

SportsLink

Ibrahim Muhammed
S17122854

BSc (Hons) Computer Science
Supervisor: Stish Sarna

May 2020

CMP6200/DIG6200
Individual Undergraduate Project

ABSTRACT

This is a product-based dissertation based on the creation of a mobile application called SportsLink. This is a sports application which allows users to find a suitable opponent to participate in the sport of their choice and meet with likeminded people through sport participation. The application will engage more users to participate to play sports and make it easier to, find, connect, and organise opportunities to play with others.

This application will provide users with a simple solution to booking venues and playing with players of the same ability and interest. Users can log in and provide their names, ability level and geographical region on the application that other users can see. Users will meet new people and make new friends through this social application and at the same time become more active and fitter by playing sports. The Methodology used to produce this application was the Agile methodology, this method provides adaptability of the project and changes to be made at different stages.

ACKNOWLEDGEMENTS

Firstly, I would like to praise Allah Almighty the most Gracious, the most Merciful. I would like to thank my mother Shelina Begum and my father Alfu Miah as this all would have been impossible without their guidance and unrepayable support. I would like to thank my family for supporting me through this process and helping me do the best. I would like to express my thanks to my supervisor Stish Sarna for assisting me throughout this process with expert advice and finally the lecturers at Birmingham City University for providing me with the knowledge, expertise and support to become proficient in learning about computing.

Table of Contents

1. Introduction	1
1.1. Problem Definition.....	1
1.2. Scope	2
1.3. Rationale	2
1.4. Aims	3
1.5. Objectives.....	3
1.6. Background information	3
2. Planning and Research.....	4
2.1. Review of Existing Knowledge	4
2.2. Theme 1: Calendar	4
2.3. Theme 2: MVC Model	4
2.4. Theme 3: Security.....	5
2.5. Methodology.	5
2.6. Primary Research Methods.....	6
2.7. Primary Research Findings.....	6
2.8. Design Methods.....	8
2.9. Development methods	9
2.10. Testing Methods.....	9
3. Design	10
3.1. Low Fidelity Prototyping.....	10
3.1.1 Paper Prototypes	10
3.1.2 Digital Wireframes.....	10
3.2. High Fidelity Prototyping	11
3.3. Use case Diagram	12
3.4. UML Class Diagram.....	12
3.5. UML Sequence Diagram.....	13
4. Development.....	14
4.1. Development Stages.....	14
4.2. Front-End Development.....	14
4.3. Back-End Development	14
4.4. Methodology Implementation	15
4.5. Practical Implementation.....	16
4.6. Testing.....	24
5. Discussion	27

5.1. Project Limitations.....	27
6. Conclusions	29
7. Recommendations for further work	30
8. List of References	31
8.1. Mahara Journal.....	31
9. Bibliography	32
10. Appendices	33
.....	37

GLOSSARY

MVC	Model-View-Controller
RAD	Rapid Application Development
Hi-Fi	High Fidelity
Lo-Fi	Low Fidelity
XML	Extensible Mark-up Language
AVD	Android Virtual Device
SDK	Software Development Kit
BIOS	Basic Input/output System
SUS	System Usability Scale

LIST OF DIAGRAMS, TABLES, PHOTOGRAPHS

List of Figures

Figure 1- Agile vs Waterfall Model.....	6
Figure 2- Primary research questionnaire 1.....	7
Figure 3- Primary research questionnaire 2.....	7
Figure 4- Graphs.....	7
Figure 5- Paper Prototypes.....	10
Figure 6- Digital Wireframe.....	11
Figure 7- Digital Wireframe 2.....	11
Figure 8- Hi-fi designs.....	12
Figure 9- Use Case Diagram	12
Figure 10- UML Class Diagram.....	13
Figure 11- UML Sequence Diagram.....	14
Figure 12- Hi-Fi before changes.....	16
Figure 13- Hi-Fi after changes	16
Figure 14- SportsLink Logo.....	17
Figure 15-Code for the login page.....	17
Figure 16- Login page.....	18
Figure 17- Login page with a toast,l.....	18
Figure 18- Registration page.....	18
Figure 19- Build app gradle.....	19
Figure 20- Homepage.....	19
Figure 21- Pick sport page.....	20
Figure 22- Pick ability page.....	20
Figure 23- Pick date page.....	20
Figure 24- Toast to prompt user to enter mobile number.....	21
Figure 25- Correct information in database.....	21
Figure 26- Dialog Box giving next instructions.....	21
Figure 27- View list page.....	21
Figure 28- Firebase Database entries.....	21
Figure 29- Update information	22

Figure 30- Database updated.....	22
Figure 31- Updated preference toast displayed.....	22
Figure 32- Rating page with empty fields	22
Figure 33- Rating page with filled fields	22
Figure 34- User Current Location	23
Figure 35 Nearby Facilities located	23
Figure 36- Marker displaying the address	23
Figure 37- app icon badge	24
Figure 38- Notification appears.....	24
Figure 39- System usability scale form.....	25
Figure 40- Showing nearby sports facilities	27
Figure 41- Calendar feature	27
Figure 42- Unused code.....	28
Figure 43- Agile Methodology Diagram	33
Figure 44- Previously used app graph	34
Figure 45- would you like to see an app like this graph	34
Figure 46- what would you like to see in the app graph	35
Figure 47- what sport do you play graph	35
Figure 48- why do you participate graph	36
Figure 49- how difficult to book venue graph	36
Figure 50- what method is currently used graph	36
Figure 51- Gantt Chart for project	37
Figure 52- Primary research questionnaire 1.....	38
Figure 53- Primary research questionnaire 2.....	39
Figure 54- Primary research questionnaire 3.....	40
Figure 55- Primary research questionnaire 4.....	41
Figure 56- Primary research questionnaire 5.....	42
Figure 57- Primary research questionnaire 6.....	43
Figure 58- Primary research questionnaire 7.....	44
Figure 59- Primary research questionnaire 8.....	45
Figure 60- Primary research questionnaire 9.....	46
Figure 61- Primary research questionnaire 10.....	47

Figure 62- Primary research questionnaire 11.....	48
Figure 63- Primary research questionnaire 12.....	49
Figure 64- Primary research questionnaire 13.....	50
Figure 65- Primary research questionnaire 14.....	51
Figure 66- Primary research questionnaire 15.....	52
Figure 67- Primary research questionnaire 16.....	53
Figure 68- Primary research questionnaire 17.....	54
Figure 69- Primary research questionnaire 18.....	55
Figure 70- Primary research questionnaire 19.....	56
Figure 71- Primary research questionnaire 20.....	57
Figure 72- SUS testing 1.....	58
Figure 73- SUS testing 2.....	59
Figure 74- SUS testing 3.....	60

List of Tables

Table 1 Using existing account information the user will login to application.....	25
Table 2 Explanation on how the User will navigate to registration page and register an account with SportsLink.....	25
Table 3-User will pick their preferred sport, ability and data from the options provided	25
Table 4 Explanation on how the user views other user preferences.....	25
Table 5 Navigating to the Map Page.....	25

1. Introduction

Sport is very important to many people around the world and there are many varieties of sports games that challenge us to develop our physical and mental health. Many people use sport to get fitter, have fun and socially interact. People also play sport as a hobby and sometimes professionally.

The target audience for the application are people interested in playing sports. There are many sports and clubs located around the community. However, finding someone to play with is not always easy. People have mixed abilities, friends may not have the same sports interest, or they might live too far. The application has demand and is wanted by people of the target audience and sports leaders.

This is where this new application called SportsLink can meet the needs of helping players overcome these issues. It finds and matches players of the same sports interest, ability level, in your location and it also looks at possible local sports facilities.

The application also caters for people with disability. It allows them to find sessions available for them. If a session is not already available, a new one can be made. This project aims to make this process easier. SportsLink is envisaged to engage more people to play sports, helping tackle social problems like obesity, loneliness and disability.

1.1. Problem Definition

The Health Survey for England 2017 estimates that 28.7% of adults in England are obese and a further 35.6% are overweight (Baker, 2020). Obesity is a big issue that the people in the UK face. Having people partaking in sports and having a healthier lifestyle can tackle the issue of obesity.

This application has been designed to help people with disabilities, obesity and loneliness. It will engage them to get fitter, healthier and make new friends. The application will be easily accessible and have a variety of options and reminders to get people active.

Through undertaking primary research, it has been identified that people love to participate in sports and with like-minded people. Playing against others is a huge motivator for people to get involved.

The reason for the creation of this application is that it allows the user to find and connect with opponents to play against in their chosen sport. People of different standards find it hard to search for other people of the same ability in their local clubs. This application helps players find others geographically and through a standard rating. This application can help users find new opponents to play and challenge so the person can improve, as well as make new friends. Aspects of this app have been seen before in various apps but have not been integrated into one app.

The proportion of disabled people who reported feeling lonely “often or always” was nearly four times that of non-disabled people. In the year ending March 2018, 13.3% of disabled people reported that they felt lonely “often or always”, compared with only 3.4% for non-disabled people. (Disability, well-being and loneliness, UK - Office for National Statistics, 2020). This app can deal with this issue. People can be matched and meet new people with similar or different disabilities and interact with them. It allows people to communicate with each other and allowing new people to meet.

This application has been discussed and shown to key sports leaders in the community, and they have given very positive feedback about the idea and things that they would like to see.

They suggested how important this application can be in practice, however, no one has developed one yet. They agree that this will help increase participation in communities, resulting in a positive impact on society.

1.2. Scope

After completing my design presentation, the feedback from Harjinder Singh, a Senior lecturer at Birmingham City University discussed whether this project was feasible or not. This is because certain aspects of the application such as the security and location services need to be integrated and work correctly. These aspects had to be taken into consideration.

It was identified that security is a big issue for this application as it involves meeting new people, without the security element, this application can be socially dangerous. Identity theft can be a result of bad security in this application.

Some of the boundaries of this application are that different sports have different criteria e.g. table tennis requires 2 people, whereas football requires 22 people for 11 a side game. All sports are not the same, they have different criteria. People can be matched to a group rather than to an individual if they want to do a team sport.

A massive boundary was learning how to use the software to create this application and to develop at the same time. A decision had to be made to either use React Native or Android Studio. Advanced research was done to find frameworks that already exist for iOS and Android. A decision was made to use Android studio instead of React Native. The benefits of using Android Studio is that the design issue between IOS and Android, as it must be compatible to both platforms. React Native has a small community of people that can help with specific problems if any were to occur compared to the community of people that can help with the solely Android Studio problems. Having previous experience in using Android Studio in the Mobile and Wearable Technology module had been beneficial during the creation of SportsLink.

Having other modules alongside the project meant that time had to be allocated towards these deadlines. In addition to this, having a part-time job during the weekends, decreasing the hours in the day that is allocated towards the honours project. The aspect of chat has been taken out, due to the time of the project, and these features taking a long time to implement. As the chat facility will not be used, users can simply use text messages or other social media platforms to communicate alternatively.

1.3. Rationale

It was identified through informal interviews that this application would be a great idea. These discussions were with Alfu Miah (father) and Brenton Nugent a Client of School lettings solutions. Brenton is a manager of a club called the School of Basketball dedicated for high ability players and some players with disabilities such as hearing and speech impairments. He would like to see players connect, organise matches and play more basketball. He says it can also be a way to promote by advertising his club and attracting more players.

This application can work and is needed in the sports industry, encouraging to pursue this project. They both believe that it should be tested in these small local communities first and then expand into the wider environment.

Discussed and highlighted were clear benefits of creating this application which will make it easier for people to get organised, connect and play in a smooth process. They stated that increasing opportunities in these communities means that people would be occupied doing a positive activity rather than being involved in negative activities such as crime and violence.

Besides the gaps identified from the sports managers, this application is being developed due to a personal interest in sports, especially in badminton and football. Through observation and experience, it has become apparent that players lack the opportunities to find other willing participants to play and compete with, thus a gap in the market and a sports application could be useful to solve these issues.

The values and benefits of this app are to get more people playing sports and being more active. The project will allow people who love to play sports get involved as well as motivate new people to start playing. Players with disabilities and those less active can locate other players with similar standards.

The SportsLink Mobile App goes further in allowing people to socially connect and manage their health and wellbeing. It makes it much easier for people to firstly get in contact with people of the same standard, find people with similar sports interests and identify where they can book facilities to play. The application takes all the hard work out of managing the whole process and thus allowing more time for people to play the sport without the hassle.

1.4. Aims

A successful mobile app that can allow users to meet and communicate with new people with similar sporting interests and ability to find facilities closest to them to use.

I want the SportsLink Mobile app to include a calendar booking feature for participants.
A personal login feature to store data of already existing customers

1.5. Objectives

- Design an engaging Social Sports App at the end of the process.
- Create a Mobile app to get people participating in sports and to get fit.
- Users will be able to find spaces and make a booking for sports facilities.
- Engage more participants to play sports and make it easier to organise and play.
- To be able to complete work before the deadline.
- Apply a calendar booking system to the application
- Understand and identify the security needs for the app

1.6. Background information

The concept for this application was initiated from Alfu Miah a sports professional experienced with working for local universities. He identified gaps in the sports market where the application could have the potential to bring people together to play sports. Though doing some research it was found that the current market has some similar applications such as the School letting Solutions bookings website, Mighty Networks and PlayFinder. Although these applications have great features individually there is not an application that combines these features all in one application. The SportsLink application will aim to integrate all these features and bring the idea to life.

Working currently at a part-time job at School Lettings Solutions(SLS) which deals with the booking of facilities for sports and events in schools. Apart of this job role of Leisure Assistant, is to check to see bookings on a calendar layout online which is booked by clients. The calendar system will be incorporated in the SportsLink application. A lack of disability bookings is made due to not having or knowing other people that would like to participate with similar disabilities or conditions.

2. Planning and Research

2.1. Review of Existing Knowledge

In this segment of the report, the themes of the projects will be reviewed. The themes that will be covered are the Calendar feature that will be used in the project application, the MVC Model and the security of the application. these sections include and demonstrate the knowledge already acquired in each subject.

2.2. Theme 1: Calendar

The calendar feature is essential for the project. Two people that are interested in playing a sport (e.g. Badminton) will be able to find a suitable date they are both available, find local or convenient venues where both people can meet up to play. This works with identifying firstly players availability and the availability of the facility. The calendar feature can be used and displayed using a calendar view. This system works in a real-life scenario as seen while working for SLS and can be adapted for this application. Similar applications on the market have the same idea and concept but are missing an essential calendar view that will make the application so much better. The internet has been used to research existing code for a calendar system so that can be adapted to suit the needs of this application and help users and achieve the development objectives.

2.3. Theme 2: MVC Model

A key theme for this project is the MVC model. It is an application design model which is comprised of three interconnected parts: Model, view and controller

All model objects in your application compose its model layer. It holds applications data. Model classes are normally designed to model things your app is concerned with, such as the user or a true-false question, their purpose is to hold and manage data. The Model object has no knowledge of the user interface.

Anything that can be seen, will be apart of the view layer. It views objects and knows how to respond to user input. For example: touches.

The controller brings the view and model objects together. It contains the applications logic. Controllers respond to events caused by the view objects, depending on the user input and to manage the flow of data.

The model layer is the business logic, the view which is the presentation and the controller which is the user input. The main advantage of the pattern of the MVC model is that it allows the full decoupling of responsibilities in a user-facing application. An application can gather features until it is too complicated to understand. To help the design and to understand the application better the code is separated into classes. It can be looked at in terms of classes instead of individual variables and methods. Modification to each part does not affect the entire model MVC makes classes easier to reuse.

2.4. Theme 3: Security

As a result of a login process that requires personal details, I must make sure that security is taken seriously. As the main goal is to get people to connect with new people through this application. This can cause certain people to make false identities online to take advantage of vulnerable people. This problem can be overcome with a verified ID method, such as a driving license and bank account verification. Some websites use the user's IP address or tracking cookies to identify users. Increasing the security of this application will make it reputable and draw in more users as they will trust the mobile application. Organisations who use the app to set up sports matches and games can request the user to do a DBS check to check their criminal record and their right to be involved.

2.5. Methodology.

The Agile methodology approach will be used instead of the 'Waterfall Development Model'. The waterfall model focuses on planning and sequential design practices.

The Agile model is a cycle that allows businesses and companies to develop software in small and quick parts. This can only be done after defining the scope of the project. The Agile cycle is analysis, design, development, and testing frequently. This process allows companies to release small changes in production and will need to be repeated continuously. (Sacolick I, 2020)

The Agile model is used over the waterfall model as the waterfall model is a structured software development methodology. However, Agile is a more adaptable method of project development. As it allows changes to be made in the project even if the initial plan has been finalized. (Weaver P, 2011)

The advantages of the agile methodology are that the client is always involved at every stage of the creation of the product, it ensures the quality of the development is maintained as it will be monitored by the user constantly. As it is an incremental process the risk is reduced as whatever has been completed will be identified. Users can have new requirements during the creation of the app this can be done and allow the application to evolve.

On the other hand, the disadvantages of the Agile methodology are that the cost of this method is slightly more expansive compared to other methodologies. If the user provides constant changes, it may cause the project to go off track and not reach the project outcome.

Alternatively, the waterfall model does have its advantages. It is the easiest model to manage as the process and the results of the application are well documented. Also, this method allows projects to be delivered in a faster time.

However, the waterfall has disadvantages. It does not allow changes to previous sections like the agile methodology does as you can move back and forth to make changes. In this method, testing is done at the end of development rather throughout the process, this can result in bugs appearing, making it more expensive to fix these bugs and find the problem.

Below are is a figure 1, it highlights the Agile methodology used to develop this application. It shows a comparison between the Waterfall model and how each stage can be re-visited to make changes.

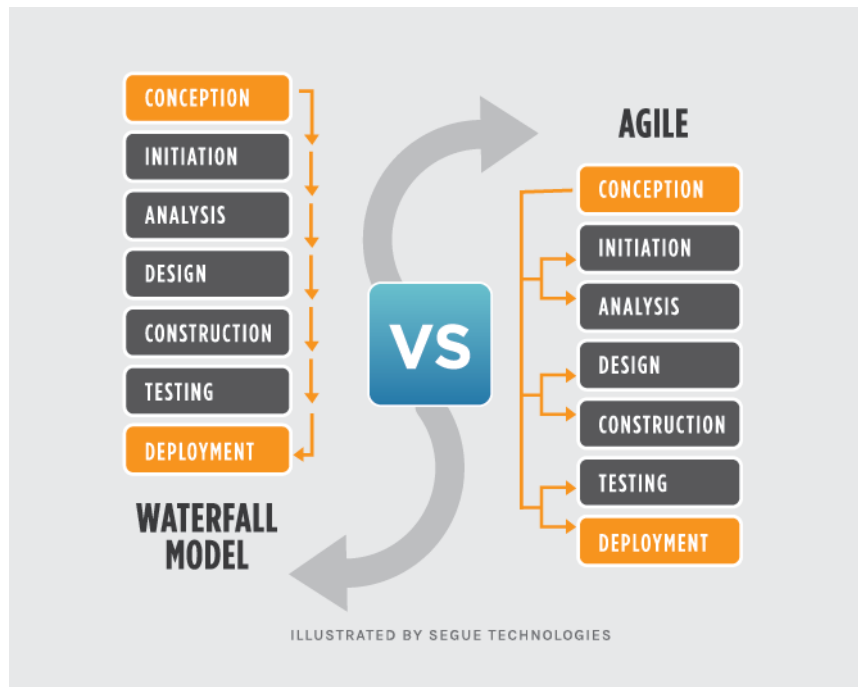


Figure 1-Waterfall vs Agile Model

2.6. Primary Research Methods

Primary research methods were used to collect data and gain better knowledge and understanding around the want and needs of the user and the environment and target audience it will serve. Primary research will be more relevant to the results of this project compared to secondary research. Meetings were held with Stish Sarna (supervisor) for guidance through the process of creating the application, looking at areas of development and progression of the overall project.

School Lettings solutions is a facility hire company. The company uses a booking system that allows clients to book a facility. Their system structure has been used in the SportsLink application and their concept of the calendar and booking system has been adapted, as it is a functioning and established system. Research has been undertaken to see what clients like and dislike about the existing system and implement the good aspects and eliminate the bad aspects. This was done by simply asking them to think aloud while they use the system. This method is excellent for providing live, truthful and correct feedback.

For primary research, interviews, meetings, and questionnaires have been used. These methods give feedback on the mobile application. These interviews and questionnaires will allow questions to be asked like what people's usability frustrations are and what they would like to see included in the application.

2.7. Primary Research Findings

As part of the primary research process, questionnaires were used to provide evidence of demand and user opinions. This was done prior to the creation of the application. The questionnaire was given to 10 people. The questionnaire was conducted to provide findings on what people would like to see in the application.

The method of using questionnaires enables advantages of gathering information quickly and the questionnaire could be collected back from the respondents in person. It is also a

way of asking direct closed questions on whether they have used a similar application and what features they would like to see in the app. Figure 2 and figure 3 show the questionnaire that was provided to the respondents.

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☐ Female ☐

1. Do you currently use or have previously used an app to manage your sporting activities?
Yes ☐ No ☐
If yes, please state which? _____

2. Would you like to see an app like this?
Yes ☐ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

- Options to Book facilities via the Application. ☐
- Connect with likeminded sport people. ☐
- Find local clubs and information about them. ☐
- Make new friends ☐
- Have an opponent rating system. ☐
- Other (Please write below) _____

4. What sport do you play or are interested in playing?

Football ☐ Badminton ☐ Table Tennis ☐
Basketball ☐ Gym work ☐ Other: _____

Figure 2-Primary research questionnaire

5. Why do you participate in sport?

- Keep fit ☐
- Train Professionally ☐
- Try something new ☐
- Meet new people ☐
- As a Hobby ☐
- Participate for competition ☐
- Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☐ Extremely likely ☐

7. How difficult if it to book a venue and sort an opponent to play sports?

Extremely difficult ☐ Somewhat difficult ☐ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?
By Phone ☐ Email ☐ Friends ☐ In Person ☐ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportslink app.

Thank You Very much for completing the questionnaire.

Figure 3-Primary research questionnaire

From the information gathered, all respondents of the questionnaire have said that they are not using or have not previously used an app to manage sporting activities and that they would like to use this SportsLink application. This is positive feedback and shows that there is a demand for this application. 6 respondents are extremely likely to recommend this application to others and 4 are somewhat likely to recommend it as shown in figure 4.

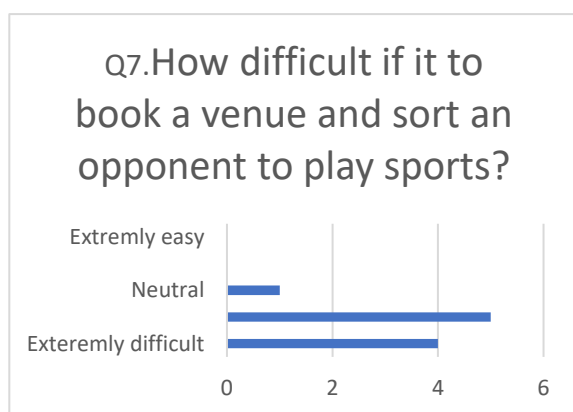
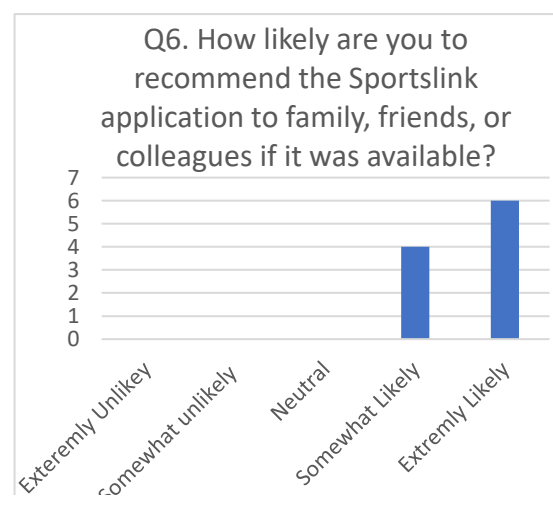


Figure 4- graphs



From the features that have been proposed, the respondents have shown that booking a facility was extremely difficult and that they would like to see the option of booking a facility

via the application as a feature. In addition, the findings show that making new friends is what they would like to see in the SportsLink application. People participate in sports for different reasons, the most popular among the sampled respondents is to keep fit.

The finding shows that the most common ways people booked were by telephone and in person. The sample respondents do not have any experience with booking via an application, giving the opportunity for this app to be able to do that and simplifying the process.

Due to the group sample being small, it difficult to gauge an accurate understanding of some of the questions asked. The questionnaires would have been better if a bigger sample was used. It would have been also ideal to ask the public. Benefits of using the questionnaire format allow straightforward analysis data and interpretation of the results

As part of primary research, some informal research was undertaken with guided questions around the application, it is uses and features. A discussion took place with the target audience group, to see if they would like to see in this application. Conversations were held with Alfu Miah and Brenton Nugent. They were chosen to give accurate feedback on the proposed design and development of SportsLink. Brenton Nugent suggested that having existing clubs on the application would allow people in the community to first find the club and then join suitable sessions. This would enable the coach or professional to contact more people and let them know when the session is on. The club can be broadcasted, and club members can also connect and book practice session amongst themselves.

Both agreed that this was an excellent idea and loved the name of the application SportsLink. Alfu Miah said, "this will be an excellent application for the sports professional and community user to use. If it does what it says, such as find and connect sports players, books venues, link up people to socialise and also get fitter then this will be a fantastic application and something that people who play sports or want to get involved, would benefit from."

From the feedback, it was highlighted that participants want to attend existing clubs that they run and can easily be advertised using the preferences listed. This indicates that there is a demand for an app like SportsLink.

2.8. Design Methods

The methods that were used for building the mobile application was User-Centred Design. The design was to suit the needs of the user. To design the application Low Fidelity (Lo-Fi) prototypes and high-fidelity(Hi-Fi) prototypes were used. This will help with the design and help me make specific changes to the application according to user feedback after they have tested the application. The Lo-Fi prototypes will be used via paper prototypes and digital wireframes.

Using paper prototypes allow the mock-up of initial designs. It allows all initial ideas to be put to paper and allows the experimentation of various ideas. This method does not require many resources and is a quick method to create many prototypes and suitable for this project. It easy to start over again if mistakes are made and do not require much expense. It is a good way to draft ideas and experiment with new ideas.

Following on from paper prototypes, the project will use Digital Wireframes to demonstrate a solid foundation of the application. This will be able to give an accurate indication of where an element will be placed on the application. The digital wireframe is more complex than the paper prototyping as it contains the realistic layout of the SportsLink application. Digital

Wireframing brings clarity to projects. It visualises the layout and interactions giving advanced designs of the application.

Eventually, using both the paper prototypes and digital wireframe. The High-fidelity prototype design should be attempted. This prototyping method is pretty much the real application. This method allows the testers to gain an understanding of how the application will function once it is built. These designs will contain interactive features to demonstrate functions and graphical layout. This is where more complex design decisions can be made about the project. Feedback on the application is given, and appropriate changes are made according to user feedback and developmental needs.

2.9. Development methods

The mobile application is developed using the use case diagram as recommended by the supervisor. A use case diagram will be created to demonstrate each function. The use case diagram will give a brief understanding to the user/tester of what the application is capable of and showing its key requirements.

I will be using Rapid Application Development (RAD) to help with the development of this mobile application. RAD is a form of agile software development methodology (Powell-Morse, A. 2019). This will allow rapid prototyping is an iterative process. I will be able to build and refine the mobile app using this method. It is a trial and improvement method to see which way the mobile app will work best. This method will help me achieve the objective set of creating the application.

2.10. Testing Methods

The application will need to be tested for any bugs in the code, as mistakes can be made when coding. The testing methods that will be used for this project include white box testing and using the System Usability Scale (SUS).

White box testing is the method which involves software testing that tests the applications internal structure. The implementation of the structure and the design structure of the application will be tested. White box testing uses a checklist format to test if a function passes or fails. This testing method works when the user knows what they are testing, and the element is known (Jain, 2020). This will ideally be the developer of the application. The reason for not using the method of black-box testing is because the element is not known. White box testing was more applicable to this application development.

As part of the testing, users undertook the task of testing the mobile application for usability and give any feedback that can help improve the application. To test the usability of the application, the System Usability Scale (SUS) method which a quantitative method of testing will be used. SUS testing provides a universal scoring system to recognise if the application is usable.

3. Design

3.1. Low Fidelity Prototyping

3.1.1 Paper Prototypes

To construct the design of the artefact, prototypes of the design were made, first starting off with low fidelity(Lo-Fi) prototypes by using paper sketches and digital wireframes. This gives an indication of how the mobile application was envisioned to look. Figure 5 shows the paper sketches for SportsLink.

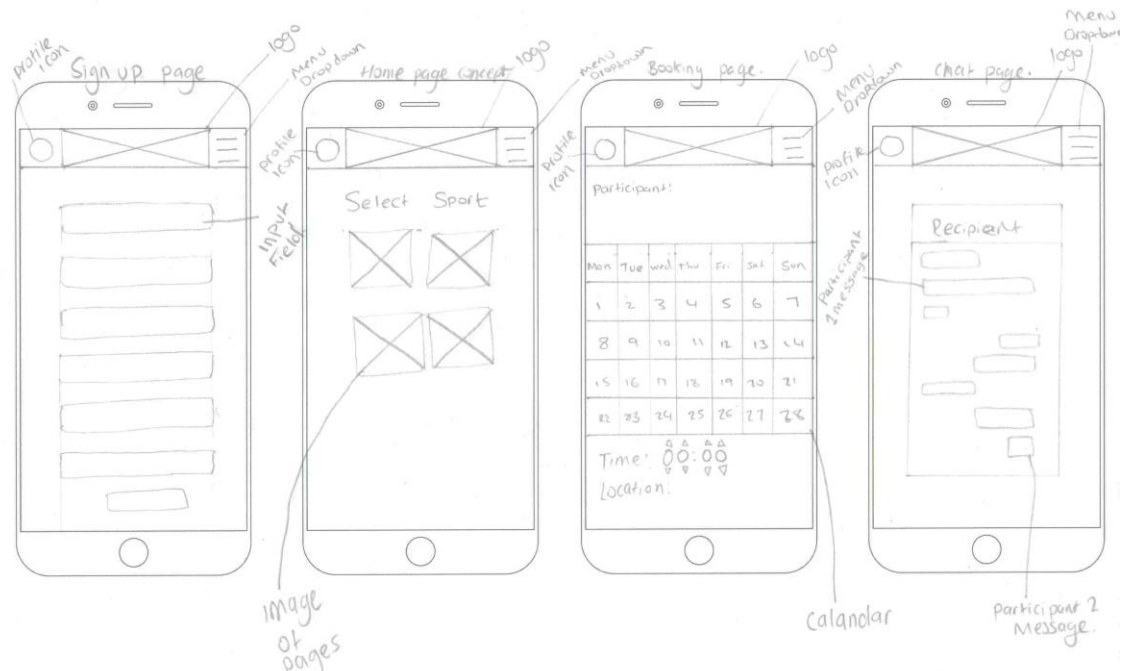


Figure 5-Paper prototypes

3.1.2 Digital Wireframes

To continue the process of Lo-Fi prototyping, digital wireframes were made, with more advanced features and a cleaner display of the application. Figure 6 and 7 show the digital wireframes of the SportsLink application. This is the point where feedback was given on the designs. The feedback was given by peers and the supervisor. This allowed improvements to be made to the design. No improvements were needed at this phase, so the design continued through to the Hi-Fi prototypes.

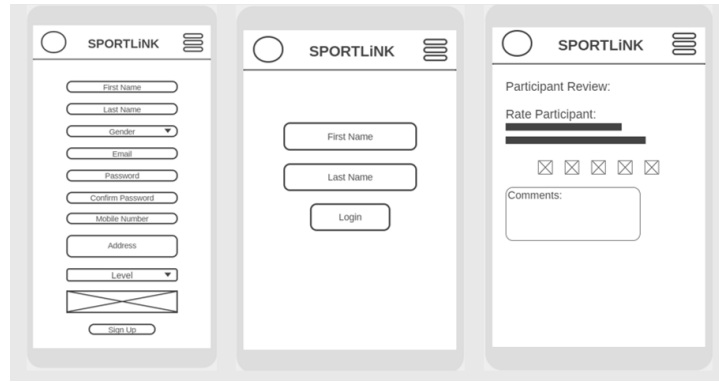


Figure 6-Digital wireframe

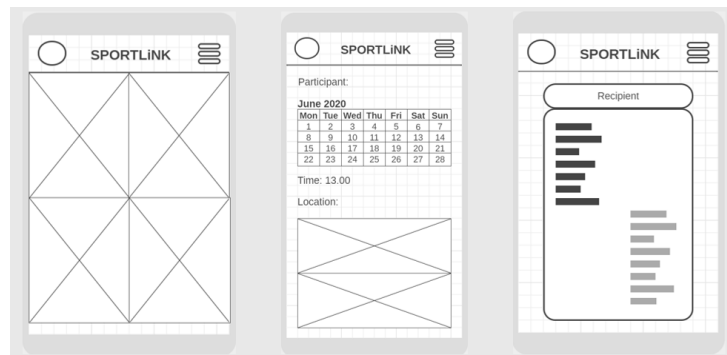


Figure 7-Digital wireframe 2

3.2. High Fidelity Prototyping

The high fidelity(Hi-Fi) prototypes will look like the final application design. At this stage of the project, to show a prototype of the application, pages were created in Adobe XD. The pages in the figure 8 below are examples of a simple homepage, a login page, a chat page, the calendar page and the user rating page. These Hi-Fi designs give a clearer understanding of what the product will look like. Improvements to the application can still be made at this point, as changes are made throughout the process of creating an application. During the stage of Hi-Fi prototypes, other functionalities were thought of, this includes the possible navigation path that the user will take, ensuring a smooth and easy interface for the user to navigate through the application to their chosen page.

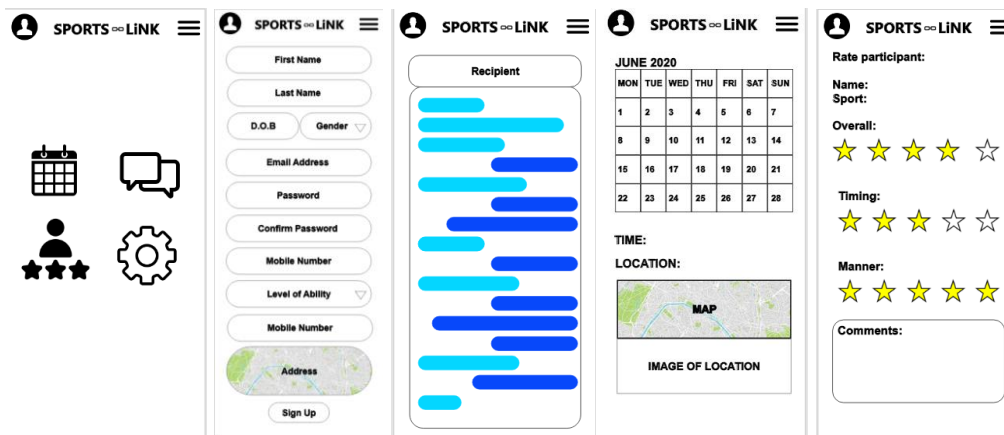


Figure 8-Hi-Fi designs

3.3. Use case Diagram

The use case diagram can be seen in figure 9 below. This use case is an outline of how the project will operate. This diagram confirms that there will need to be at least two separate users. A user will be required to Login/Sign up into their account to gain access to the application. From there, both users will have to complete the same steps to come to the step of matching one another's preferences together. To continue, the match/meeting of two users will happen when a local facility has been located. This can be talked about within the chat feature. Once located, the facility employee can choose to accept or decline the booking.

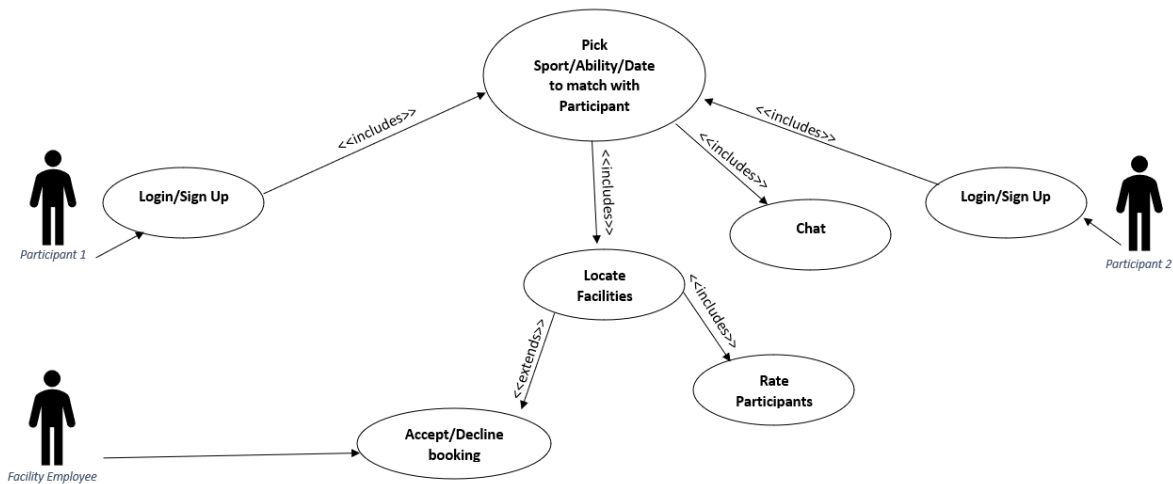


Figure 9-Use case diagram

3.4. UML Class Diagram

To give an overview of the system, a UML Class diagram has been produced. As displayed in figure 10, it contains the classes, attributes and operations of the system and the relationship between these classes and the components of the mobile application. The classes contain a one-to-one relationship which implies that a single user will log in and gain access only to their personal location, they will receive one current location. Whereas one class that has a one-to-many relationship is the Firebase database as the user will have access to multiple preferences in the database.

The users account details will be stored using the userId, email and password in string format within the firebase authentication.

The map class states the attribute of getting the current location of the user and the nearby places. The operation will be given to every user.

The Firebase Database class contains the attributes userId, sport, ability, date and mobile number. This information will be stored in the database by the user only after they have signed in.

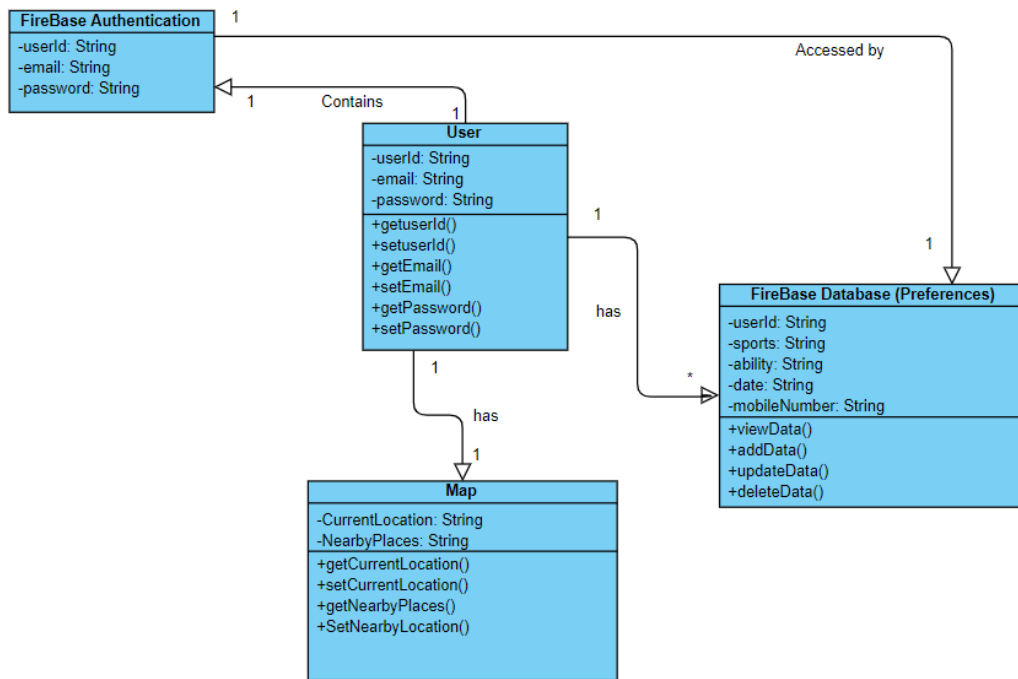


Figure 10-Use Class Diagram

3.5. UML Sequence Diagram

By using a sequence diagram shown in figure 11. It describes what order the SportsLink objects work in a diagram and how they work together. This sequence diagram is based on the specific use case of picking a preference. This diagram shows how the information is added by the user on the SportsLink application and then what happens when it connects to the Firebase Realtime Database. It demonstrates what happens when the application creates, reads, updates and deletes information and how both the app and database work according to the actions taken.

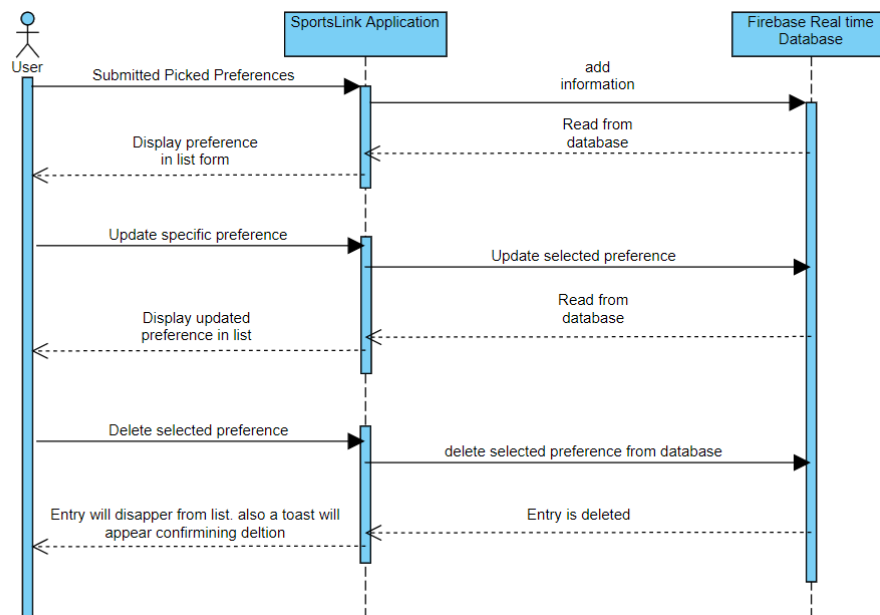


Figure 11-UML Sequence Diagram

4. Development

Initially, the development of the artefact was going to be produced in React Native, due to more knowledge gained in Android Studio, the development begun in Android studio.

4.1. Development Stages

A journal was kept showing the different stages of my project and reviewing the progress of the project implementing the model of Agile Methodology to move between stages, as necessary. This journal was recorded on Mahara. The journal was originally kept on paper. However, the journals were moved online. Mahara had the feature of attaching files and the ability to easily add weekly entries of project progress. The Journal entries enclosed what had been done and completed during the week alongside a to-do list and actions that must complete for the following week. This enabled project management, the documentation of the engagement in the project and its progress.(Mahara)

At various stages, simple feedback was received on certain aspects of the application, this included certain design decisions based on user requirements and visual satisfaction. An example of this is when deciding the colours to use for the background throughout the application. Originally, white was going to be used as shown, see figure 8 of the Hi-Fi prototypes, but this changed as the implementation of the application commenced. More pages were created during the implantation stage that was not displayed in the design stage. While implementing, new ideas spring to mind and better ways of displaying information on a page.

4.2. Front-End Development

Android Studio was utilised for the front-end of the application. This is where the developer was able to design what the user will interact with. The Application contains a responsive, design and enables the adjustment of the application to work with various device screen sizes. Each page on the application consists of a “Scroll View” to allow the user to scroll through the application to interact with the whole application. This ensured that the design was well presented and not cluttered onto the screen, enabling the design to work in a horizontal orientation. Alternative components like “View” were not used as they do not allow the feature of scrolling through the screen and making it unable to see the entire screen. The front-end is essential in the design of all applications. Wales 2020, who writes about front end development, states that; the front end of a website is the part that users interact with. He writes. “The front end of a website is the part that users interact with. Everything that you see when you’re navigating around the Internet, from fonts and colours to dropdown menus and sliders, is a combo of HTML, CSS, and JavaScript being controlled by your computer’s browser.” (Wales, 2020)

4.3. Back-End Development

Firebase was utilised for the back end of the application. Firebase is a google based software that allows the use of its resources. The Authentication function was used to store the login details of users. Firebase Realtime database was used to keep each individual user preferences such as sport, ability, preferred date of the activity and their mobile number. When the participant starts, they must submit their preference of sport, level of ability, and mobile number. This will enable the correct matching of opponent. The SportsLink application was able to Read, Write, Update and Delete from the Realtime Database. Later in the report, an explanation of how this is done will be explained.

The back end and front end both work in harmony to produce an application as stated by Wales 2020. “The back end of a website consists of a server, an application, and a database. A back-end developer builds and maintains the technology that powers those components which, together, enable the user-facing side of the website to even exist in the first place.” (Wales 2020)

4.4. Methodology Implementation

The methodology adopted is the Agile methodology as discussed in the earlier stage of this report. There are various approaches to this project and reading about the Agile methodology works well to develop the practicalities of this application. The methodology was suitable for this project in comparison to using the waterfall method. As this methodology does not allow the adaptability and changes to be made in the process of making this product. As well as not allowing testing and then allowing the movement to redesign and make changes to the application.

The fluidity of the Agile method allowed the project to change not from initiation to conception and to but to move up and down in the process of the model, which was found to be very helpful. An example of this, is when designing the application, implementing it and then realising that changes will need to be made. Therefore, returning to the design stage of the process, allowing improvements to be made. Another change was performed of the number of fields that were needed during the registration on to the application. All fields were not required and only the most significant fields such as the email and password were included at this point. These changes were conducted according to the Agile Methodology system. Figure 12 shows what the Hi-Fi designs before the changes were made and Figure 13 shows the final application after changes were made.

Figure 12-Hifi Before change

Figure 13- Final application after change

The waterfall method although simple, did not allow alterations and changes to be made. The waterfall method is a quite ridged methodology and would have meant that the project would not have been developed to a high standard with the ability to develop, change and adapt making the application better as time went on and as new learning occurred.

Initially, when brainstorming ideas, the application was going to contain many features. These ideas were put into perspective and there came a realisation that everything cannot be included. This realisation came while completing the design and implementation stage of the process. During this stage, it was identified that certain areas of this application cannot

be produced due to knowledge and feasibility, implying that these sections could not be physically possible and personally not being able to do something after attempting it. The Agile method permits these changes to be made as the design stage can be revisited even after attempting the implementation stage. This action can be completed several times to meet the requirement. Using the agile methodology,

This idea had to be an application that is in demand and is needed. Otherwise, it would not be necessary to build the application. “Developing an app that has no demand is a terrible mistake” (Georgiou, 2020). Existing application was searched for on the market as duplicating or copying another application is a waste of time, resources and money.

4.5. Practical Implementation

The application was developed using Android Studio. The Java language was used in Android Studio, code was stored in Java classes and implemented in XML(Extensible Markup Language) files. This software allows easy and quick connectivity to Firebase. Firebase allows the storage of information in a Realtime Database.

All pages included the same colour scheme, the colour purple(#564999) is used. Keeping it consistent throughout the entire application. the colour is not bright and resembles a playful theme. Furthermore, the colour white(#FFFFFF) was used for the text colour. White is more visible on purple than another colour like black(#000000). Additionally, the design of the page was kept simple and easy for the user to use. This allowed the application to flow. Information was not all clustered onto one page, rather split through the pages.

Figure 14 shows how the SportsLink logo will look. It is an image of a football to imply that it is a sports application. To change the icon, the PNG file had to be imported and then changed in the AndroidManifest.XML file.

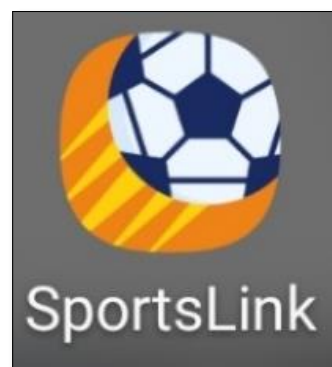


Figure 14-SportsLink Logo

Login Page

The login page is the first page that the user will see when they access the application, this is known as the launcher activity. Already existing users will use this page to access the home page. Figure 16 shows the login page. The design of the page contains the logo, the name of the app and two 'EditText' fields allows the user to enter their email and password. Users will have to provide their existing email and passwords they had set at the registration stage which is stored in the Firebase Realtime Database. This will grant access to the

application. Additionally, this page entails a sign-in button allowing the user to enter the home page of the application providing their email and password match according to the Firebase Authentication system. Figure 15 shows the code regarding the login stage. It shows that if the field is empty, to prompt the user to enter their email. Toasts have been made to inform the user of what they have done during this stage. For example, if the user has entered the wrong password in the field, a Toast will appear saying 'Login error, please try again' as shown in figure 17.

```
btnLogin.setOnClickListener((v) -> {
    String email = etEmail.getText().toString();
    String pwd = etPass.getText().toString();
    if(email.isEmpty()) {
        etEmail.setError("Please enter your email");
        etEmail.requestFocus();
    }
    else if(pwd.isEmpty()) {
        etPass.setError("Please enter your password");
        etPass.requestFocus();
    }
    else if(email.isEmpty() && pwd.isEmpty()) {
        Toast.makeText(context, MainActivity.this, "Fields are Empty!", Toast.LENGTH_SHORT).show();
    }
    else if(!email.isEmpty() && !pwd.isEmpty()) {
        mFirebaseAuth.signInWithEmailAndPassword(email, pwd).addOnCompleteListener( activity: MainActivity.this, (task) -> {
            if(task.isSuccessful()) {
                Toast.makeText(context, MainActivity.this, "Login error, please try again", Toast.LENGTH_SHORT).show();
            }
            else{
                Intent intToHome = new Intent( packageContext: MainActivity.this, Dashboard.class);
                startActivity(intToHome);
            }
        });
    }
    else{
        Toast.makeText(context, MainActivity.this, "Error Occurred!", Toast.LENGTH_SHORT).show();
    }
});
});
```

Figure 15-Code for login page



Figure 16-Login page

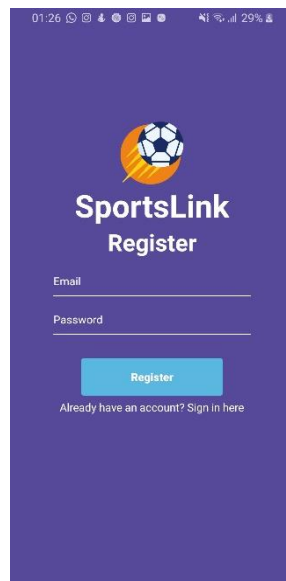


Figure 17-Login page showing toast message

Register Page

The user must register on the app using an email and password. This will be stored on the Firebase database. This will allow the user to have authentication onto the application. To enter this information, two 'EditText' fields are provided. The sign-up button is used to direct the user to the home page of the application. If the user has already registered on the

application, there is a prompt to click 'already have an account, sign in here' this will redirect users to the login page. The page also contains the logo and name of the application to show the user what application they are using, this is all shown in figure 18.



*Figure 18-
Registration Page*

To allow a connection from Android Studio to Firebase, the build gradle needed to contain certain dependencies. To use Firebase Authentication, the authentication dependency needed to be included. The dependency that was needed was 'com.google.firebase:firebase-auth'. Figure 19 shows the authentication dependency in the build gradle.

```
dependencies {
    implementation fileTree(dir: 'libs', include: ['*.jar'])

    implementation 'androidx.appcompat:appcompat:1.0.2'
    implementation 'com.android.support:cardview-v7:28.0.0-rc02'
    implementation 'androidx.constraintlayout:constraintlayout:1.1.3'
    implementation 'com.google.android.gms:play-services-maps:17.0.0'
    implementation 'com.google.android.gms:play-services-location:17.0.0'
    implementation 'com.google.firebase:firebase-database:19.3.0'
    testImplementation 'junit:junit:4.12'
    androidTestImplementation 'androidx.test.ext:junit:1.1.1'
    androidTestImplementation 'androidx.test.espresso:espresso-core:3.2.0'
    implementation 'com.google.firebase:firebase-analytics:17.2.2'
    implementation 'com.google.firebase:firebase-auth:19.3.0'
}
```

Figure 19-List of Dependencies

Home page

After the user has logged in, they enter the homepage. This vital page permits navigation through the application. It consists of 4 main buttons. The buttons include a 'play', 'map', 'rate', and 'logout' button. These buttons are directed to the pages assigned. To call the activities 'onClickListener' was used. The layout for the page is a 'Grid View', which presents the buttons in a tabular form. On the Homepage, there are a set of instructions that are produced that tell the user how to use the application. This page has been designed to

represent the playful theme of sport and get users to be more interactive and be fun to use. This page can be seen in figure 20.

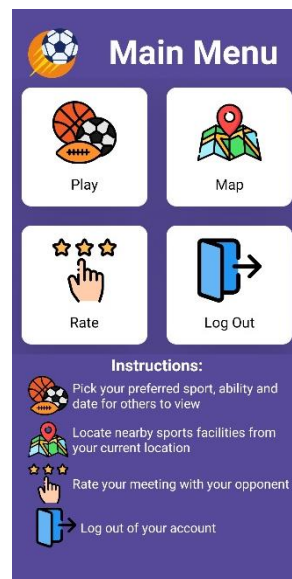


Figure 20-Homepage

Play Pages

When the Play button is clicked by the user, they will encounter various pages until they reach the Data Form page. Here the users can select a preference of sport, ability, and date on the provided screens. Users will select their sport from the list provided as shown in figure 21. Then choose their ability in that sport from the list proved as shown in figure 22. Then, they will pick a preferred date to do their sport as shown in figure 23. The information they had selected will be transferred to the form page. The preferred information that the user has picked was given a string value that was passed through the pages to be displayed on the Form page. This form can be edited if needed. Each user will have their own preference which can be updated and deleted at a later stage.

Figure 21-Pick sport page

Figure 22-Pick ability page

Figure 23-Pick date page

Data Form Page

The user can input their preferences of sport, ability and the date they would wish to partake in the activity. They must also provide a mobile number so that others can contact them. If any of these fields are left empty, a toast will appear as displayed in figure 24 the data will not be submitted without the required fields being completed. Once, this information has been entered correctly, as demonstrated in figure 25, the user will be able to press 'Add to record'. Next, the user will receive a dialog box instructing what to do next. As shown in figure 26 The data will add to the Firebase Realtime Database This information can then be viewed by clicking the image as instructed on the page shown in figure 25.

Figure 24-Toast to prompt user to enter mobile number

Figure 25-Correct information in database

Figure 26-Dialog Box giving next instructions

List page

As illustrated in figure 27 the user can look at the list of other user preferences. They can view each other's sport, ability and the possible date and decide to contact that person to arrange a match. This data/information is read from the Realtime Database. Whatever is on the database will be displayed on this list page as portrayed on figure 28.

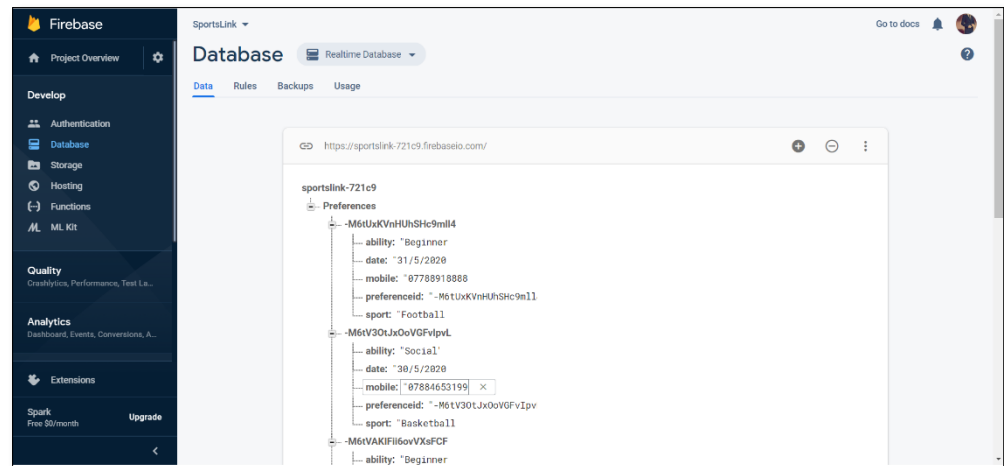
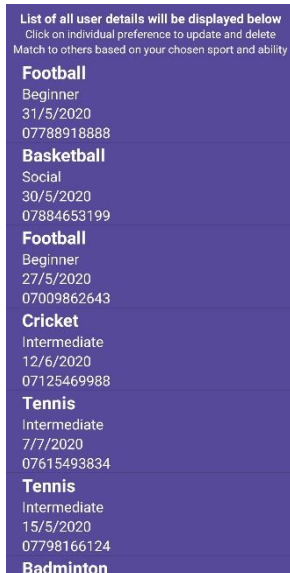


Figure 27- View List page Figure 28- Firebase database entries

This information can be updated and deleted, affecting the Firebase Realtime database. As demonstrated in figure 29, whatever is updated on the form will impact the database as shown in Figure 30 when a certain entry is updated, it will change on the database and on the list of preferences as shown in figure 31.

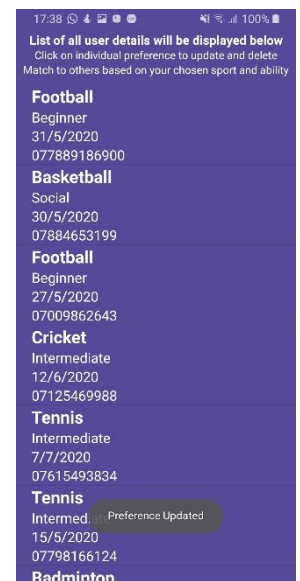
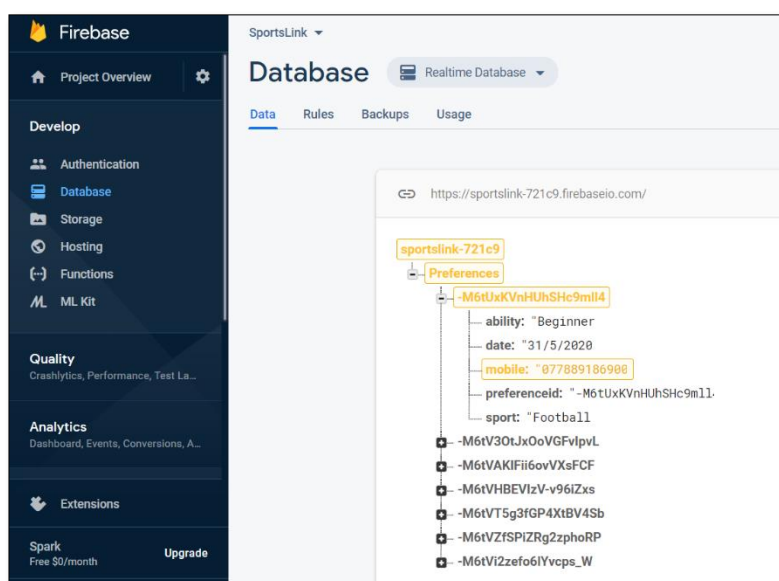
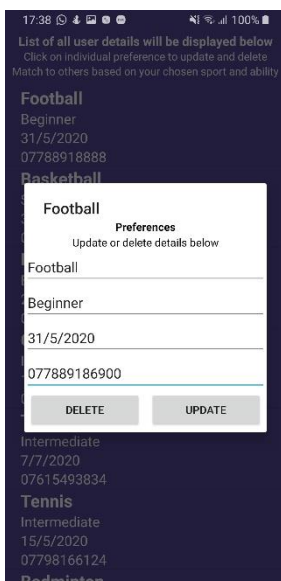


Figure 29-Update information

Figure 30-Database updated

Figure 31-Updated preference toast displayed.

Rating Page

The user can fill out a rating form. This is based on the user's prior experience with their matched opponent. As displayed in Figure 32, there are three fields for the user to complete, the user can screenshot the rating form and send it to the opponent to rate their experience between themselves. The stars that are on the page have been set to increment by one star at a time. Figure 33 shows how the page will look after the user chooses their rating.

Rate your Opponent
Please complete the sections below to rate the Individual, based on their manners, communication and an overall rating.

Manners
★ ★ ★ ★ ★

Communication
★ ★ ★ ★ ★

Overall
★ ★ ★ ★ ★

Comments



Screenshot and send this page to your opponent

Figure 32- Rating page with empty fields

Rate your Opponent
Please complete the sections below to rate the Individual, based on their manners, communication and an overall rating.

Manners
★ ★ ★ ★ ★

Communication
★ ★ ★ ★ ★

Overall
★ ★ ★ ★ ★

Comments



Screenshot and send this page to your opponent

Figure 33- Rating page with filled fields

Map Page

After users have identified each other's preferences, they will be directed to the map page using a notification. If the device location is turned on, the map retrieves the current location of the user as displayed in figure 34, this information is then used to get the nearby sports facilities as shown in figure 35. To display the information of each school, the user will click on a marker and it will give the address of the school as shown in figure 36. Using the information of the preferences, contact information and the nearby facilities. Users are able to initiate a sporting activity together.

Google Places API

This API is very significant to this project, as it allowed the application to include the maps feature of locating nearby places. To access this feature, an API key had to be created and inputted within the code. The code has been registered to schools, as most schools contain leisure and sports facilities. Without this API, the nearby facilities will not be located.

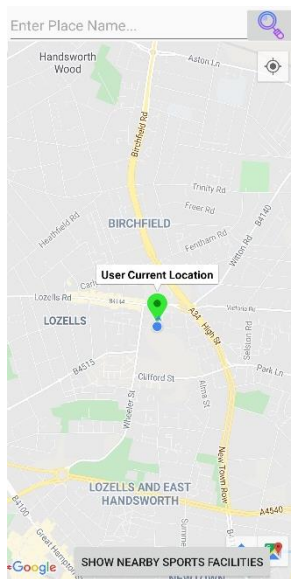


Figure 34-User Current Location



Figure 35-Nearby Facilities located



Figure 36- Marker displaying the address

Notification

The is programmed to appear when the user views the list of other user preferences. When the notification is clicked, the user is directed to the Map. This will prompt them and push them to access the Map to find nearby sports facilities. Figure 38 shows how the notification will appear at the top of the user's screen. Figure 37 shows how the notification will appear on the user's application drawer. It will display a '1' next to the SportsLink application logo to indicate that there is a notification.

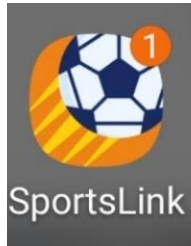


Figure 37-app icon badge

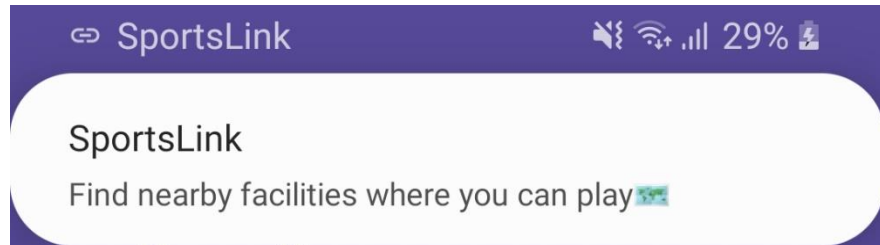


Figure 38-Notification appears

4.6. Testing

It was very important to test the application at all the stages of development. The testing was done to ensure that all the functionalities, design, usability, errors and additional add-ons can be identified through general user feedback. The code was debugged for errors, which can be caused by human error throughout the phase of development.

The Usability testing of the application was conducted using SUS. The standard questionnaire SUS testing is shown in Figure 39. During the testing stage the Coronavirus pandemic meant that testing was not applicable to the public as social distancing measures were introduced. Communication with people outside your household was not permitted. , Four family members we used to do usability testing.

The family were able to test its functionality and feedback on design and experience of usability. There was a language barrier as well as an understanding of the application as one parent did not speak English and the application was created in English. This resulted in having to explain each component of the application and the reasoning behind each feature.

After the usability test was completed. Each questionnaire was analysed and access to give a score. The average system usability scale score that was produced was seventy-eight. This score resembles a good application with good usability that can require a few adjustments to make it better.

Please enter your participant number: __1__

System Usability Scale (SUS)

This is a standard questionnaire that measures the overall usability of a system. Please select the answer that best expresses how you feel about each statement after using the application today.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1. I think I would like to use this application frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. I found the application unnecessarily complex.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I thought the application was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. I think that I would need the support of a technical person to be able to use this application.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I found the various functions in this application were well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. I thought there was too much inconsistency in this application.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I would imagine that most people would learn to use this application very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8. I found the application very cumbersome to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I felt very confident using the mobile application.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10. I needed to learn a lot of things before I could get going with this application.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How likely are you to recommend this application to others? (please circle your answer)

Not at all likely 0 1 2 3 4 5 6 7 8 9 10 Extremely likely

Figure 39- System Usability Scale form

The white box testing allows small and frequent test of an application, this testing was conducted for this application. The benefits of using white box testing is that it allows the developer to conduct the tests that they need as they know how the system works internally. (Software Testing Fundamentals, 2020) Results of the tests are shown in the tables below

Table 1- Using existing account information the user will login to application

User Input	Expected Outcome	Result
User Inputs already registered email and password in the fields provided.	User Gains access to the application.	Pass

Table 2- Explanation on how the User will navigate to registration page and register an account with SportsLink

User Input	Expected Outcome	Result
User Clicks the 'Sign up here' to access the registration Page. The user adds Email and Password. The user presses the 'Sign up, button.	User Gains access to the application. User Information is stored in Firebase authentication.	Pass

Table 3-User will pick their preferred sport, ability and data from the options provided.

User Input	Expected Outcome	Result
User picks the preferred sport, ability and Date	User Preferences will be submitted to Firebase Realtime database.	Pass

Table 4- User views at other user preferences

User Input	Expected Outcome	Result
User selected 'View Page'.	User preferences list will be displayed.	Pass

Table 5- Navigating to the Map Page

User Input	Expected Outcome	Result
The user selects the 'Map page' on the Home Page	Map is displayed.	Pass

5. Discussion

The features implemented allowed the aim of the project to be achieved. As proposed, the SportsLink application allows users to meet and communicate with people of similar interests and ability. The application contains a login feature and a registration page for already existing customers, and a calendar booking feature. It was not exactly implemented as first envisaged as some features were modified.

At the beginning of this process, The research was conducted on what software that should be used to develop the application, it was narrowed down to either React native or Android Studio, one of the reasons I didn't go for React Native, is because the framework would have to be found that works for both iOS and Android. Although Android Studio was a new software to me, the best way to progress and benefit was to learn how to use this software as well as develop my application simultaneously.

The project aims set were met and the application was successful in meeting the needs and requirements of the user. The application has been made to allow users to select their chosen sport, ability and location. Using this information the users can pick a date that they would like to play and then connected with each other easily.

The objectives that were set were also achieved. This included users able to find sports facilities, this is demonstrated in figure 40. To apply a calendar booking system as shown in figure 41. This application is engaging and simple. It will result in people participating in sports and eventually getting more fit and finally make it easier for participants to organise and play sports. Improvements could be made to the security of the application as it only requires an email and password. It should include a more secure way of accessing and using the application.



Figure 40-Showing nearby sports facilities

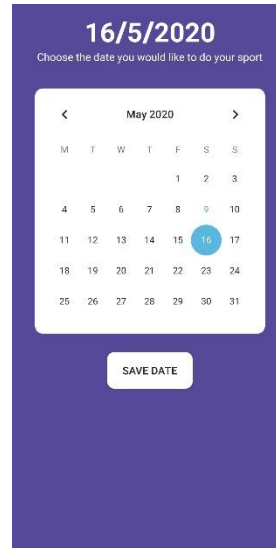


Figure 41-Calendar feature

5.1. Project Limitations

During this process, working in employment restricted the progress of time allocated to the project, however having a timetable and priority and managing the work I was able to complete all the necessary sections.

As part of the first implementation of the security within the application, it was first thought that uploading a user's photograph would enable a more secure transaction. This was changed as the user could upload any picture and falsify who they were making it a security risk. A more robust security measure was needed where the user was who they said they were and could not create false identities.

It will firstly be trailed locally. For it to be used nationally or globally, it will need a few updated features to work better for a large group of people.

One of the features that would have been essential to include did not work. The application should have allowed the functionality for the user to identify, allow and edit their own user preferences amongst the rest of the database. It now shows all the preferences at the same time and allows users to edit preferences from other users. The way to sort this issue out would be to set some parameters when reading for the database and only allow users to edit their specific information. The code that did not work is displayed in figure 42.

```
private void addPreference() {
    //FirebaseUser user1 = FirebaseAuth.getInstance().getCurrentUser();
    //String userId = user1.getId();
    String sport = editTextSport.getText().toString().trim();
    String ability = editTextAbility.getText().toString().trim();
    String date = editTextDate.getText().toString().trim();
    String mobile = editTextMobile.getText().toString().trim();
    if (!TextUtils.isEmpty(sport)) {
        if (!TextUtils.isEmpty(ability)) {
            if (!TextUtils.isEmpty(date)) {
                if (!TextUtils.isEmpty(mobile)) {
                    String id = databaseReference.push().getKey();
                    Preference Preference = new Preference(id, sport, ability, date, mobile);
                    databaseReference.child(id).setValue(Preference);
                    editTextSport.setText("");
                    editTextDate.setText("");
                    editTextAbility.setText("");
                    editTextMobile.setText("");
                    Toast.makeText(context, this, "Preference added", Toast.LENGTH_LONG).show();
                    infoDialog();
                }
            }
        }
    }
}
```

Figure 42-Unused code

Another proposed feature that was not included in the final application was the chat feature. A decision was made to not include the chat as participants can easily contact each other through other mobile phone applications.

March 2020 was seeing some unprecedented times as the world experienced the Coronavirus (Covid-19) outbreak. This has had a massive impact and was a limitation to the learning process, developing this product, and university life.

The Pandemic resulted in the suspension of all face-to-face lectures and meeting. Those who had underlying health issues had to self-isolate and quarantine at home. This was an unforeseen circumstance, that had many implications such as not allowing normal communication between lecturers and our supervisors, or meeting at university premises due to safety and preventing the spread of the disease. Lectures and seminars were moved to online classes, something we had not done before and the library and resources available at the university were closed to all. It was an unprecedented scenario which made sure that personal health and safety was the top priority. As it was an uncertain and confusing time.

It was a hard been a hard time to focus on work and the project itself as well as adjust to this situation. However, with this implication and limitation in mind, the work still had to be

completed. Planning work, seeking advice from lectures online and doing research using the internet has been the best way forward to complete the project. This was also an opportunity to self-learn and really get to grips with independent learning and study.

The Covid-19 has restricted the opportunity to visit the library. The literature review is heavy with online articles and website and has fewer books due to the lack of access to the library and its resources. The psychological and mental aspects of working alone has also been a limitation. There has been limited contact with lecturers to talk and discuss issues and with peers alike. The discussion and Ideas and areas of development are an essential need to help with progress.

Another limitation was the emulator. The process of the downloading an emulator was to access the Android Virtual Device(AVD) Manager, create a virtual device and select the System Development Kit(SDK) version. Depending on what version is selected, it states the percentage of devices the software will run on. The problem encountered was, the fact that the emulator did not run on the laptop device without having to change the BIOS settings. The Virtual Technology needed to be enabled in the BIOS for the emulator to run. The emulator caused the computer device to slow down and sometimes not respond and eventually was deleted. As an alternative, the application build was run on a Samsung Galaxy S9 device.

6. Conclusions

In conclusion, the application contained a lot of working features and putting all these features that worked together was quite an achievement. The proposal identified the project aims and objectives, after developing and designing the project, it has been identified that all the aims and objectives have been met. The aim was to create a successful mobile application that can allow users to meet and play sports. Its features allow communication with other registered users and connect with new people with similar sporting interests. It has a built-in feature to find sports venues and facilities closest to them to use. In addition, the application includes a calendar booking system for participants. It has a personal login feature to store data of already existing customers and matches people up so they can play.

The SportsLink application contained the login feature, calendar and a map feature. An overview of the system is that it enabled the user to input their user references based on sport, ability, date of the activity and a mobile number to contact. This was then recorded to the Firebase Realtime Database allowing other users to see and match these preferences. Using this information, users were able to contact each other and find nearby sports facilities to take part in their chosen sport. Once the sports activity was completed, users can complete a rating form which can then be screenshot and sent to their opponents.

The primary research collected using questionnaires gave an understanding of the demand for an application like SportsLink and what the application can provide for the user. The testing was done using some respondent and the application was enhanced through their feedback. The other testing method used was white box testing that allowed to see if the functions worked as they should. The usability was tested using the System Usability Scale, the results showed that the application has good usability but may require a few adjustments.

Using the Agile Methodology has allowed the adaptability of the development of the artefact. Changes were able to be made during the development to make the application better and to reach the requirements. This method allowed frequent changes to be made between this applications design and implementation stages. The process of the design included Low-

Fidelity and High-Fidelity prototypes. This showed a gradual improvement in application design as the development stage went on. Learning and developing the project in Android studio has provided valuable experience. Encountering problems and experimenting with code to find the solution. Many of the project objectives were met, however, some objectives will require more attention to reach its full potential, such as developing the security of the application that will require more time and resources.

Finally, the application was practically sound the overall design and user experience was seen to be good. The application fulfilled its objectives and user needs. Testers stated that they found the application quite easy to use and something that would be beneficial to the sporting industry.

7. Recommendations for further work

- It would be great if, the application that was created was what was envisioned in the initial idea with all components of the application working.
- For Future work, the application should be implemented on iOS. This can be done using React-Native,
- To improve security while using the application, the photo-ID verification can be implemented to reduce security problems like identity theft.
- The chat facility was left out from the initial design, this feature could be implemented in future work. The chat facility would enable the user to chat directly to the person enabling them to organise playing time and discuss standards and venue. Whole teams can be included with this chat feature. For example, a football team can be on the chat and the coach might update training times.
- To improve the nearby sports facility feature it could book venue facilities directly through the application. This will alleviate the need to call the sports centres and the players could all be notified when the booking is made with the details of the booking such as venue location and time.
- The application could be implemented along with a Smartwatch. It could include a notification feature that comes directly to a user's watch. It could send notification of player match with someone with the same preferences.
- Finally, the application could have a supporting feature that could include sports rules and advice for those who want to try a sport for the first time. As this project occurred during the Coronavirus pandemic, there were limited resources and aid available for the project, as it created a disruption to normal studies. Future work will require more help and support for it to reach its full potential.

8. List of References

Powell-Morse, A. (2019). *What Is Rapid Application Development (RAD) and How Do You Use It?*. [online] Airbrake Blog. Available at: <https://airbrake.io/blog/sdlc/rapid-application-development> [Accessed Dec. 2019]

Baker, C., 2020. *Obesity Statistics*. [online] House of Commons Library. Available at: <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN03336> [Accessed March 2020]

Ons.gov.uk. 2020. *Disability, Well-Being And Loneliness, UK - Office For National Statistics*. [online] Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/disability/bulletins/disabilitywellbeingandlonelinessuk/2019> [Accessed March 2020].

Georgiou, M., 2020. *8 Common Mistakes To Avoid When Developing A Mobile App For Your Business | Clutch.Co*. [online] Clutch.co. Available at: <https://clutch.co/app-developers/resources/8-common-mistakes-avoid-when-developing-mobile-app-your-business> [Accessed April 2020].

Sacolick, I., 2020. *What Is Agile Methodology? Modern Software Development Explained*. [online] InfoWorld. Available at: <https://www.infoworld.com/article/3237508/what-is-agile-methodology-modern-software-development-explained.html> [Accessed April 2020].

Wales, M., 2020. *Front-End Vs Back-End Vs Full Stack Web Developers*. [online] Udacity. Available at: <https://blog.udacity.com/2014/12/front-end-vs-back-end-vs-full-stack-web-developers.html> [Accessed April 2020].

Weaver, P. (2011). *Success in Your Project*. Harlow: Pearson, p.55

Jain, M., 2020. *Differences Between Black Box Testing Vs White Box Testing - Geeksforgeeks*. [online] GeeksforGeeks. Available at: <https://www.geeksforgeeks.org/differences-between-black-box-testing-vs-white-box-testing> [Accessed May 2020].

Software Testing Fundamentals. 2020. *White Box Testing - Software Testing Fundamentals*. [online] Available at: <http://softwaretestingfundamentals.com/white-box-testing> [Accessed May 2020].

8.1. Mahara Journal

Link to Mahara Journal-<https://moodle-portfolio.bcu.ac.uk/view/view.php?t=8VeoGErgilU03Jdj4CZm>

9. Bibliography

Said (2018). What you need to know to start building mobile apps in React Native [online] freecodecamp.org. Available at: <https://www.freecodecamp.org/news/what-you-need-to-know-to-start-building-mobile-apps-in-react-native-dded951277b7/>

Segue Technologies. 2020. *The Importance Of Wireframing For A Responsive Website*. [online] Available at: <https://www.seguetech.com/the-importance-of-wireframing-for-a-responsive-website/> [Accessed March 2020].

Lucidchart.com. 2020. [online] Available at: <https://www.lucidchart.com/pages/how-to-draw-a-sequence-diagram-in-UML> [Accessed 10 May 2020].

Development, M., Development, M., ERP, D., Bot, F. and Study, C., 2020. *6 Advantages Of Using MVC Model For Effective Web Application Development*. [online] Brainvire. Available at: <https://www.brainvire.com/six-benefits-of-using-mvc-model-for-effective-web-application-development> [Accessed 6 May 2020].

Hart, C., 1998. *Doing A Literature Review*. Sage Publications.

Mew, K., 2017. *Mastering Android Studio 3*. Birmingham, UK: Packt Publishing.

Codelabs.developers.google.com. 2020. *Firebase Android Codelab - Build Friendly Chat*. [online] Available at: <https://codelabs.developers.google.com/codelabs/firebase-android/index.html?index=..%2F..index#9> [Accessed 9 May 2020].

Thomas, N., 2020. [online] Usabilitygeek.com. Available at: <https://usabilitygeek.com/how-to-use-the-system-usability-scale-sus-to-evaluate-the-usability-of-your-website> [Accessed 10 May 2020].

10. Appendices

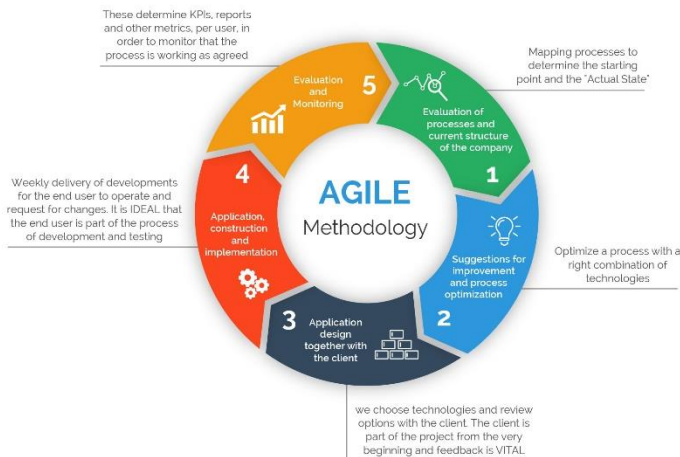


Figure 43- Agile Methodology Diagram

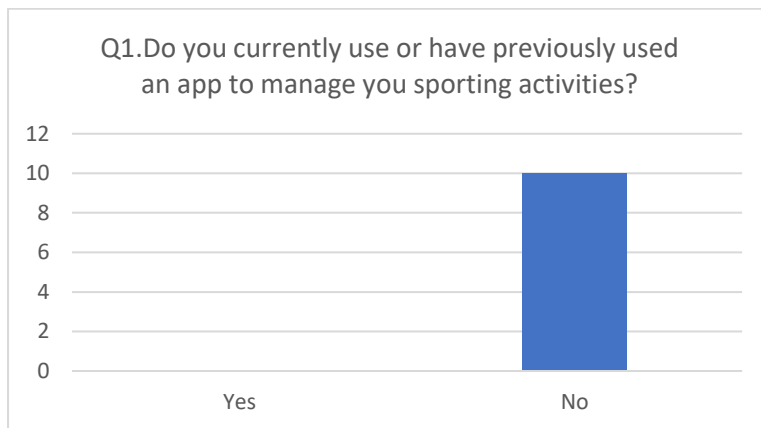


Figure 44-Previously used app graph

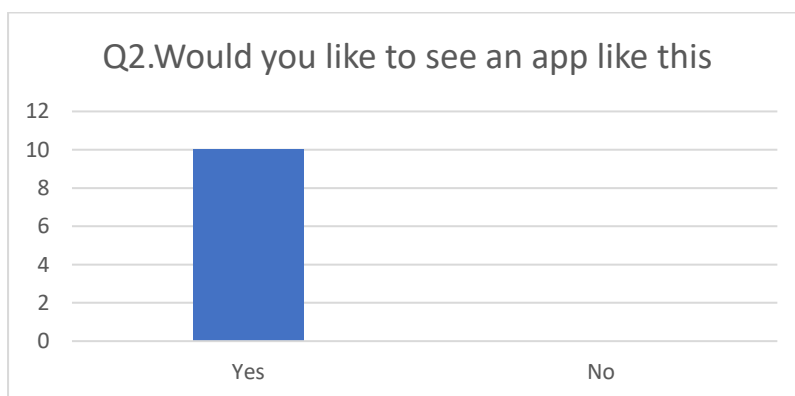


Figure 45- would you like to see an app like this graph

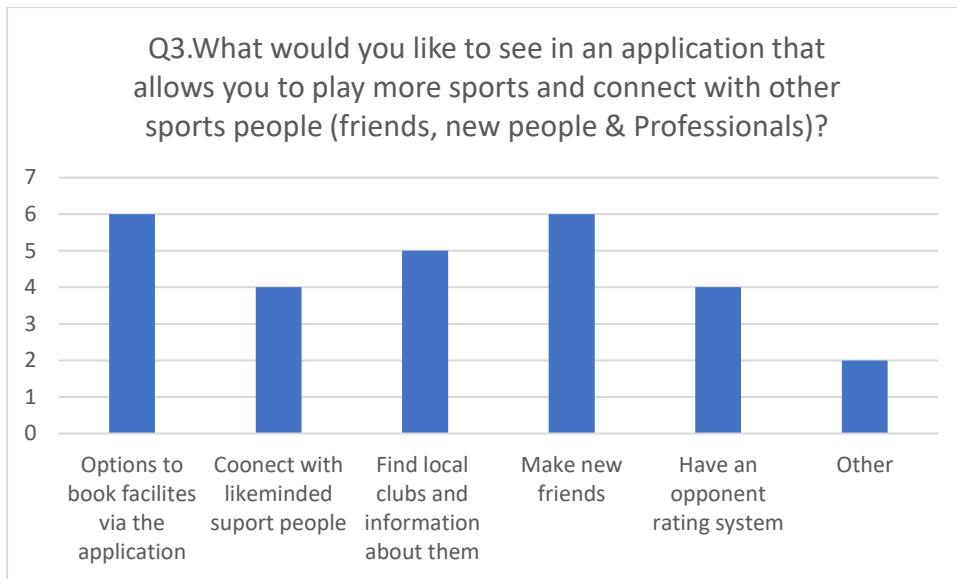


Figure 46- what would you like to see in the app graph

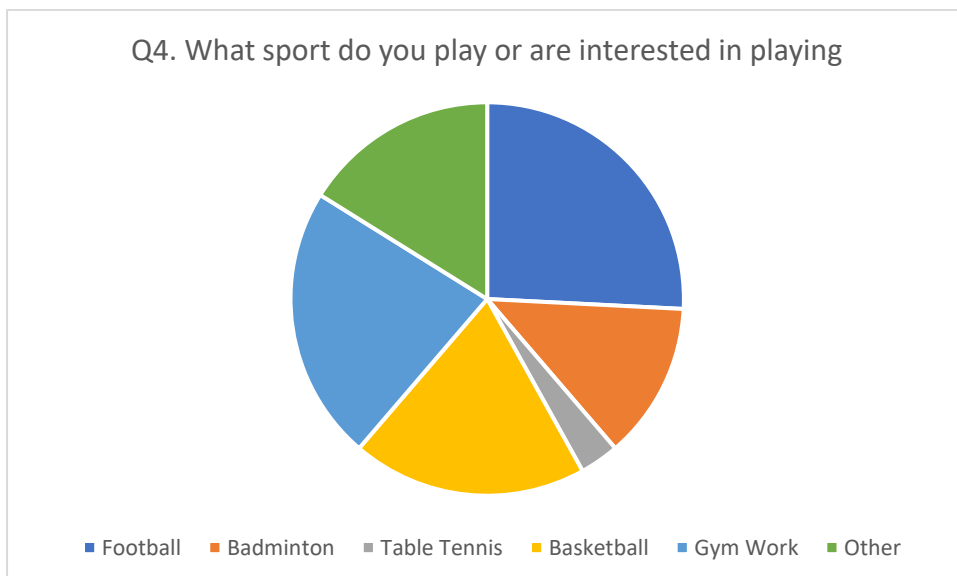


Figure 47- what sport do you play graph

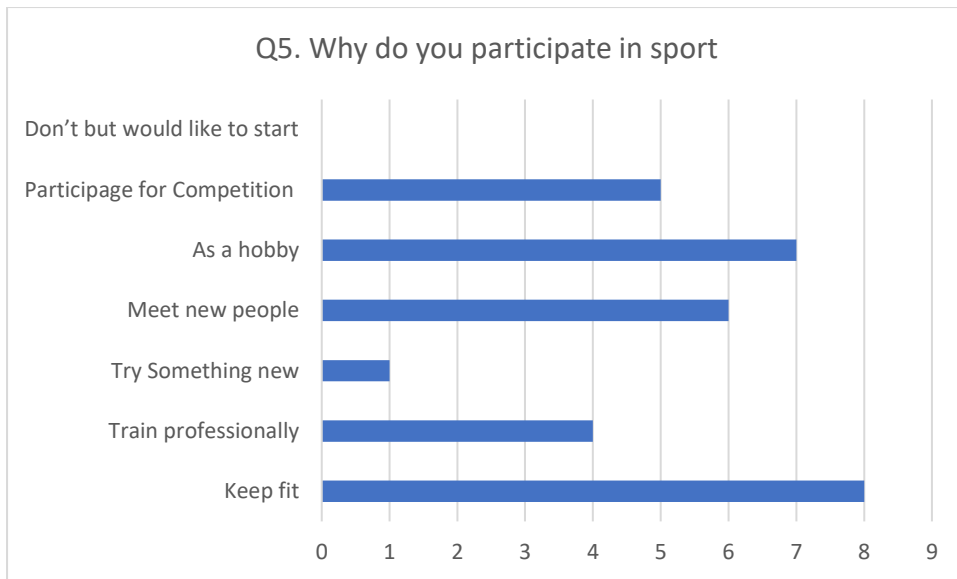


Figure 48-why do you participate graph

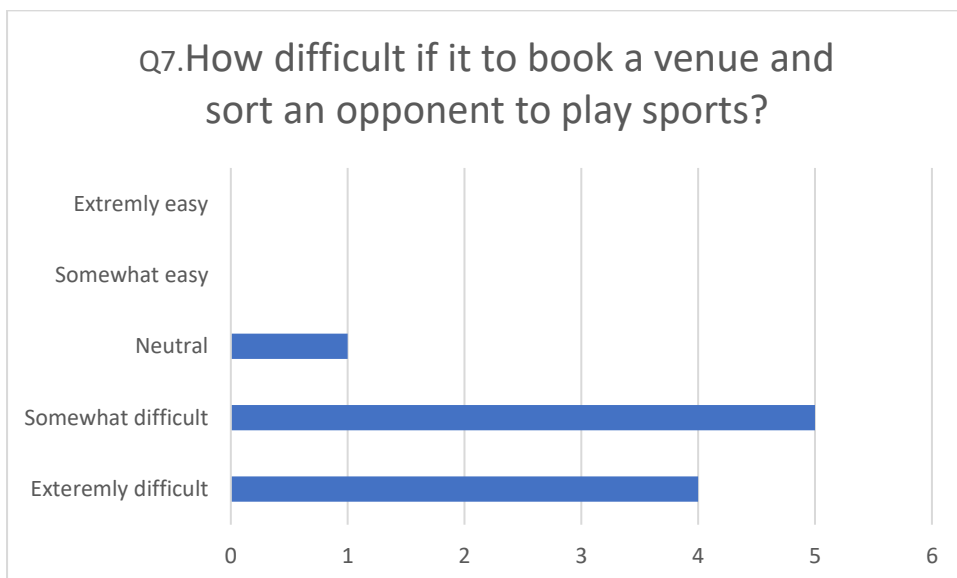


Figure 49-how difficult to book venue graph5

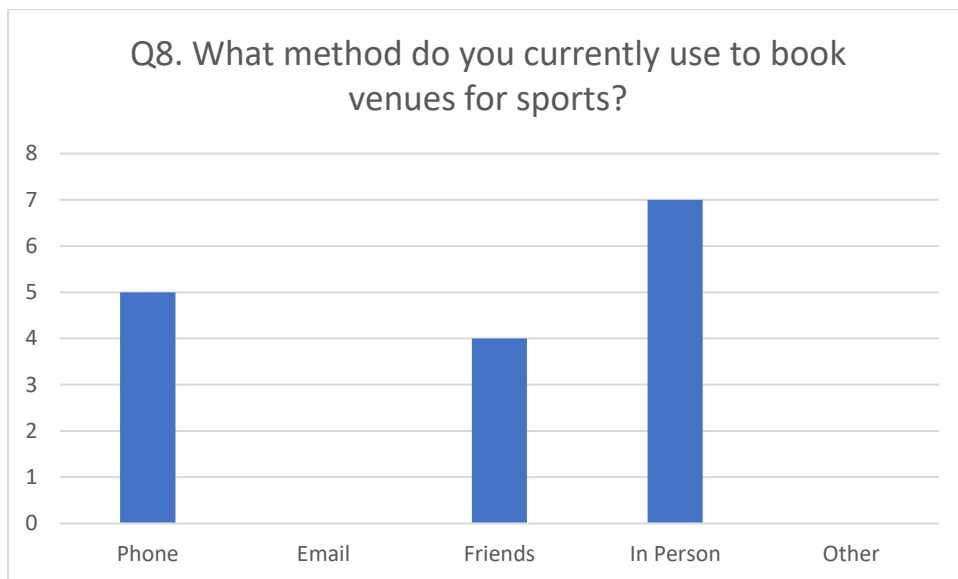


Figure 50-what method is currently used graph

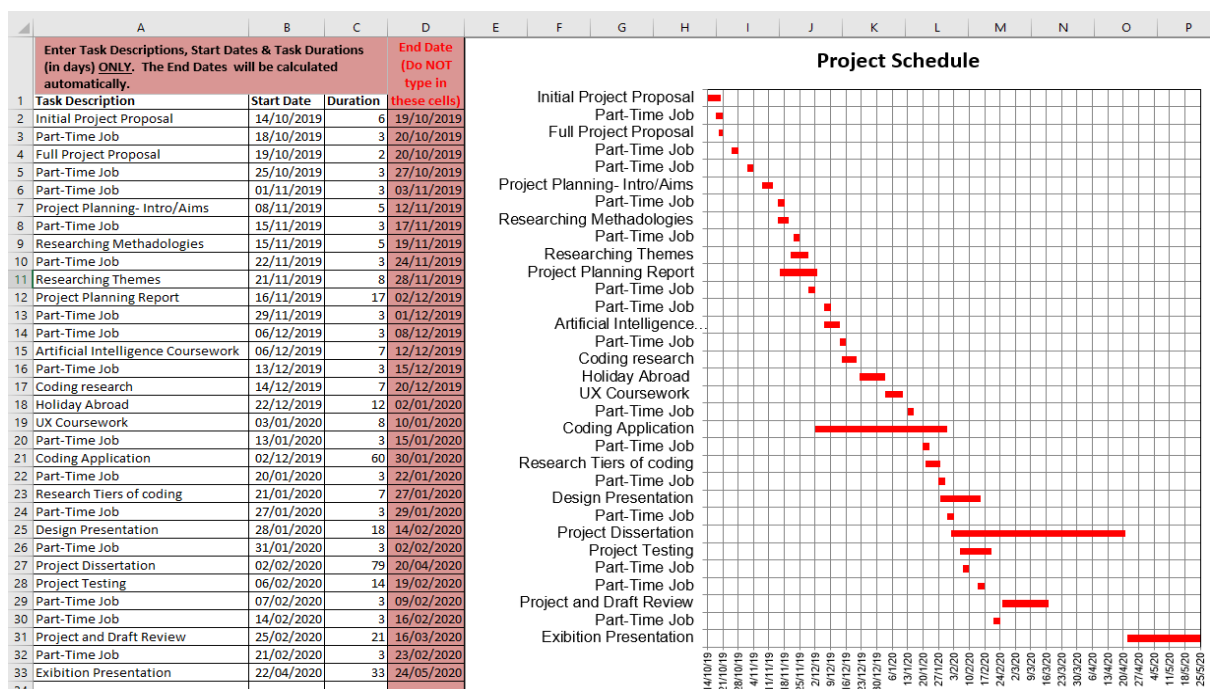


Figure 51-Gantt Chart for project6

(/ A)

QUESTIONNAIRE

SPORTSLINK

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☒

Female ☐

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application. ☐
2. Connect with likeminded sport people. ☐
3. Find local clubs and information about them. ☐
4. Make new friends ☒
5. Have an opponent rating system. ☒
6. Other (Please write below)

4. What sport do you play or are interested in playing?

Football ☒

Badminton ☒

Table Tennis ☐

Basketball ☐

Gym work ☐

Other: _____

Figure 52-Primary research questionnaire 1

(16)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☒ 3. Try something new ☐
4. Meet new people ☒ 5. 4. As a Hobby ☒ 6. Participate for competition ☒
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☐ Extremely likely ☒

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☒ Somewhat difficult ☐ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☐ Email ☐ Friends ☐ In Person ☒ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Thank You Very much for completing the questionnaire.

Figure 53-Primary research questionnaire 2

(2a)

QUESTIONNAIRE

SPORTSLINK

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☒

Female ☐

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

- 1. Options to Book facilities via the Application. ☒
- 2. Connect with likeminded sport people. ☐
- 3. Find local clubs and information about them. ☒
- 4. Make new friends ☐
- 5. Have an opponent rating system. ☐
- 6. Other (Please write below) ☐

4. What sport do you play or are interested in playing?

Football ☐

Badminton ☐

Table Tennis ☐

Basketball ☐

Gym work ☒

Other: CROSS FITNESS / GYM
CLASSES,

Figure 54-Primary research questionnaire 3

(26)

5. Why do you participate in sport?

1. Keep fit ☐ 2. Train Professionally ☐ 3. Try something new ☐
4. Meet new people ☐ 5. 4. As a Hobby ☒ 6. Participate for competition ☒
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☐ Extremely likely ☒

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☐ Somewhat difficult ☒ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

Difficult to book as low availability

8. What method do currently you use to book venues for sports?

- By Phone ☒ Email ☐ Friends ☐ In Person ☒ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Great Idea I would Def. Download and give it a try.

Thank You Very much for completing the questionnaire.

Figure 55-Primary research questionnaire 4

(3a)

QUESTIONNAIRE

SPORTSLINK

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☐

Female ☒

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application.
2. Connect with likeminded sport people.
3. Find local clubs and information about them.
4. Make new friends
5. Have an opponent rating system.
6. Other (Please write below)

☒
☒
☒
☒
☒
☒

4. What sport do you play or are interested in playing?

Football ☐

Badminton ☒

Table Tennis ☐

Basketball ☒

Gym work ☒

Other: _____

Figure 56-Primary research questionnaire 5

(36)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☐ 3. Try something new ☒
4. Meet new people ☒ 5. 4. As a Hobby ☐ 6. Participate for competition ☐
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☐ Extremely likely ☒

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☒ Somewhat difficult ☐ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☒ Email ☐ Friends ☐ In Person ☒ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Thank You Very much for completing the questionnaire.

Figure 57-Primary research questionnaire 6

(4a)

QUESTIONNAIRE

SPORTSLINK

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☐

Female ☒

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

- | | |
|--|-------------------------------------|
| 1. Options to Book facilities via the Application. | <input type="checkbox"/> |
| 2. Connect with likeminded sport people. | <input type="checkbox"/> |
| 3. Find local clubs and information about them. | <input type="checkbox"/> |
| 4. Make new friends | <input checked="" type="checkbox"/> |
| 5. Have an opponent rating system. | <input type="checkbox"/> |
| 6. Other (Please write below) | <input type="checkbox"/> |

4. What sport do you play or are interested in playing?

Football ☐

Badminton ☒

Table Tennis ☐

Basketball ☐

Gym work ☐

Other: _____

Figure 58-Primary research questionnaire 7

(4b)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☐ 3. Try something new ☐
4. Meet new people ☒ 5. As a Hobby ☒ 6. Participate for competition ☐
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☒ Extremely likely ☐

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☒ Somewhat difficult ☐ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☐ Email ☐ Friends ☒ In Person ☐ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Thank You Very much for completing the questionnaire.

Figure 59-Primary research questionnaire 8

(5a)

QUESTIONNAIRE

SPORTSLINK

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☒

Female ☐

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application. ☒
2. Connect with likeminded sport people. ☒
3. Find local clubs and information about them. ☒
4. Make new friends ☒
5. Have an opponent rating system. ☒
6. Other (Please write below)

4. What sport do you play or are interested in playing?

Football ☒

Badminton ☒

Table Tennis ☒

Basketball ☐

Gym work ☐

Other: SNooker

Figure 60-Primary research questionnaire 9

(56)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☒ 3. Try something new ☐
4. Meet new people ☒ 5. 4. As a Hobby ☒ 6. Participate for competition ☒
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☒ Extremely likely ☐

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☐ Somewhat difficult ☒ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☒ Email ☐ Friends ☐ In Person ☒ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

PLAYERS PROFILE AND RATINGS, SO CAN MEET LIKE MINDED
PEOPLE AT THE SAME STANDARD

Thank You Very much for completing the questionnaire.

Figure 61-Primary research questionnaire 10

(6a)

QUESTIONNAIRE

SPORTSLINK

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☒

Female ☐

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application.
2. Connect with likeminded sport people.
3. Find local clubs and information about them.
4. Make new friends
5. Have an opponent rating system.
6. Other (Please write below)

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

4. What sport do you play or are interested in playing?

Football ☐

Badminton ☒

Table Tennis ☐

Basketball ☐

Gym work ☐

Other: Fitness Clubs.

Figure 62-Primary research questionnaire 11

(6b)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☒ 3. Try something new ☐
4. Meet new people ☐ 5. 4. As a Hobby ☐ 6. Participate for competition ☐
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☐ Extremely likely ☒

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☐ Somewhat difficult ☒ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☐ Email ☐ Friends ☐ In Person ☒ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Should be easy to use. it must be cheap or free.
Should be safe to use.

Thank You Very much for completing the questionnaire.

Figure 63-Primary research questionnaire 12

QUESTIONNAIRE

SPORTSLINK

(7a)

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☒

Female ☐

1. Do you currently use or have previously used an app to manage your sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application. ☐
2. Connect with likeminded sport people. ☒
3. Find local clubs and information about them. ☐
4. Make new friends ☐
5. Have an opponent rating system. ☐
6. Other (Please write below) ☐

4. What sport do you play or are interested in playing?

Football ☒

Badminton ☒

Table Tennis ☐

Basketball ☐

Gym work ☐

Other: _____

Figure 64-Primary research questionnaire 13

(7b)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☒ 3. Try something new ☐
4. Meet new people ☒ 5. As a Hobby ☒ 6. Participate for competition ☒
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☐ Extremely likely ☒

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☐ Somewhat difficult ☒ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☒ Email ☐ Friends ☒ In Person ☒ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Thank You Very much for completing the questionnaire.

Figure 65-Primary research questionnaire 14

QUESTIONNAIRE

SPORTSLINK

(8a)

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☐

Female ☒

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application. ☒
2. Connect with likeminded sport people. ☐
3. Find local clubs and information about them. ☒
4. Make new friends ☒
5. Have an opponent rating system. ☐
6. Other (Please write below)

Tournaments of competitions going around my local area.

4. What sport do you play or are interested in playing?

Football ☐

Badminton ☒

Table Tennis ☐

Basketball ☐

Gym work ☐

Other: netball

Figure 66-Primary research questionnaire 15

(86)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☐ 3. Try something new ☐
4. Meet new people ☒ 5. 4. As a Hobby ☐ 6. Participate for competition ☐
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☒ Extremely likely ☐

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☒ Somewhat difficult ☐ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☐ Email ☐ Friends ☒ In Person ☐ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

- Will Sportslink make you pay to be a member
- How will you get booking information
- Will sportslink be introduced to already famous sports people.
Thank You Very much for completing the questionnaire.

Figure 67-Primary research questionnaire 16

QUESTIONNAIRE

SPORTSLINK

(9a)

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☐

Female ☒

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application.
2. Connect with likeminded sport people.
3. Find local clubs and information about them.
4. Make new friends
5. Have an opponent rating system.
6. Other (Please write below)

☒
☐
☐
☐
☒

Dixtry plan

4. What sport do you play or are interested in playing?

Football ☐

Badminton ☐

Table Tennis ☐

Basketball ☐

Gym work ☒

Other: netball

Figure 68-Primary research questionnaire 17

(96)

5. Why do you participate in sport?

1. Keep fit ☐ 2. Train Professionally ☐ 3. Try something new ☐
4. Meet new people ☐ 5. 4. As a Hobby ☒ 6. Participate for competition ☒
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☒ Extremely likely ☐

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☐ Somewhat difficult ☐ Neutral ☒
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☐ Email ☐ Friends ☐ In Person ☒ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Thank You Very much for completing the questionnaire.

Figure 69-Primary research questionnaire 18

QUESTIONNAIRE

SPORTSLINK

(10a)

Dear Respondent: This piece of research is based on my university Dissertation. It is based on developing SportsLink, an application to help people get healthy, play sports, and connect with other sports minded people. The application will allow registered users to find suitable opponents, book venues and make new friends via the application. By completing this questionnaire you are supporting this research. All response will be treated with strict confidence and in line with university research guidelines.

Please answer the question below.

Age

Male ☐

Female ☒

1. Do you currently use or have previously used an app to manage you sporting activities?

Yes ☐ No ☒

If yes, please state which? _____

2. Would you like to see an app like this?

Yes ☒ No ☐

3. What would you like to see in an application that allows you to play more sports and connect with other sports people (friends, new people & Professionals)?

1. Options to Book facilities via the Application. ☐
2. Connect with likeminded sport people. ☒
3. Find local clubs and information about them. ☐
4. Make new friends ☒
5. Have an opponent rating system. ☐
6. Other (Please write below)

4. What sport do you play or are interested in playing?

Football ☒

Badminton ☒

Table Tennis ☐

Basketball ☒

Gym work ☐

Other: _____

Figure 70-Primary research questionnaire 19

(106)

5. Why do you participate in sport?

1. Keep fit ☒ 2. Train Professionally ☐ 3. Try something new ☐
4. Meet new people ☐ 5. 4. As a Hobby ☒ 6. Participate for competition ☐
7. Don't but would like to start. ☐

Other: _____

6. How likely are you to recommend the Sportslink application to family, friends, or colleagues if it was available?

- Extremely unlikely ☐ Somewhat unlikely ☐ Neutral ☐
Somewhat likely ☐ Extremely likely ☒

7. How difficult if it to book a venue and sort an opponent to play sports?

- Extremely difficult ☐ Somewhat difficult ☒ Neutral ☐
Somewhat easy ☐ Extremely easy ☐

8. What method do currently you use to book venues for sports?

- By Phone ☒ Email ☐ Friends ☒ In Person ☐ Other ☐

9. How likely are you to use an application like this to play more sport? (please circle rating below. 10=Extremely Likely/1=Extremely unlikely)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

10. Please comment or add anything else you think about this Sportlink app.

Thank You Very much for completing the questionnaire.

Figure 71-Primary research questionnaire 20

Please enter your participant number: 2

System Usability Scale (SUS)

This is a standard questionnaire that measures the overall usability of a system. Please select the answer that best expresses how you feel about each statement after using the application today.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1. I think I would like to use this application frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. I found the application unnecessarily complex.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I thought the application was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. I think that I would need the support of a technical person to be able to use this application.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I found the various functions in this application were well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. I thought there was too much inconsistency in this application.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I would imagine that most people would learn to use this application very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8. I found the application very cumbersome to use.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I felt very confident using the mobile application.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10. I needed to learn a lot of things before I could get going with this application.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How likely are you to recommend this application to others? (please circle your answer)

Not at all likely 0 1 2 3 4 5 6 7 **8** 9 10 Extremely likely

Figure 72-Sus Testing 1

Please enter your participant number: 3

System Usability Scale (SUS)

This is a standard questionnaire that measures the overall usability of a system. Please select the answer that best expresses how you feel about each statement after using the application today.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1. I think I would like to use this application frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. I found the application unnecessarily complex.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I thought the application was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. I think that I would need the support of a technical person to be able to use this application.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I found the various functions in this application were well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. I thought there was too much inconsistency in this application.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I would imagine that most people would learn to use this application very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8. I found the application very cumbersome to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I felt very confident using the mobile application.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10. I needed to learn a lot of things before I could get going with this application.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How likely are you to recommend this application to others? (please circle your answer)

Not at all likely 0 1 2 3 4 5 6 7 8 9 **10** Extremely likely

Figure 73-SUS testing 2

Please enter your participant number: 4

System Usability Scale (SUS)

This is a standard questionnaire that measures the overall usability of a system. Please select the answer that best expresses how you feel about each statement after using the application today.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1. I think I would like to use this application frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. I found the application unnecessarily complex.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I thought the application was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I think that I would need the support of a technical person to be able to use this application.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I found the various functions in this application were well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6. I thought there was too much inconsistency in this application.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I would imagine that most people would learn to use this application very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8. I found the application very cumbersome to use.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I felt very confident using the mobile application.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10. I needed to learn a lot of things before I could get going with this application.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How likely are you to recommend this application to others? (please circle your answer)

Not at all likely 0 1 2 3 4 5 6 7 8 **9** 10 Extremely likely

Figure 74-SUS testing 3