical model of the finding of usability problems. New York: ACM; 1993 Presented at: CHI '93 Proceedings of the INTERACT '93 and CHI '93 Conference on Human Factors in Computing Systems; Amsterdam, The Netherlands p. 206-213. [CrossRef]
- Oxford English Dictionary. (2016). Contributors. [online] Available at: <http://public.oed.com/history-of-the-oed/contributors/> [Accessed 28 Mar 2017].
- Retrofit. (2013). *Requesting Permissions at Run Time | Android Developers*. [online] Developer.android.com. Available at: <https://developer.android.com/training/permissions/requesting.html> [Accessed 8 Apr. 2017].

Sauro J, Lewis JR. (2012) Quantifying the User Experience: Practical Statistics for User Research. Burlington, MA: Morgan Kaufmann.

Stellman, A. and Greene, J. (2005). *Applied software project management*. 1st ed. Sebastopol, Calif.: O'Reilly, p.110.

Tullis TS, Stetson JN. (2004) A comparison of questionnaires for assessing website usability. Usability Professional Association Conference. Minneapolis, MN. [online] Available at: <http://home.comcast.net/~tomtullis/publications/UPA2004TullisStetson.pdf> [Accessed 15 Apr. 2017] [[WebCite Cache](#)]