2022 Project Frith

Agile Cycle 3

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Contents

1. Definitions

For the purposes of this report:

API – means Application Programming Interface.

The Project – means Project Frith.

The Client – means the individual Peter Crawt.

The Project Team – means the members of the team developing the project. These members are Sebastian Bailey, Ted Krimmer, Yuk Hei Pak, and Yang Feng.

Security Firm – means a business that provides security services to clients.

Business Owner – means an owner, or a member of a business.

Mobile Application – means a software application that is deployed to and runs on a mobile device.

Dashboard – means a software application to view and manage information

2. Executive Summary

This document contains the process of the technical implementation of the solution dictated in the Initiation document. The solution is digitising current in-place practices in the security field as a smartphone application. It also includes a dashboard for Security Firms and Business Owners.

Application design was explored in the System Interfaces section, where design principles were applied to ensure that the application is successful. Additionally, potential users were considered in the design with the goal of the application being extremely usable and adhering to usability goals. The progress of the application of the technical requirements outlined in Agile Cycle 2 with the current Technical Implementation was completed in the Functionality section. The performance of the Application was tested by using black box and white box testing in Technical Testing. This exposed several discrepancies between the RTM and the Technical Implementation. Client Feedback was gathered through an interview to ensure that the Application was adhering to their expectations, and to provide the Team with the opportunity to rectify components if necessary.

Quality and Compliance compared the Technical Implementation with the Quality and Compliance expectations dictated in the Planning Document as well as showing code samples to demonstrate adherence. A comparative review of the Technical Implementation was conducted, in the Post-development Review, through looking at the Initiation and Planning Reports, to determine the state of the final system regarding the deliverables, requirements, expected benefits for the client and users, client quality expectations, and client acceptance criteria.

Accompanying this report are the User and Reference Manuals. These documents provide an overview of the software, including software composition, troubleshooting, tool setup, implementation, back-end structure, and modification resources. The purpose of these documents is to ensure a smooth handover of all project files and software. This will enable future development of the program as well as enable new users to become acquainted with operating the software.

3. Introduction

This project aims to digitise current practices in the security field to streamline on-the-groundwork requirements, create an easy and simple way of accessing tools, reduce required file management, and offer a reliable method of communication. The purpose of this report is to detail the technical implementation process and adherence to the previous documentation, as well as the program architecture. Ensuring the project closely follows the requirements is imperative to a successful deliverable. This document will provide further information about system interfaces, and the process of adhering to design principles through user mapping and explore best practice development principles and their application in implementation This project aims to digitise current practices in the security field to streamline on-the-groundwork requirements, create an easy and straightforward way of accessing tools, reduce required file management, and offer functionality, discuss best practice testing principles and use them in ensuring the technical deliverables meet expectations in specialised testing, consider how the project meets the quality and compliance requirements dictated in the previous documentation, explain client feedback methodology and the impact, explore user testing to explore areas of improvement, conduct a post-development review through comparing Initiation and Planning Reports against the final system, as well as providing a User and Reference Manual to ensure that the project is smoothly handed over to the Client.

4. System Interfaces

4.1 Design Principles and Usability Goals

4.1.1 Usability Goals

Usability is an important indicator to measure whether a product is easy to use for users, and it is also a necessary condition for the survival of an application (Calongne, 2001). If an application does not meet the Usability goals, users are likely to stop using the application due to its difficult use. Therefore, the Frith application will be designed to achieve the following six main usability goals. In this third Agile development cycle, we have not created any new designs. The team focused on implementation and adjustments. Please refer to pages 6 through 12 of the Project Frith Agile Cycle 2 report.

I. Learn from the first use (Mobile Application)

Ease of learning for new users is a fundamental goal, and the technical solution needs to be very easy to understand and learn on first use. For this goal, we changed the homepage to make the

icons more appropriate and added titles to each menu option (Figure 1). These changes will allow users to better understand how to use the app more easily.

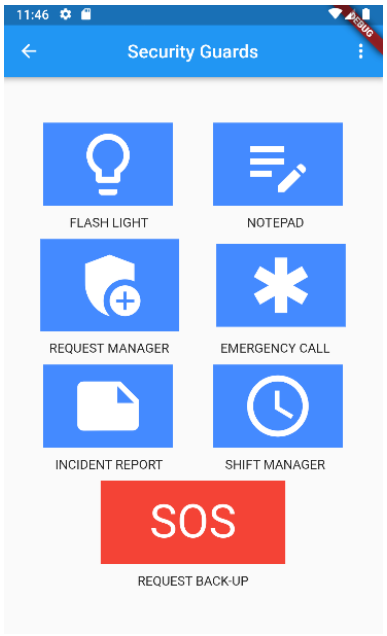

Figure 1

ii. Memorable on repeat uses (Dashboard Application)

Having simple design features and menus will allow users to navigate and use the app each time easily. In the application, both the “Shift manager” and “backup response” screens have been designed to look similar. This will help users to understand the screen once they are familiar with the other without having to learn.

iii. Efficient (Mobile Application)

The list will only show available options for each security guard on the Start/End shift screen Application (Figure 2). This is more efficient than showing every business and location in the database. Having this pre-filled out for the user will save time when starting a shift. Once the user has begun a shift, it will only show that location for when they end their shift. It also means that potential users will find adapting to this new system easier, as actions are reduced to what is necessary. There are no frustrating hurdles, and you can simply tap a button and access the functionality required.

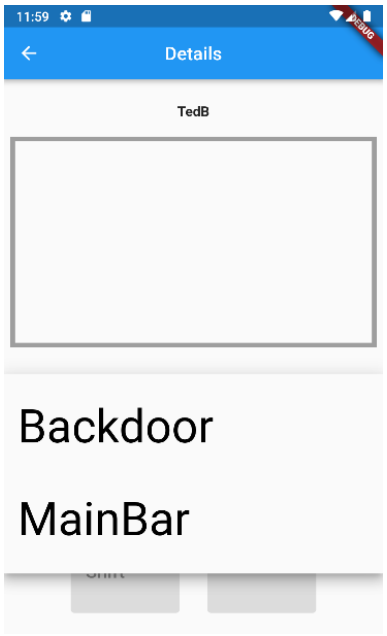

Figure 2

IV. Failure-resistant (Dashboard Application)

Making this application failure-resistant is critical. The main implementation has alerted the user must respond before continuing. This is seen when the user attempts to request a backup. An alert will be displayed before the request is sent. Once the user presses ok, then the request will be sent out. This avoids accidental requests being sent.

V. Forgiving (Mobile)

This application must be forgiving when dealing with user errors. To give you an idea, When the user starts a shift, they must pick a location. If they choose the wrong location, the user can easily swap by selecting the correct location.

VI. Satisfying (Mobile)

For this application to be satisfying, we must ensure all aspects of starting and ending shifts are covered. If the shift has missing information usually known to the employer, it will be frustrating and unsatisfying for the user. In the prototype, we have added all necessary data such as location, date, time, type and two options to start and end shift.

4.2 Don Norman's Design Principles

In the user interface design process, using Don Norman's Design Principles as a guide to design the interface can help developers develop a more user-friendly interface, effectively improving the user experience (Norman, 2013). In this report, we will create the user interface of the Frith mobile application according to Don Norman's design principles of consistency, visibility, feedback, affordance, mapping, and constraints (2013).

4.2.1 Feedback

The feedback principle allows the user to confirm whether an operation was performed successfully or to let the user know what the application is doing. Looking at the application (Figure 3), we have used a new page to inform the user that the request for backup has been sent. This is an easy way to ensure the user understands that the application has confirmed their action. Alternatively, we could

use a message band across the bottom of the screen. However, we believe the method of using an alert needs to be dismissed for being more evident to the users.

If the users have not received this feedback, they may think their request has not been sent. This would cause confusion and frustration. Therefore, a well-designed mobile application cannot do without feedback because only if the interface gives feedback can the user receive the signal and understand the current progress of the application work.

Also, prompt, meaningful, and perceptible feedback can help users understand an action's outcome. First, in Frith's page interaction, the input must be immediate because waiting too long can make the user feel uneasy or even give up and choose other activities. Second, feedback needs to be carefully planned and prioritised, presenting the essential information in an obvious way. To illustrate, the Frith application uses an eye-catching way to deliver crucial signals. On the screen (Figure 3), the user will see a big green tick, which will help the user understand that the process has been recognised and saved by the application.

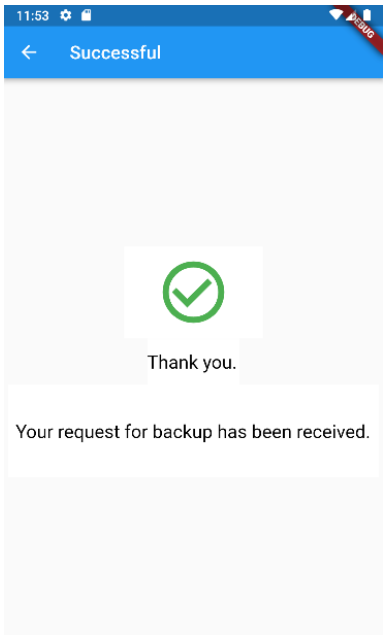

Figure 3

4.2.2 Consistency

Consistency in design reduces the number of users learning new things. The user interface of the Frith application is straightforward, the layout will not contain complicated and cluttered elements, and the colours will be consistent. Similar interfaces maintain similar structures that are easy for users to remember. This is strongly connected with the usability goal of "Learn from the first use". For instance, looking at both the Start/End Shift and the respond to backup screens, we have implemented similar colour-coded buttons for similar actions (Figure 4). These buttons are green for the user to accept/confirm and red for cancel/end.

Elements with similar designs will have similar operations. Each row of information in a list will have the data presented similarly. Looking at the information in the "Backup Respond screen", the data will be shown in order as name, location, time, and status. Once the user selects a backup request, they will move to a new screen. This screen will show the same data again in the same order. This affects the security guard's ability to know how the information will be displayed in this application.

In user interface design, most language, content, colour, layout, theme, and action methods are provided to users consistently, making usage habitual. Also, a consistent design can make users happy to use the interface multiple times because they don't have to spend much effort recalling how various complex pages are used.

Implementing this into our working application has been successful. Most of the screens produced have a similar look and feel.

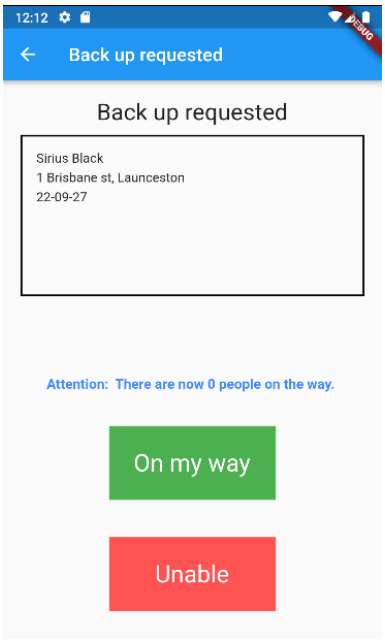

Figure 4

4.2.3 Mapping

Mapping has remained the same for the last cycle report. Please refer to page 10 of the Project Frith Agile Cycle 2 report.

4.2.4 Visibility

Visibility has remained the same for the last cycle report. Please refer to page 10 of the Project Frith Agile Cycle 2 report.

4.2.5 Constraints

Constraints indicate that prototyping can limit the types of interactions that can occur. For example, in this application, users can input certain information. To illustrate this in the design, we have tried to make it as easy as possible when starting and ending shifts. This is done by having drop-down menus for location. This restricts users to only pick available locations to guard.

4.2.6 Affordance

Affordance is enabled by displaying the physical properties of the item, prompting the user on how to manipulate the object. The app uses coloured buttons with icons to look "solid" and stand out from the screen, and people click the button when they see it, so when users see the button on the page, they know they can click here. We have implemented this in several ways for each screen. To give you an idea, the buttons on the “Respond to backup” screen (Figure 5) are coloured green and red. They are also labelled with the message that will be sent.

Users know that the button can be clicked when they see the button. This is an action that can be operated without any guidance. Therefore, adopting the affordance principle in the design will also reduce the user's learning cost.

5. Functionality

5.1 Architecture

6.1.1 Project Schedule

Please view *Appendix C* for a comprehensive view of the Project schedule.

5.1.2 Project RTM

Please view *Appendix D*, which contains the RTM, for a comprehensive view of the Project functionality goals.

5.2 What has been achieved

6.2.1 Changes to Agile one cycle.

Before starting on new functionality, we first had a few parts left over from the first cycle to finish and implement.

i. Incident Report

- Fix deleting of draft reports.

ii. Icon changes

- The client wished icons to be made bigger and to add titles to menu options.

5.2.2 Agile cycle 2

For cycle three, we focused on finishing all major parts of the application. For the security guard side of the application, this included finishing the “Start/End shift” functionality and database connection and finishing the “Back-up response/request” functionality and database connection. For the security firm dashboard, we concentrated on displaying the associated business details and incident reports from the assigned guards.

i. Start/End Shift

In the previous cycle, we had designed and produced a mock-up of the Start/end shift screens. The functionality was not yet implemented. The final product follows the RTM. For the Start shift, the user can begin their shift at a selected business location. This option is only available if the guard starting their shift is not already on a shift. Starting a shift will display a list of businesses that the user has been assigned to.

For ending the shift, a guard can end their shift. This option is only available if the guard ending their shift is already on a shift that is started.

The only part not yet implemented is 3.6.4, stating, A guard cannot access the incident report or request backup tools if they have not started a shift, as this uses information including business location and the area they are guarding. Due to the time constraint, we were unable to implement this function.

Applying the best practice technical development principles, the screens have been designed to be as simple as possible with fewer ways for users to make mistakes. This will also help with the learnability of the application for new users.

ii. Back-up response/request

In the previous cycle, we had designed and produced a mock-up of the Backup response/request screens. The functionality was not yet implemented. Due to time constraints, the functionality does not reflect the RTM and has a few issues. Parts that were successfully implemented are. There is a numerical value displayed for guards that are on the way to help (figure 5). 3.5.4.1 and 3.5.4.2 are semi-functional. At this point in development, the data displayed for guard information is hardcoded or displays null. In figure 5, we can see the correct details because they are hard coded. In figure 6, you can see that when a new request is sent, it shows null.

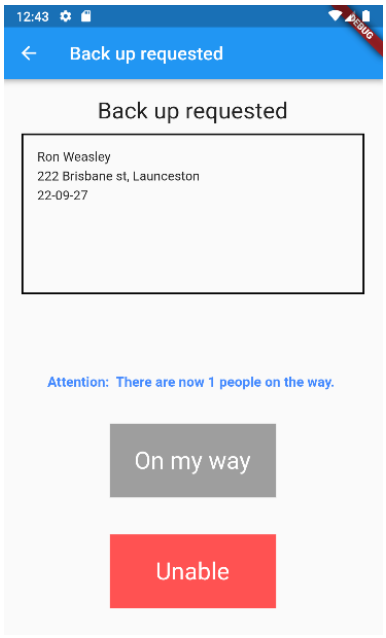

Figure 5

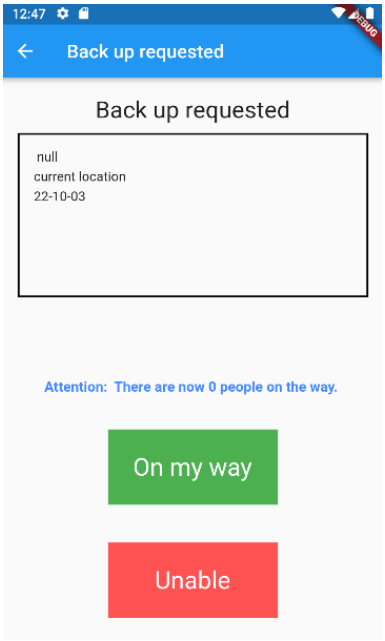

Figure 6

iii. Security Firm Dashboard

As displayed in (Figure 7), the list of assigned businesses is displayed, with both the business name and contact number. Upon selecting a business from the table, a pop-up window displaying further business details (Figure 8) appears. The following details are presented: Business Name, ABN, Phone Number, Email Address, Manager Name, and Guardable Locations. This functionality matches requirements dictated by the RTM, specifically, 4.1.7.1, 4.1.8.1, and 4.1.9.1.

Assigned Businesses

Business Name	Contact Number
Apache	32412434
LAMP	3827733
Verizon	23498811

Figure 7- Assigned Businesses

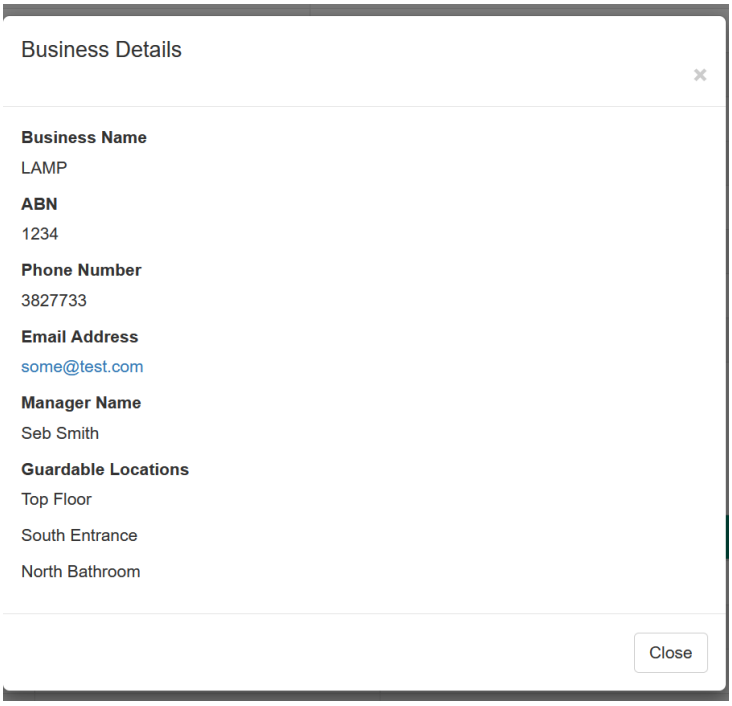

Figure 8- Business Details

iv. Security Firm Dashboard – Incident Reports

The Security Firm Dashboard also displays a table of incident reports (Figure 9) that contains all reports submitted by assigned security guards. Following RTM requirements 4.1.7.1 and 4.1.7.2, upon selecting an incident report from the table, the user is presented with a window (Figure 10) containing the following details: Guard Name, Business Name, Business ID, Time Submitted, Incident Type, Location, and Description of events.

Incident Reports

Guard Key	Business ID	Incident Type	Date/Time
113	1	Medium	2022-09-22 13:38:49
113	1	Low	2022-09-12 13:38:55
113	1	High	2022-08-22 12:34:18
113	1	Informative	2022-08-21 17:30:51
113	1	High	2022-08-21 17:29:18
113	1	Medium	2022-08-07 10:20:13

Figure 9 - Incident Report Table

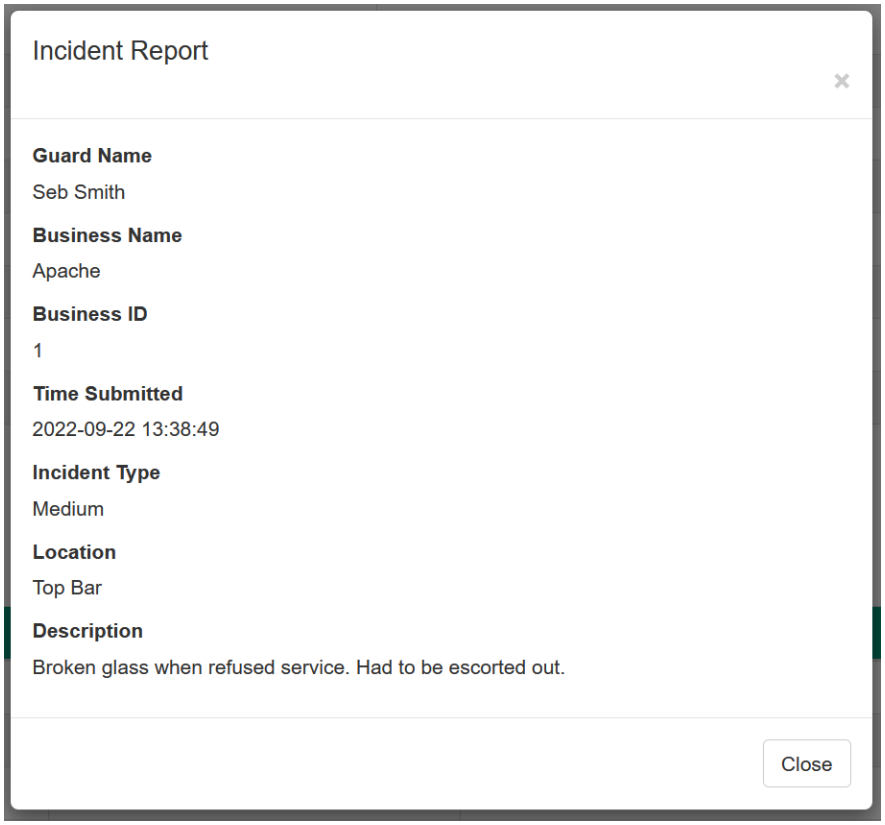

Figure 10 - Incident Report Details

6. User Testing

6.1 Introduce to User Testing and Usability Testing

User testing is a critical component, designed to improve the usability of mobile applications by allowing participants to engage in real tasks related to mobile applications as real users, and their actions and words would be observed and recorded (Dumas and Redish, 1999).

Therefore, we will demonstrate the implementation of usability testing of the Frith mobile application in terms of the main objectives of improving the usability of the product, the participants of usability testing, the usability testing methods, the tasks of the participants and the observed results.

6.2 The main objectives of usability testing

- To test whether the user can easily use the Backup request function and complete the task.
- To test whether the user can easily use the start and end shift function and complete the task.
- To test whether the user can easily use the dashboard webpage and complete the task.

6.3 Who would be joining usability testing and user testing?

6.3.1 Participant

Peter Crawt perfectly met the selection criteria for our usability test participants. First, he already had a basic understanding of the Frith application as our client, so we could save a lot of time for the participants to get familiar with the project. Also, Peter Crawt knows the working environment of security guards and the places where real users use the application. So, he was invited to participate in our user testing on the representative of real users.

6.3.2 Facilitator

In the client meeting with Peter Crawt, Yuk Hei Pak, Yang Feng and Sebastian Bailey present the parts of the function they are responsible for, which are the start and end shift function, the backup function and the dashboard webpage.

6.3.3 Observer

Sebastian Bailey maintains a state of communication with the user during testing and observes the user's expressions and body movements while the communication is put in. If the user knows decisively what to think during the test, Sebastian will quietly observe. However, if the user shows doubtful or hesitant expressions and movements during the test, Sebastian will ask if the participant's need for the task must be clearly explained again, but in a way that would not affect the user's judgment.

6.3.4 Recorder

Yuk Hei Pak and Yang Feng are responsible for taking quick notes on the user's behaviour, whether the task is completed or not, whether there are errors in performing the task and the time of each task and completing the experimenter's Note-sheet to complete the user testing analysis. For more details, please see the example of the experimenter's Note-sheet (Figure 11).

Participant			
Task 1			
Success	Yes	Only with help	No
Time taken			
Observations			
Errors			
User Comments			

Figure 11. example of experimenter's Note-sheet

6. 4 The Methods of User Testing & Usability Testing

In this user testing, thinking aloud and observation will be employed. This combination of methods will facilitate the project team to select the most appropriate methodological tool for the specific project task, thus enhancing the usability of the mobile application.

6.4.1 Usability Tests- Thinking aloud

6.4.1.1 What is think aloud?

Think aloud refers to the user operating Frith mobile application at the same time to say what is in mind (Lewis,1982). Lewis also demonstrates the approach can reflect the user's understanding of the interface and functionality, but also the user which interface or can be surprised, but also tell us what misunderstandings the user has about the operation of the application, which allows the development team to find the currently existing problems in the project.

6.4.1.2 The process of think aloud

To prevent users from giving inaccurate answers because of nervousness, we started the formal user testing with a short warm-up chat, the purpose of which was to relax the participants and make their performance more natural and more realistic to reflect the user experience.

Then, according to the goal of this usability test, we designed some real tasks for participants to imagine as real users to experience. Also, each task requires the user to understand thoroughly and know exactly what the task is to do for the user to complete the task successfully. Therefore, to explain the tasks clearly, we not only prepared a table of each task scenario in advance but also prepared a PowerPoint so that the users could see what tasks needed to be done, just in case. Although PowerPoint was not used in this usability test, it may be considered in cases where the questioner cannot express the question clearly or where the receiver's visual receptivity is better than his or her ability to listen.
In addition, Yuk Hei Pak, Yang Feng and Sebastian Bailey conducted a pre-test before the formal user testing. The main purpose of the pre-testing session was to check the correctness of all scripts and equipment environments and to simulate the real test process before the formal testing.

Finally, below are the tables of tasks. The main tasks are divided into three parts: Backup function, Start-end shift function and the web page dashboard.

I.Scenarios- Backup

	Scenarios	Testing purposes
Backup function	1. You can't control the current situation by yourself, you need other colleagues to come and help you.	1. request back up function
	2. You are free now and you want to check if there are other colleagues who need your support right now.	2. backup list
	3. You want to check how many people are on their way to support you right now.	3. Response backup function

II.Scenarios- Start end shift

	Scenarios	Testing purposes
Start end shift function	1. You just start the shift, but you have to check in though the app.	1. To test the functionality and usability of start shift function.
	2. You have to check who is working at the moment.	2. To test the functionality of the shift list and is the list easy to understand for the user.
	3. You are now out of work, and you have to mark on the app though the end shift function.	3. To test the functionality and usability of end shift function. To see if the user needs more instruction or title to understand the app.

III.Scenarios - web page dashboard

	Scenarios	Testing purposes
Webpage function	1. As a security firm account owner, generate a key so a new security guard may create an account.	1.To test the functionality and usability of key generation. To see if the user needs more instruction or title to understand the web.
	2. As a security firm account owner, check a guard's details to find out what their phone number is.	2.To see if the user needs more instruction or title to understand the web.
	3 As a security firm owner, check an incident report to view a description of events.	3.To see if the user needs more instruction or title to understand the web.

6.4.2 Usability Tests –Observation

6.4.2.1 What is Observation?

The observation method is a formal usability testing method used to identify usability problems in a project by observing users as they complete a realistic test task (Gerber, 2011).

The observer should remain as quiet as possible and not offer suggestions to users or answer their questions because offering added information or unconscious clues could lead to biased test results. Also, keep a friendly smile and observe attentively while taking notes, because observers' small movements, facial expressions, or noises can easily influence the participant's behaviours.

6.4.2.2 The process of Observation

The following experimenter's note-sheet records the participants, the task, whether it was successful, the time spent, and the observation results.

Experimenter's Note-sheet – Task 1

Participant	Peter		
Task 1	You can't control the current situation by yourself, you need other colleagues to come and help you.		
Success	Yes	Only with help	No
Time taken	1 second		
Observations	There was no confusion or hesitation while using the backup function.		
Errors	N/A		
User Comments	The red SOS icon is easy to understand even without thinking, the color and choice of word "SOS" standing out for user. It would be nice for the function to have another way to trigger the function such as holding down the icon or holding down the volume button and vibrate when the request is sent. It would also be nice to have a timestamp function or page to display how long ago the requested was requested.		

Experimenter's Note-sheet – Task 2

Participant	Peter		
Task 2	You are free now and you want to check if there are other colleagues who need your support right now.		
Success	Yes	Only with help	Yes
Time taken	15 seconds		

Observations	Peter was confused about which function was to check if any colleagues needed support. He needed to guess and our explanation on the menu page but after entering the backup page, Peter could proceed without help.
Errors	N/A
User Comments	The wording on icon is confusing and we should change the “team manager” to “team management”.

Experimenter’s Note-sheet – Task 3

Participant	Peter		
Task 3	You want to check how many people are on their way to support you right now.		
Success	Yes	Only with help	No
Time taken			
Observations	There was no confusion or hesitation while checking how many staff were coming to help as back-up.		
Errors	N/A		
User Comments	It is good to have the number count for users.		

Experimenter’s Note-sheet – Task 4

Participant	Peter		
Task 4	You just start the shift, but you have to check in though the app.		
Success	Yes	Only with help	yes
Time taken	8 seconds		
Observations	Peter was confused about which function was to check-in. He needed to guess and our explanation on the menu page.		
Errors	N/A		

User Comments	"Shift manager" should be changed to "Shift Management". All the buttons, such as the drop-down menu and start/end Shift button, can be bigger.

Experimenter's Note-sheet – Task 5

Participant	Peter		
Task 5	You have to check who is working at the moment.		
Success	Yes	Only with help	No
Time taken	2 seconds		
Observations	There was no confusion or hesitation when he was trying to check who is working at where.		
Errors	N/A		
User Comments	It would be nice to add a change location function, so the user does not need to end shift and change to another location.		

Experimenter's Note-sheet – Task 6

Participant	Peter		
Task 6	You are now out from work, and you have to mark on the app though the end shift function.		
Success	Yes	Only with help	No
Time taken	1 second		
Observations	There was no confusion or hesitation while checking how many staff were coming to help as back-up.		
Errors	N/A		
User Comments	Ending the shift straight away would be an easier way for user to control.		

Experimenter's Note-sheet – Task 7

Participant	Peter		
Task 7	As a security firm account owner, generate a key so a new security guard may create an account.		
Success	Yes	Only with help	No
Time taken	2 seconds		

Observations	There was no confusion or hesitation while generating a key.
Errors	N/A
User Comments	The work page is clean and easy to read but it helpful to display whether a key has been assigned to a guard without needing to click on the key.

Experimenter's Note-sheet – Task 8

Participant	Peter		
Task 8	As a security firm account owner, check a guard's details to find out what their phone number is.		
Success	Yes	Only with help	No
Time taken	1 second		
Observations	There was no confusion or hesitation while checking guard detail.		
Errors	N/A		
User Comments	It is nice and handy and adds in the ABN function. Good design, functionality is made clear with the selected item highlighting grey before clicking.		

Experimenter's Note-sheet – Task 9

Participant	Peter		
Task 9	As a security firm owner, check an incident report to view a description of events.		
Success	Yes	Only with help	No
Time taken	2 seconds		
Observations	There was no confusion or hesitation while checking guard detail.		
Errors	N/A		
User Comments	Details panel was informative and easy to read. It would be nice to add in some sort of filtering system.		

6.5 Summarize the usefulness and usability of Frith application

First, with the user testing, we obtained effective feedback from the users on the current project phase. Still, the users were a bit confused about the display of the interface, which indicated that the clear representation of the interface buttons needed to be improved.

In addition, after the practice of think aloud, we learned that the task explanation must be clear, otherwise the user's blind operation in case of misunderstanding the task will also affect the test results and increase the complexity of the record. In addition, there should be good cooperation between the questioner and the recorder when conducting observation practice and controlling the time and rhythm of the test is also something we must pay attention to.
Overall, the interface of the mobile application achieved a high level of ease of use, but there are still areas that need to be improved. The team was generally satisfied with the evaluation results. Still, with a larger number of different types of participants, the results could have provided a more comprehensive reflection of the usability of the current project.

7. Technical Testing

To ensure that the software functionality matched the dictated requirements in the requirements trace matrix from the Planning report, we applied a case-based testing methodology. The value of case-based testing lies in its effectiveness in laying-bare discrepancies between software's functionality and what was defined in the requirements document. This is a systems-level test that aims to find as many faults as possible while requiring manageable amounts of effort without exceeding time constraints.

Use-based testing consists of two components. The first is black box testing which is completed via a set of tasks that are assigned to a user with the assumption that the user has no knowledge of how the software operates behind the user interface. All black box tests are undergone purely using the interface. Resulting from this, tests are planned based solely on available interactions and expected responses. The second is white box testing, where tests are designed to examine all internal execution paths. Tests are expected to utilise knowledge about the underlying system to ensure that software behaves as expected. Interaction with the user interface is allowed, but decisions are made with the knowledge of the underlying system with a large focus on components that are likely to fail.

The mobile application and the website were tested using use-based testing for each feature created within Agile Cycle three. Please see the attached document: Appendix A, for all tests, methods, and outcomes.

Conducting these tests highlighted multiple faults with the technical implementation. For the Request Backup feature, numerous faults were exposed. When creating a request, the expected details were not passed through. This does not meet the basic expectations of the RTM requirements. Furthermore, numerous discrepancies between the RTM expectations and the implementation of the Shift Management functionality were revealed. White box testing exposed flaws in code path, an example of which is that a guard can view other businesses while on shift. In addition to this, the order of events in the technical implementation is different to what has been defined in the RTM. It was expected that the guard would start a shift and then select a business and location. However, in the technical implementation, the guard first selects a business, then a location and then can start a shift.

8. Client Feedback

Before introducing client feedback, we would like to review the user testing mentioned above, which is the measurement of the user's experience with a digital product. In contrast to the user experience, the client experience is different from the overall impression of the quality of the interaction between the client and the entire project team. It is the sum of all the components of the client's interaction with the project, including the project's digital product, the project members, and the entire project's process after the interaction (Elliot, & Williams, 2003).

Then, we will consider customer satisfaction as a metric to measure customer experience. Customer satisfaction is a measure of communication between a project and its consumers, as the CSAT score provides a qualitative indication of how customers perceive the project's products or the way they experience them (Attkisson& Greenfield, 1996).

8.1 Define the purpose of Collecting Feedback

In Agile Cycle 3, seeking feedback from customers is an important process to ensure that the project team has built a stronger relationship with the customer, and to verify that the work in Agile Cycle 3 is meeting the customer's needs.

One of the goals of our project team in gathering feedback was to understand how the customer felt about the Frith application with the following features: Backup manager Function, Start End Shift Function, the Dashboard for security firm account owner on the second objective was to measure the overall satisfaction of the entire project and project team by focusing on customer feedback.

8.2 Preparation before getting client feedback

A well-organized client meeting must be prepared sufficiently in advance. After setting the goal of obtaining customer satisfaction, some of the preparations include testing the project in advance, scheduling the participants, and arranging the meeting time and place can contribute to the efficiency of collecting customer feedback.

8.2.1 Who will be in the meeting?

Client - Peter Crawt has an irreplaceable role in this meeting, and he will provide valuable feedback to the project team from the client's standpoint.

Project Manager - Sebastian Bailey is the project manager and is the top person in charge of the entire project team, and his participation in the meeting is necessary.

Client Liaison - Feng Yang's role is that of a client liaison, so organizing and scheduling meetings with the client is the primary responsibility of the client liaison.
Lead Document - Yuk Hei Pak is also responsible for asking questions and taking notes in the participation this time and was a very active participant.

8.2.2 Meeting Arrangement

8.2.2.1 Meeting Invitation

The meeting as a formal meeting will be notified in writing, where the formal written notice of the meeting should contain: a brief description of the meeting agenda, participants, meeting time, meeting location, etc. In addition, the meeting will be held online via Zoom, as in Agile Cycle 2, and the formal invitation to the meeting will be sent to the participants via formal email.

8.2.2.2 Meeting schedule

When arranging the meeting agenda, we should consider the meeting time, and try to obey the customer's time, 13:00-17:00. And, due to the public holiday, we changed the meeting originally scheduled for Thursday to Friday, for the change of meeting time, we also asked the customer's wishes by email in advance.

8.3 The process of obtaining customer feedback

8.3.1 Ask client feedback by asking questions

Q1. Are you satisfied with the Request backup Function for Security Guards on the mobile app? What improvements can you think of that might make the Incident Report more functional?

Q2. Are you satisfied with the Backup manager Function for Security Guards on the mobile app? What improvements can you think of that might make the Incident Report more functional?

Q3. Are you satisfied with the Start End Shift Function for Security Guards on the mobile app? What improvements can you think of that might make the Start End Shift more functional?

Q4. Are you satisfied with the Dashboard for security firm account owners on the webpage? What improvements can you think of that might make the security firm account owner dashboard more functional?

Q5. How do you feel about the current state of the project?

Finally, the client may have more feedback they want to share…

Q6. Do you have any further suggestions regarding the current state of the project? For example, performance (page navigation/functionality/etc.).

Questions	Client Feedback
Request backup Function	The red SOS icon is easy to understand even without thinking, the colour and choice of word “SOS” standing out for user. It would be nice for the function to have another way to trigger the function such as holding down the icon or holding down the volume button and vibrate when the request is sent. It would also be nice to have a timestamp function or page to display how long ago the requested was requested.
Backup manager Function	The wording on icon is confusing and we should change the “team manager” to “team management”. It is good to have the number count for users.
Start End Shift Function	“Shift manager” should be changed to “Shift Management”. All the buttons such as the drop-down menu and start/end Shift button can be bigger. It would be nice to add a change location function, so the user does not need to end shift and change to another location. Ending the shift straight away would be an easier way for user to control.
Dashboard Webpage	The work page is clean and easy to read but it helpful to display whether a key has been assigned to a guard without needing to click on the key. It is nice and handy and adds in the ABN function. Good design, functionality is made clear with the selected item highlighting grey before clicking. Details panel was informative and easy to read. It would be nice to add in some sort of filtering system.
Current state of the project	I'm really happy with everything.
Further suggestions	So far, I am relatively satisfied with the results of the project team. If the project team members are willing, it is possible to continue to improve the project after this semester to accumulate experience in ICT as a practice before finding a job after graduation.

Figure 8.3.1- Customer satisfaction Table

Questions	Feedback	Satisfaction level (1-5 points, the highest score is 5 points)	Project team response

Request backup Function	I. The layout and button color are very nice. II. It is suggested that there is another way to trigger the function, such as holding down the volume button, the request can happen that would be better.	5	Holding down the volume keys to trigger this function is out of scope.
Backup manager Function	I. It is recommended to change the name of the button from backup manager to backup management. II. Good to have the number count for users.	4	Suggest changes to relevant code-responsible members of the team: nice to change the name of backup button.
Start End Shift Function	I. The name of the button is suggested to be changed from "Shift manager" to "Shift Management". II. Change the size of the buttons, such as the drop-down menu and the start/end shift buttons could be larger. III. It would be nice to add a change location feature so that the user does not have to end the shift and change to another location. Ending shifts directly would be a much easier way for users to control.	4	Suggest changes to relevant code-responsible members of the team: nice to change the name of the Start End Shift button, update the size of buttons, and nice to add a change location feature
Dashboard Webpage	Need to add date and title filter	4	Suggest changes to relevant code-responsible members of the team: nice to add date and title filter
Current state of the project	I. Clean and easy to read, nice and handy and adds in the ABN function. II. Good design, layout and colour functionality is made clear with the selected item highlighting grey before clicking. III. Details panel would be nice to add some sort of filtering system.	5	Suggest changes to relevant code-responsible members of the team: nice to add in some sort of filtering system.

Further suggestions	All good	4	There is currently no need to propose changes.

Figure 8.3.2 - Customer satisfaction and Project team response Table

8.4 Act Based on Feedback

First, after collecting and analysing customer feedback, it was obvious that Backup manager Function, Start End Shift Function and Dashboard Webpage all got a score of 4, so the project team needed to discuss these parts and make changes.

Secondly, the customer feedback not only gave us inspiration, but also showed where the application could be improved. After collecting the client feedback, our project team shared it internally and decided to respond accordingly. The following table will show more details (Figure. 8.4.1 Act Based on Feedback table).

Tasks	Action level	How to implement?
Backup management Button	4 - nice to improve	Change the name button to “Backup Management”
Start End Shift Function	4 - nice to improve	Nice to change the name of Start End Shift button, update the size of buttons, and nice to add a change location feature
Dashboard Webpage	4 - nice to improve	Nice to add date and title filter

Figure.8.4.1 Act Based on Feedback table

9. Quality and Compliance

As there is not a large change in the quality and compliance methods compared to the current state of the technical implementation and that of Agile Cycle 2 (the compliance methods are very similar to the technical tasks completed in this cycle), the Agile Cycle 2 content applies to this document. Therefore, the Agile Cycle 2 content will be partially reiterated here. The main notable addition was the implementation of password hashing for account generation and password storage in the database.

The technical deliverables of this project were designed and implemented considering the quality and compliance requirements dictated by the Initiation and Planning documents. However, due to the current state of the implementation of the technical deliverables, a reasonable portion was unable to be addressed as it is not applicable. For example, the compliance document outlines the management of media recorded by the user and stored in the database. This feature has not yet been implemented, so data management is impossible.

Examples of how design decisions and technical prototype outcomes adhere to quality and compliance requirements outlined by the Initiation and Planning documents can be broken up into the following categories: mitigation of data breaches and adherence to common law and the Australian Privacy Principles.

9.1 Mitigation of Data Breaches

An example of mitigating data breaches is the design and implementation of the database requiring authentication. Data input, access, and editing are all restricted by authentication. This includes requests or queries attempted by APIs (Figure 11). Side note: database is stored locally, and authentication details will be changed before deployment.

```
$db = "frith";
$servername = "localhost";
$username = "root";
$password = "thisadmin";


$conn = new mysqli($servername, $username, $password, $db);
```

Figure 11 - Database Authentication

Another example of data breach mitigation is the design of the Business Owner accounts. A user can register a Business Owner account. Still, they cannot use it until the server administrator approves their account, as shown in the database property 'StatusID' (Figure 12). This condition removes the ability of an unapproved user to gain access to the application. While this is not as important at this stage of the technical implementation, for future use, it will prevent someone from accessing information they should not have access to.

BusinessID	StatusID	PoolID	BusinessName	ABN	EmailAddress
1	Approved	1	Test Bus	12343	bus@test.com
30	Approved	1	seb	1234	some@test.com
31	Pending	1	somet	239	some@new.com

Figure 125 - Business Owner Database

Additionally, as outlined in the Initiation Document, when Business Owners create new accounts, they need to adhere to the password policy where they are required to have a password of at least 10 characters in length, as well as contain one of each of the following: lowercase letter, an uppercase letter, number, and special character (! @#$&*~) (Figure 13).

```
validator: (value) {
  RegExp regex = RegExp(
      r'^(?=.*?[A-Z])(?=.*?[a-z])(?=.*?[0-9])(?=.*?[!@#\$&*~]).{10,}$'); // RegExp

  if (value == null || value.isEmpty) {
    return "Please enter a valid password";
  } else if (!regex.hasMatch(value)) {
    return "Invalid password - password must contain lowercase and uppercase letters"
        "at least one number and one special character(!@#\$&*~) and 10 characters";
  }
  return null;
```

Figure 13 - Password Requirements

To protect against SQL injection attacks, all API that receives string values from user input that will be inserted into the database is subjected to string cleaning to ensure legal SQL queries (Figure 14). Although the database is currently hosted locally, the team decided that proactively implementing this protection would be of great benefit for the future of the project.

```
//Escape string to ensure that sql injection is not possible.
$busName = mysqli_escape_string($conn, $busName);
$ABN = mysqli_escape_string($conn, $ABN);
$busPhoneNumber = mysqli_escape_string($conn, $busPhoneNumber);
$busEmail = mysqli_escape_string($conn, $busEmail);
$busPassword = mysqli_escape_string($conn, $busPassword);
$busFirstName = mysqli_escape_string($conn, $busFirstName);
$busLastName = mysqli_escape_string($conn, $busLastName);

//TODO: Check with database setup -> how to add business account
$sql = "SELECT * FROM `informationpool` WHERE `PoolID`= '$busPoolID';";
$res = mysqli_query($conn, $sql);
$numrows = mysqli_num_rows($res);

//if table does not contain unique key
if ($numrows == 0) {
    $json["error"] = true;
    $json["message"] = "Invalid Pool ID";
} else {
    $sql = "INSERT INTO `accountbusinessowner`(`StatusID`, `PoolID`, `Bus
```

Figure 14 - Legal SQL Restriction

Finally, as shown in Agile Cycle 2, users are subject to authentication and access to information is only possible once they have successfully been authenticated and logged in. This applies to both the Mobile Application as well as the Website. For example, in the Website Security Firm login the user will only be able to access the Security Firm Dashboard after being authenticated (Figure 15).

```php
include 'db_conn.php';

include("../session.php");

$email = $_POST['email'];
$password = $_POST['password'];
$error = "";

$email = stripcslashes($email);
$password = stripcslashes($password);


$sql = "select * from accountsecurityfirm where EmailAddress = '$email' and Password = '$password'";
$result = mysqli_query($conn,$sql);
$row = mysqli_fetch_array($result);
if ($row['EmailAddress'] == $email && $row['Password'] == $password) {
    $_SESSION['EmailAddress'] = $email;
    $_SESSION['Password'] = $password;
    header("Location: security_firm_dashboard.php");


}else {
    header("Location: login.php?error=1");
}
```

Figure 15 - Security Firm Authentication

9.2 Adherence to Common Law and the Australian Privacy Principles

As the technical prototype was designed in consideration of common law, there are no conflicts. Furthermore, the application adheres to the Australian Privacy Principles in its current state. There is no management, collection, or use of personal data.

9.3 Additional Requirements Identified and Added to the Project

During Agile Cycle 3, the team identified that password hashing had not yet been implemented. This oversight could have resulted in easy account access in the event of a data breach. To rectify this oversight, password hashing was implemented in every point of account creation. This ensured that all stored passwords were hashed.

This can be viewed in the following areas, security guard login (Figure 16), security guard register (Figure 17), business owner register (Figure 18), and security firm login (Figure 19).

```php
//check if password value has been received
if (empty($data['password'])) {
    $json["errmsg2"] = "Did not get password";
} else {
    $password = $data['password'];
    $password = md5($password, $binary = false);
    $received = true;
}


if($received) {

    $email = mysqli_escape_string($conn, $email);
    $password = mysqli_escape_string($conn, $password);

    $sql = "SELECT * FROM `accountsecurityguard` WHERE `EmailAddress`='$email' AND `Password`='$password';";
    $res = mysqli_query($conn, $sql);
    //$numrows = mysqli_num_rows($res);
```

Figure 16 - Security Guard Login

```php
$Password = $str[9];
$Password = md5($Password, $binary = false);
$UniqueKey = $str[11];
```

Figure 17 - Security Guard Register

```php
//check if password value has been received
if (empty($data['Password'])) {
    $received = false;
} else {
    $busPassword = $data['Password'];
    $busPassword = md5($busPassword, $binary = false);
    $received = true;
}
```

Figure 18 - Business Owner Register

```php
<?php
include 'db_conn.php';

include("../session.php");

$email = $_POST['email'];
$password = $_POST['password'];
$error = "";

$email = stripcslashes($email);
$password = stripcslashes($password);
$password = md5($password, $binary = false);


$sql = "select * from accountsecurityfirm where EmailAddress = '$email' and Password = '$password'";
$result = mysqli_query($conn,$sql);
$row = mysqli_fetch_array($result);
if ($row['EmailAddress'] == $email && $row['Password'] == $password) {
    $_SESSION['EmailAddress'] = $email;
    $_SESSION['Password'] = $password;
    header("Location: security_firm_dashboard.php");


}else {
    header("Location: login.php?error=1");
}
```

Figure 19 - Dashboard Login

10. Post-development Review

10.1 Mobile Application

The deliverables identified in both the Initiation and Planning Reports are almost entirely met with the final technical implementation. The Business Owner log in and registration, as well as the Information Pool List all work as expected. The Security Guard features defined are also almost entirely achieved, registration, flashlight, notepad, incident report, and emergency services all meet the expectations. Request backup is the one exception where implementation has not fully met the requirements since it is missing some core functionality and not working as intended.

These features have been implemented adhering to usability design principles to ensure that they are easy to use and meet the client's expectations for the intended clientele. There has been a heavy focus on designing functionality and UI that can be used by Security Guards and user testing and client feedback has ensured that the application meets the client's acceptance criteria. Carefully adhering to this criterion has resulted in an application that is easy to use, while achieving the goal of digitising in-place systems while not being overwhelming when it comes to adopting this program.

10.2 Dashboard

The deliverables identified in both the Initiation and Planning Reports are entirely met with the final technical implementation. Security Firm users can log in and register to use the service. They are able to generate unique keys to provide to guards and view the status of existing keys. They can view assigned guards as well as their details. They can view allocation businesses and business details. Finally, they can view Incident Reports generated by associated guards. All of these features match the expectations defined.

These features have been implemented adhering to usability design principles to ensure that they are easy to use and meet the client's expectations for the intended clientele.

When designing the Dashboard, careful consideration in applying commonly used features to promote quick understanding of use was utilised. In conjunction of this approach, the team regularly conducted user testing and receiving client feedback to ensure that functional and non-functional requirements were met. Through this attention to detail and regular feedback, the system should be able to be quickly adopted by any potential user who has very basic website experience. This will greatly aid the usability of the project, as well as promote future development and deployment.

10.3 Client Quality Expectations and Acceptance Criteria

The final technical almost fully meets the defined acceptance criteria defined in the Initiation Report. It successfully provides a platform that enables Security Guards to carry less equipment and utilises mobile phones that are already possessed. This will reduce the associated equipment costs for businesses that employ this system. Of the defined scenario, two were not met due to a change in Project Scope. These changes were made with permission from the client, so they should not impact the acceptance criteria. From the remaining three, two fully meet the expected criteria (media recording was shifted to nice-to-have in accordance with the client), while the remaining scenario was not fully met due to the feature not being fully implemented.

Quality expectations were met through constant communication with the client. Regular feedback ensured that the UI and functionality were both meeting expectations. Further user testing and design considerations were utilised to produce an effective and usable product.

11. Conclusion

To deliver a successful product for Agile Cycle 3, the Project Team adhered to the guidelines dictated by the Initiation and Planning documents, as well as improved upon the project by applying results from Agile Cycle 2. This report applied the best practice interface and design principles to improve the usability of the application. It then described the progress towards the technical implementation's functionality requirements. User testing, technical testing and client feedback are the three methods used to test the Application. User testing principles were applied to gather feedback on the application's usability from the client. Technical testing identified flaws or discrepancies between the RTM and the Application. Client feedback was the final step of testing to ensure that the Application fulfilled the client's expectations and provided the team with opportunities to rectify and improve any features. Quality and Compliance compared the Application to the requirements outlined in the Planning Report to ensure that those requirements are being met. A comparative review of the Initiation and Planning Reports was conducted that resulted in a reflection of the deliverables and whether the client's acceptance criteria were met. Finally, User and Reference Manuals were created to aid the future development of the project, as well as provide documentation on the composition and management of the software.

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13. Appendix

Appendix A

Appendix A is an attached file alongside this report labelled "*Appendix A Test Cases*".

Appendix B

Appendix B is an attached file alongside this report labelled *"Appendix B Change Log"*.

Appendix C

Appendix C is an attached file alongside this report labelled *"Appendix C Project Schedule"*.

Appendix D

Appendix D is an attached file alongside this report labelled *"Appendix D RTM"*.

Appendix E

Appendix E is an attached file alongside this report labelled *"Appendix E Frith User Manual"*.

Appendix F

Appendix F is an attached file alongside this report labelled *"Appendix F Frith Reference Manual"*.

Appendix G

Appendix G is an attached file alongside this report labelled *"Appendix G Entity Relationship Diagram"*.