Final Year Project Dissertation – 2021

Project: Menopause Symptoms Tracker

BSc (Hons) Software Engineering (Level 6)

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Abstract:

Project research question: *"Would the proposed system help menopausal women track their symptoms, medication, and cycle by providing a responsive tool compatible with different web browsers?"*

Introduction:

Menopause is a common condition with a considerable impact on women. The hormonal changes affect women's bodies, usually between the ages 45 and 55 [28], and cause various symptoms.

This project was proposed by a customer who claimed to find no efficient, easy-to-use menopause symptoms tracking tool. All available tools were mainly mobile apps. Some of the available apps have excellent features but miss usability features. All requirements were elicited from the customer via interviews. Research was also conducted to gather information and better understand menopause to build a symptoms tracking tool that meets user requirements.

Objectives:

The main objective of this project was to build a responsive web application that helps women going through menopause track menopause symptoms, medications and menstruation cycle.

Methods:

The Iterative and Incremental approach for agile development methodology was used to develop the system. The system was developed over four increments. This web application was thoroughly tested, and security, usability, and performance were evaluated. Usability testing was undertaken during each increment to ensure a usable web application. Users from different backgrounds have tested the web application to ensure its ease of use. All feedback was taken into consideration when possible.

Conclusion:

The conducted evaluation and the user testing showed that this web application is fully functional and can help women track menopause symptoms, medication and cycle.

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Chapter 1: Introduction

1.1 Motivation:

Menopause, a natural biological process, marks the end of a women's menstrual cycle but can cause several physical and emotional symptoms, such as hot flushes, anxiety, unsettled sleeping routine, and lower energy. Hot flushes and night sweats are menopausal vasomotor symptoms. These symptoms affect between 60% and 80% of menopausal women [20].

This project's motivation is to help menopausal women track their symptoms, medications and to educate them about menopause. The main inspiration came from the lack of tools that concerns this issue; for example, no web application deals with tracking menopause symptoms.

Some mobile apps help to track these symptoms. However, the drawback of an app is that it is designed for a specific platform, such as iOS or Android, and can only be used by installing it on devices that support that platform, such as Apple and Samsung phones. Therefore, mobile apps are not always available to all users. However, a web application can be used on any browser; and a responsive web application can also be used on a mobile phone.

Having a chance to see some real examples of women experiencing menopause helped to raise my awareness of how disturbing, painful, and serious these symptoms could be. These symptoms could have a devastating impact on the lifestyle of women suffering to adapt to this stage of their lives. These, together with my interest in health and wellbeing, were the main reasons for taking this project.

Completing this project will enrich my knowledge concerning the latest research on menopause, and, importantly, it will help me as a woman when I also go through menopause. It will also develop my technical skills, e.g. planning skills, as this is important to successfully deliver the project: it will also develop both my coding and problem-solving skills.

1.2 Aim:

The project aims to build a web application that will help women going through menopause track menopause symptoms and medications. It also aims to educate women about menopause by providing reliable articles about different aspects like symptoms, medications, and health tips to help women adopt this stage.

1.3 Objectives:

A review has been done on the first version of the objectives, leading to creating a second version where the search engine was removed. This amendment was because the user interface design made the search engine less important, as all the symptoms were listed on one page, as were the medication. Furthermore, after reading different articles on how important it is to educate women about menopause, one of the optional objectives to create an articles page was made one of the main objectives "included in objective 3".

Below is the new version of the project objectives:

- Objective 1: to research menopause and its symptoms to gain a better understanding of menopause and to gather information for this web application (1 st of November) completed.
- Objective 2: To research similar applications related to menopause to improve the currently available applications (1st of November).
- Objective 3: To identify the functionalities needed for the system to help to achieve the project aim (1st of November).
- Objective 4: To research programming languages that meet the system specifications (1st of November) completed.
- Objective 5: To design a user interface that contains all the functional specifications identified in the earlier stage, focusing on usability, ensuring a good user experience (1st of December) completed.
- Objective 6: To design and create a quality database to store the required data (1st of December) completed.
- Objective 7: To implement functionalities specified in the earlier stage. To be completed by (15th of March).
- Objective 8: To evaluate the application in terms of; performance, quality, and security to ensure a good user experience (25th of March).

Optional objectives:

1. To create a visual demonstration for the severity of symptoms shown on a calendar to help the user understand their symptoms' patterns. The customer suggested this objective after a demo.

2. To create a tips generator, this should generate tips according to the user's symptoms. These tips are based on scientific research to help users manage their symptoms.

1.4 Adopted approach:

After deciding on the project topic, different researches were carried out to determine suitable tools to implement this web application.

The first research was to look at menopause symptoms and medications from trusted resources, such as books, journals, and conferences—the main reason being to understand menopause and gather the needed information to feed into the web application.

The second research was to look at similar products to ascertain advantages and weaknesses to aid the building of better web applications and fill in the gaps in existing applications. Notes were taken, and plans for the user interface were sketched on paper to help find a usable interface and friendly interface.
The third research was to investigate and choose a development methodology to help with fastand flexible development to keep this project on the right track.

The fourth research was to explore suitable programming languages that could help with creating this web application.

The fifth research was to decide on the development environment that can adopt the proposed programming languages.

The sixth research was to choose the appropriate qualitative and quantitative methods to evaluate my web application. Moreover, as the user is the main player for this web, one of the concerns was finding ways to seek the user's consent to reproduce their information only for the proposed app.

Chapter 2: Literature Review

2.1 Introduction:

The purpose of this paper is to review recent research into menopause to understand menopause and the changes that a women's body faces during menopause.

Doing this research will help build a more reliable web application. All the information that will be fed into the system will be from trusted resources, such as books, journals, and the NHS official website.

A considerable amount of literature has been published on menopause. These studies explained in-depth menopause, its cause, and its symptoms.

The first part of this paper will give an overview of menopause. It will look into various literature sources, including journal articles, conference papers, and project reports that have been published on menopause, to identify gaps that I can cover by creating my web application.

The second part of this paper focuses on reviewing existing applications that have been published to help women deal with this stage of their lives. It will also identify the gaps that will be filled by completing this project and why it differs from existing projects.

2.2 Menopause:

Menopause is a common condition that has a considerable impact on women and is the hormonal changes that affect women's bodies over a long time, usually between the age of 45 and 55 [1]. Menopause is referred to in three terms or stages (Perimenopause, Menopause, and Climacteric), each of which has a different meaning and describes a period where changes in women's hormones take place. Below is an explanation of each stage:

2.1.1 Perimenopause:

This stage lasts between 3 to 5 years, but shifting into this stage can be sudden. Recent research defined the main symptoms for this stage as a rise in the blood level of FSH, impaired ovarian function, irregular menstruation patterns, the start of experiencing menopause symptoms, a decrease in fertility and a higher risk of "fatal genetic abnormality", thus not recommending pregnancy during this age [2].

2.1.2 Menopause:

What defines this stage is that menstruation ceases due to the insufficient oestrogen production by the ovaries, which affects the endometrial, causing it to increase in size. As a result, menstruation stops. This stage usually occurs around the age of 50; however, this is uncertain and unconfirmed unless women have had six months with no menstruation [2].

2.1.3 Climacteric:

The main characteristic of this stage is the ovarian follicular function stops. This might be a difficult stage for most women because of the symptoms associated with it. However, according to some surveys, this stage does not affect life quality for most women [2].

In each of the above stages, women suffer from different symptoms. Tracking these symptoms can lead to a better understanding of them. It can also help women keep track of their current stage and seek the correct health advice related to their current stage. Menopause and technologies:

Research has been done to evaluate the quality of content for websites that provides information about menopause [21]. The quality of these websites was measured according to "specific criteria, content type, language, and quality". The findings from this research were that they were inconsistent with content and quality. Most websites were commercial with low-quality content or gave little-value information. Only a few sites provided reliable information about menopause. Not enough information was found on the scientific societies about the possible negative effects of hormone replacement therapy.

Other research has been published concerning the same issue [19], i.e. the reliability of menopause information and information about HRT "Hormone Replacement Therapy" used as a menopause treatment. This research evaluated 25 websites to investigate their reliability. A semi-structured qualitative manner was used to assess these sites. The findings were that reliability was questioned in most of these websites. Only websites owned by "the pharmaceutical industry, community pharmacies, governments, and charities" tend to be reliable. Still, the content needs to be studied carefully as commercial sites may be biased towards their products. As a result, it was recommended that healthcare professionals should direct women towards reliable sites such as "the pharmaceutical industry, community pharmacies, governments, and charities".

[14] Research has been made on 25 high-ranking menopause websites to assess the readability

and usefulness of the information provided on these websites. The readability was assessed using Flesch Reading Ease and Flesch-Kincaid Grade Level formulae which are considered the most common formulas to evaluate readability. The Findings were that the information reading level on these websites was higher than the recommended sixth-grade level, and additionally, there was a lack of appropriate health information.

[26] Research has been made to identify the educational need for menopausal women and test the usefulness of self-management online tools. Methods used were focus groups with 24 women ages 40 – 55, telephone interviews with eight healthcare experts. Mapping methodology was used for evaluating qualitative data to determine the programmatic approach needed to create a useful program, the creation of a test program, and then research with 35 women and nine healthcare experts to qualify knowledge gained from using this program. The findings were that women seek more information about menopause and symptoms management, and online programs with reliable information can significantly increase women's knowledge about menopause.

[27] This research looked into possible ways to help mental health practitioners recommend digital health strategies to help women in the workforce during menopause manage menopause symptoms. The method used is a literature review that examines the benefit of digital health strategies to help women manage menopause symptoms. The finding demonstrates the need to find effective, secure, and reliable digital health technology to help women during menopause.

A variety of literature sources have been published on menopause. Some of this literature was focused on explaining this stage of women's lives, and some were concerning the reliability of the information published on different websites; others considered the readability of the information provided on these tools. On the other hand, some researchers looked into the educational need for menopausal women. In contrast, others looked into the benefit of finding a reliable digital healthcare application that helps women in the workforce cope with menopause symptoms.

2.2 Related Products:

This section examines the related work with an eye for improvement opportunities. Looking at different published web applications/mobile apps is an essential approach in investigating the advantages and weaknesses of each product. This will help to fill in the gap previous products have left. Many Healthcare applications were developed concerning menopause. Some of these applications are web-based, and a large number of them are mobile apps. The main issue with many of these applications is that they may not always support specific user's requirements.

An app called Balance was found. The founder of this app is Dr Louise Newson. This app helps women to track their symptoms and medications as well as helping women about menopause. However, after downloading and using this app, I found difficulty in using it. The way symptoms are saved makes it hard to view; the user should not have to keep going back on the calendar to view or find the day the symptoms in question were experienced [22].

Below are some screenshots that show the steps on adding a symptom and how hard it is to view a previoussymptom, as the calendar does not show previous symptoms, so the user needs to remember when they have experienced a specific symptom and go back to the calendar to find it:

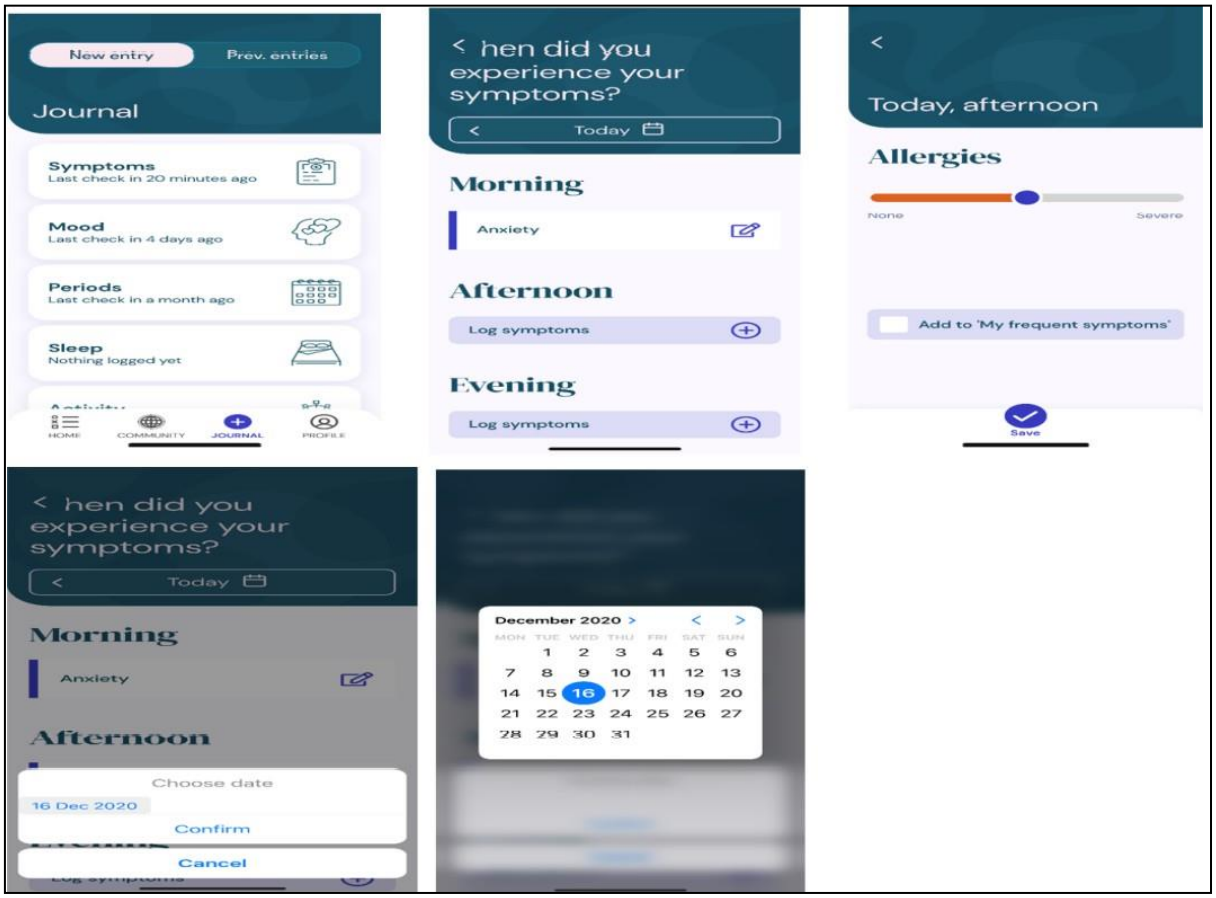


Figure 1 - Different screenshots from the Balance app showing the difficulty of reviewing symptoms history on the calendar

Another app "mySyster Symptoms Tracker" was downloaded and tested. This app allows women to track their symptoms. It was easy to use. However, there were charges for premium service, which might not be affordable for some women [23].

Some of the web-based products were mostly commercial web applications, and the main concern was to sell their products. An example of that is Health & Her [15] web application.

This web application asks the user to choose symptoms, and they offer different products according to those symptoms. Below is three screenshots showing the way this application works, where the user is asked to choose symptoms, then choose the severity of the symptoms, and then they offer their products to the user to buy:

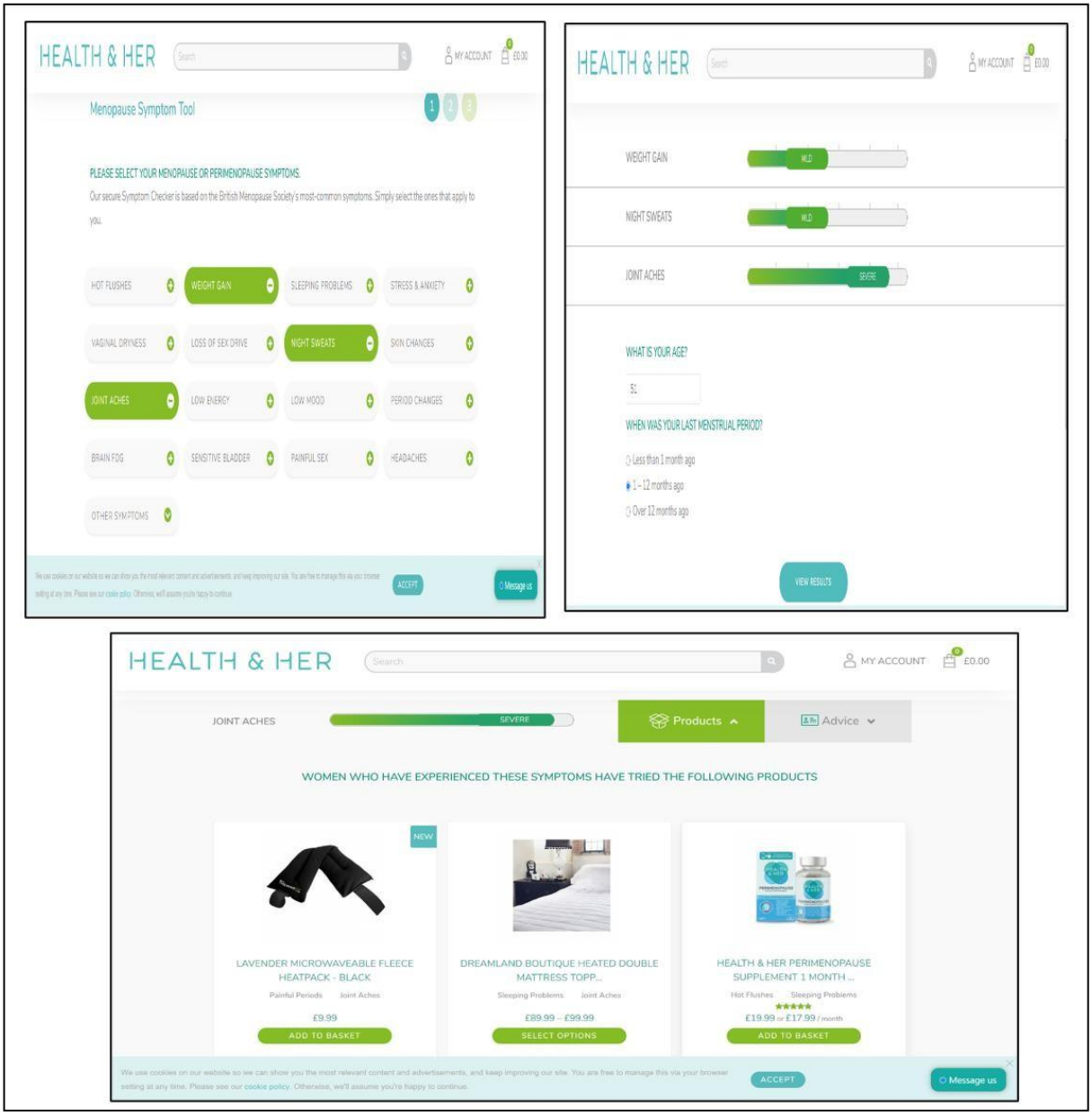


Figure 2 - Screenshots from Health & Her web application showing this web application is a commercial web application

Rock my menopause [16] is another example of a menopause tracker web application, but all that this application provides is a calendar that users need to download to use for recording symptoms, which might not be handy, as women tend to look for an automated solution that can keep a record of all symptoms during this stage.

Figure 3 - The tracking tool for Rock My Menopause is a calendar that can be downloaded and used manually

Below is a comparison between different products and the proposed web application:

Features	Product			
	Balance/mobile app	Menopause symptoms tracker	mySysters/ mobile app	Health and her Commercial website
Compatibility				
Apple phone	yes	Yes	Yes	Yes
Android	yes	Yes	No	Yes
Laptop	No	Yes	No	Yes
Desktop	No	Yes	No	Yes
Different browsers	No	Yes	No	Yes
Tracking				
Menopause symptoms	Yes	Yes	Yes	No
Menstrual cycle	Yes	Yes	Yes	No
Menopause medication	Yes	Yes	No	No
Menstrual medication	Yes	Yes	No	No
Menopause education				
Health articles	Yes	Yes	No	
Price				
Free	Yes	Yes	Payment required for the premium version	Yes

Table 1- Comparison between the abovementioned symptoms tracking tools and the proposed system

The table shows different gaps for each app/web application, such as compatibility with different devices and browsers; not all the listed devices track symptoms or medications. Some

of these systems do not have articles or useful information about menopause some of them require payment. These gaps could be covered by creating my application.

2.3 Summary and justification:

The main conclusion is that web-based menopause tools were either commercial or informative. No web-based application focused on tracking menopause symptoms. Covering this gap could be of benefit to women who may not have access to specific apps.

Secondly, some researchers claimed that some information on different websites wasn't reliable, which is another gap that can be covered when creating the proposed system. All the articles on this web application will be from reliable resources and will be reviewed and agreed upon.

Finally, the last gap found was the information about menopause on different websites was too technical and may not be easily read by some women who do not have a high educational level. Therefore further research will be done later when choosing materials for the articles page with the brief to choose reliable readable materials that can suit different types of readers.

Chapter 3: Methodology

3.1 Introduction:

This project aims to build a web application that helps women to track menopause symptoms and medications. It also educates women about menopause by providing articles that help women to understand and accept menopause.

Before starting the development phase for this project, different research questions need to be considered:

First, what is the best research methodology that can help carry out my research? To ensure a robust, reliable, and repeatable methodology, it is important to plan what data to collect and what methods to use to collect and assess these data.

Secondly, what is the best development methodology that can be used throughout the development process? A suitable method will help monitor the evolution of this project and give the flexibility to react to any required changes.

Thirdly, what are the appropriate programming languages and development framework for this project? To achieve the required user interface and required function to handle the user input and satisfy the user's needs.

Fourthly, what is the appropriate development environment for this project? Choosing a suitable development environment. Choosing a suitable tool that is compatible with the programming languages used makes the development process smoother.

Fifthly, what are the tools needed to protect the user's details? User data is the main element for the web application. The user is the main player, therefore choosing suitable storage to keep the user's details safe is very important.

Sixthly, what is the appropriate method to analyse the performance? This will help to achieve a functional and secure web application and ensure a good user experience. Testing methods need to be chosen to analyse the performance and improve it if needed.

Seventhly, what is the appropriate qualitative method to evaluate the usability of the web application? Defining needed methods to measure the quality help to ensure an effective user experience.

The hypothesis of now is that my application should benefit menopausal women to track their

symptoms and medications. It will also educate them about menopause by providing reliable menopause information from reliable resources.

3.2 Research Methods:

Hybrid approach of qualitative and quantitative methodology will be adopted for this project.

- Qualitative methodology offers the ability to describe the way people experience a specific research issue. It gives information about how a human is interacting with an issue, e.g. beliefs, opinions, and emotions. Qualitative research methods help researchers better understand the research field and helps them to spot complex issues in the system that are usually missed [23].

  Having a development project that requires user interaction with the system makes this methodology the best to follow to evaluate the user experience. Different qualitative methods will be used, such as observation of the user testing the system, a survey to evaluate the application's usability, and a questionnaire to evaluate the readability of the articles in the system [23]; these explained more in section 3.7.

- Quantitative research is the numerical representation of observations used to describe the circumstances reflected by those observations. It is widely used in natural and social sciences [25].

  The experiment methods of the quantitative methodology will be used to measure the performance of my web application. These methods will be used to measure page load time, and the time an SQL statement takes to be executed to ensure high-quality performance.

3.3 Development Methodology:

Development methodologies are very important for developing software systems. It aids the development process with a framework for “planning, managing, and executing” this development process. There are different types of development methodologies; each has different features that make each have its critics and supporters. Waterfall, prototyping, and Agail are types of development methodologies. Agile methods have been widely used in software development for the benefits these methods provide [23].

The incremental process and the iteration techniques for Agile methodology will be used for this project. The incremental process for Agile will ensure a high-quality product, as testing is part of the development cycle and will help to track and fix any issues. Having a design and build project makes the incremental methodology the best methodology to use [9].

The flexibility of this methodology allows this project to cope with any changes the customer may request [9].

Implementing this web application is based on delivering the project in small parts and not the whole project at once; adopting the incremental methodology will help get the maximum productivity and the minimum risk when building the project [9].

Feedback from the customer when delivering each part of the project is an opportunity to improve the application.

3.4 Programming Languages:

3.4.1 Frontend Programming languages:

HTML, CSS, Bootstrap, and Javascript will be used to develop the user interface for the proposed application. These programming languages are considered the main components of a web application. HTML is for developing the web app layout, CSS is for styling the web app, and Javascript will be used for user interaction.

Bootstrap classes will be used to ensure responsiveness. Bootstrap is a library of reusable components, every component of which can be reused instead of recreating. Moreover, Bootstrap is an open HTML, CSS, and Javascript library. By adding a shortcode to the page, the web page can run on any device fee-free.[8].

Javascript is usually embedded in HTML files to handle user interaction with the web. One of the main benefits of javascript is portability as browsers are equipped with a javascript engine [7]. As JavaScript code runs locally in a user's web browser, the browser can respond to user actions quickly [22].

Jason (JavaScript Object Notation) Jason is used for storing and exchanging data between a web server and a web page. Considered the most popular data interchange format for web applications, Jason will be used for data exchange [12].

Ajax, used for creating fast and dynamic web pages, will ensure a quality performance for the proposed web application. It allows web pages to be updated by exchanging small amounts of data with the server. In Ajax, it is possible to update parts of a web page without reloading the whole page [12]

jQuery is an extendable javascript library. The reason for choosing this language is that jQuery makes it easier to use javascript code on a website. jQuery performs a task that would require a big block of javascript code and wraps it with a single line of code[12].

3.4.2 Back-end Programming Language:

Research has been made to choose a suitable programming language that can be deployed to develop the back-end for my web application.

Before doing this research, two programming languages were proposed for back-end development, "C# and PHP". Below is a comparison between the two languages:

Php	C#
Is not an OOP, however, this language can be used to imitate Object Oriented Programming practice [4].	Is an OOP language [4].
Is designed mainly for web application development, but can also be used as a "general purposes programming language" [4]	Is commonly used for non-web application development, mainly used as "general purposes programming language" [4].
LAMP stack is the common way of building a web application, LAMP means Linux, Apache, MySql, and Php, LAMP can increase performance [5].	Only MSSQL can be combined with C# [5].
Is free of charge [5]	A Microsoft product, which implies certain charges [5].
Can run on all platforms [5]	Runs on limited platforms [5].
Open source gives more freedom to the developer to do anything [5].	Gives developers limited freedom [5].
More popular when it comes to web development, PHP has a 67% share among the top million websites [5].	Less popular, it has a share of less than 50% among the top million websites [5].
Can run on any OS, Windows, Mac, Linux, or Unix [5].	Can only run on a limited OS [5].
Compatible with most relational databases [5].	Is not compatible with most relational database [5].

Table 2 - Comparison between C# and PHP

After comparing the advantages of both programming languages, PHP was chosen. Another advantage for PHP is having previous experience with its framework will save time in learning new languages. SQL (a query language used for database manipulation) will be used to store user data in the database. SQL language helps execute queries against a database, retrieve and

insert data, update and delete a record, create a table or a database, and set tables “permissions, procedures, or views” [12].

3.5 Development Techniques:

Following research to find an efficient way to maintain and develop my web application, easier MVC design patterns were chosen as the development technique. The below features for design patterns and MVC design patterns justify my choice.

3.5.1 Design Pattern:

A design pattern is the reuse of a solution in software design to handle a common problem. Using a design pattern will help to deal with problems and effectively solve them. It provides quality solutions that are proven to work, as a problem has been already handled. It enhances the “software development process”, It also uses OOP Object-Oriented Programming.

3.5.2 MVC pattern:

MVC (Model View Controller) is a well-known design pattern. MVC is mainly used to develop applications that have a user interface; it helps to organise and break down your application by separating the presentation(view), logic(controller), and data(model). This separation between the MVC element allows the model to be independently implemented and tested. [6]. Below is a diagram [1] that shows the relationships between them:

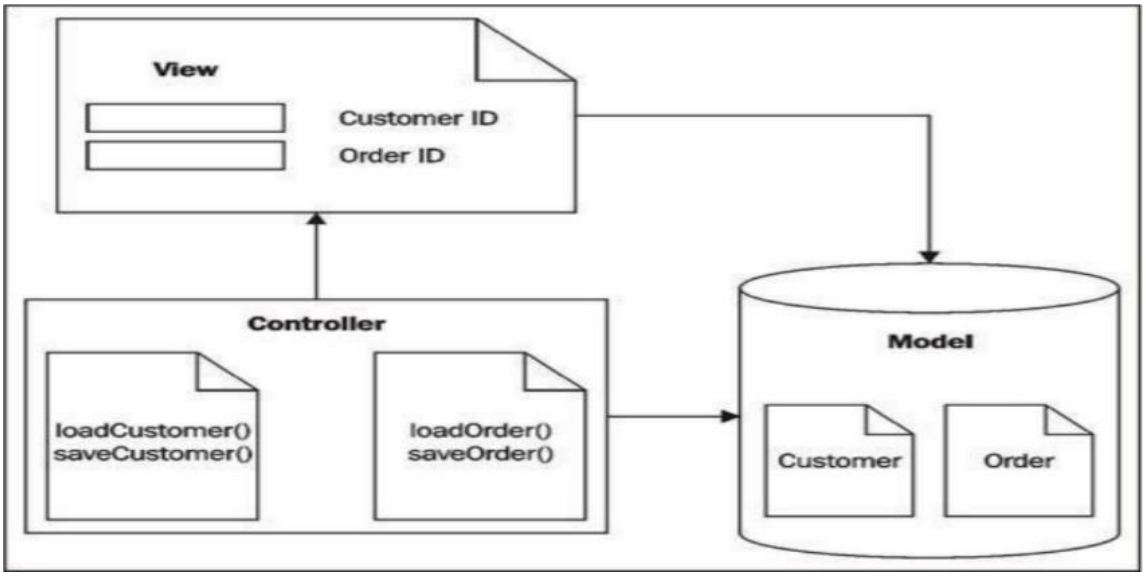


Figure 4 - MVC design patterns

3.6 Development Environment:

Following research to choose a development environment PhpStormwas was chosen. PhpStrom will be downloaded on a windows device, which will be used to develop this web application.

PhpStorm was designed to help build web applications written in PHP [3]. PhpStorm provides a list of features, supports OOP Object-Oriented Programming, it provides easy navigation between classes, parameters, and methods. With PhpStorm, you can easily import different libraries [3].

MySQL will be used for creating and managing the database. The reason for choosing MySQL is the flexibility MySQL provides. MySQL is compatible with all operating systems. It also provides a wide range of APIs that can be downloaded for different programming languages, including PHP. Importantly MySQL has high speed and performance. It also has different mechanisms that allow you to manage your data easily [13].

This web application will be hosted on Azure (Azure is a Microsoft product), the cloud computing service. Chosen this hosting for its free facilities provided by the School.

3.7 Evaluation:

3.7.1 Evaluating software performance:

Experiment methods of quantitive methods will be used to measure performance. Examples of tests that need to be considered to analyse the performance measure memory usage, page load time, and the time an SQL statement takes to be executed.

3.7.2 Evaluating software quality:

Some quality measures need to be ensured to build a quality web application. Qualitative methods will be used to evaluate the useability of the proposed system (observation, survey, and questionnaire). Below is a diagram [2] that shows the quality measures and the list of characteristics that define a quality web application [10]:

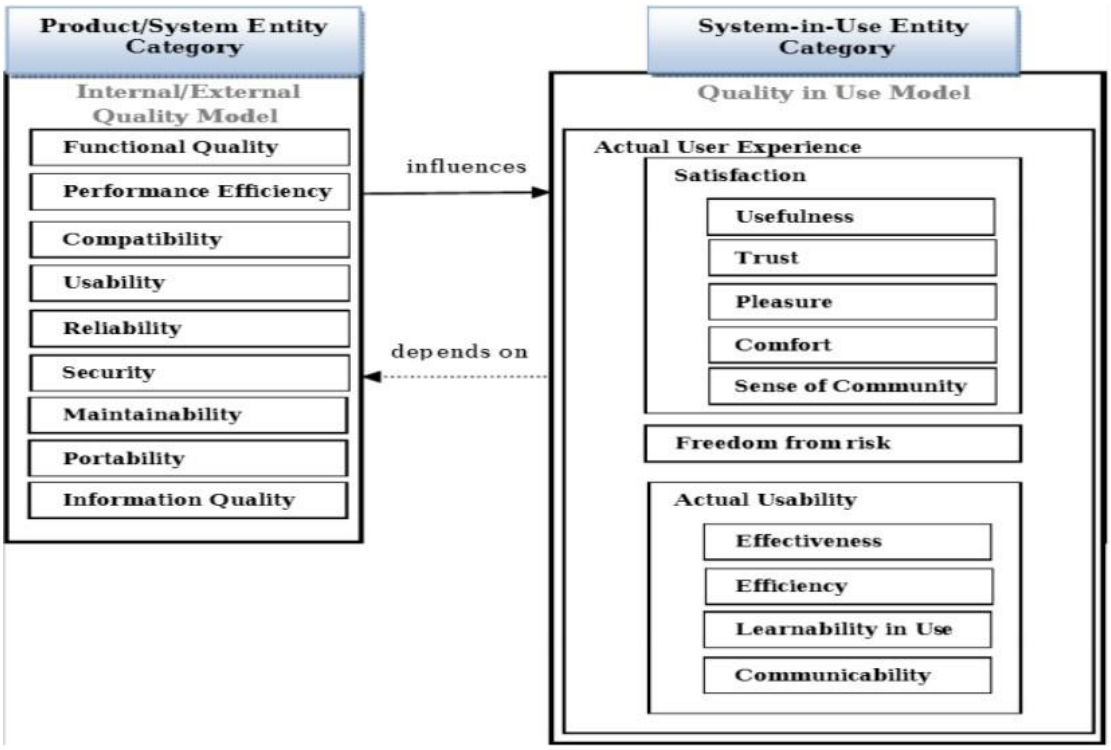


Figure 5 - The main characteristics for quality web application

- Compatibility: ensured by running this web application on different browsers and a mobile phone.
- Reliability: ensured by performing user testing, and observation will be performed to analyse the reliability of the specified action. The user will be asked to apply input and check if the application's behaviour is as expected [11].
- Maintainability: MVC design pattern will be used to ensure the maintainability application. MVC makes it easier to test and allows improving or adding functionality if required.
- Security: different security tests will be performed against this web app to check whether the system is protected against potential attacks, such as Cross-site scripting, SQL injection attacks, Session hijacking, RFI (remote file inclusion) attack, etc...
- Usability: this can be met by ensuring efficiency, effectiveness, learnability, and accessibility to enable the user to achieve a specified goal. This can be performed by observing the user while using the system. A minimum of 5 women staff in the University of Salford will be asked to test the system; each user will be given a task to perform on the web application. Observation will be made to record their movements and the time taken as they complete the task.

  User testing will be followed by a survey with suitable questions that will be given to the user immediately after testing to evaluate the application's usability. Learnability can be

ensured by ensuring the readability of the articles; this can be assessed by asking users from different educational levels to choose an article and have a read through. A questionnaire will be given to them to assess the readability of the chosen articles. Users from different groups such as Syrian women will be involved in the testing to ensure that the application is suitable and easy to use for people from different backgrounds.

- User experience: tested by performing the above testing "observation followed by the questionnaire".
- Performance efficiency: can be assessed by performing the above user testing to check the interaction between the user and the application.
- Information quality: will be gathered from only trusted legal resources. To keep the information up to date, APIs will be used to allow content to syndicate from these resources, such as the NHS website, to ensure information quality.

Comparative testing will be performed to ensure that my application covers all the listed gaps. The user will be asked to complete a particular task on my application and then a similar task on a similar app; this will help assess the application's usability compared to an existing reliable app such as the Balance app.

Chapter 4: First Increment (MVP)

Increment goal: "*The primary goal for this increment is to produce the Minimum Viable Product (MVP), given to both the project supervisor and customer for preliminary feedback*".

Creating an MVP at an early stage is beneficial as it helps to understand the customers' interest in the product without fully implementing it.

4.1 Introduction:

Since the development methodology is incremental, the criteria for each increment had to be carefully selected and prioritised while keeping customer satisfaction in mind. The requirements for each increment were derived primarily from the customer via an interview, literature review and brainstorming. The elicited requirements were initially represented as user stories before being divided into functional and non-functional requirements. Before the project began, all non-functional requirements were identified to address the system's primary constraints.

This chapter provides an overview of the system and highlights the user stories, non-functional requirements, and usability requirements. It then becomes more specific as it defines the first increment of functional requirements. It also explains the development process for the incremental requirements, the problems faced during the implementation, and solutions adopted to handle them.

4.2 Overall Description of the System:

Menopause Symptoms Tracker is a web application that aims to help women track their menopausal symptoms, medication, and cycle. The developed system is meant to be responsive and compatible with different browsers.

4.3 Specification and Design:

Requirement elicitation was the first project stage. The approach adopted for eliciting the customer requirements was via interviews.

A set of user stories were created based on the requirements elicited from the customer, the literature review and brainstorming. Because the development approach was iterative and incremental, some of these user stories changed, some functionalities were dropped, and others were added.

4.3.1 User Stories:

In agile methodology, a user story is a piece of informal information explaining a feature or functionality written from the user's perspective; it describes the type of targeted user [25]. The table below displays the user stories gathered via customer interviews, brainstormingand a literature review prior to the start of the project:

No	Story Title	Story Description
US1	Log-in system	As a user, I want to create an account and log in.
US2	User profile	As a user, I want to have a user profile page to view and edit my details.
US3	Add symptom	As a user, I want to add symptoms to my profile.
US4	Delete symptom	As a user, I want to delete symptoms from your profile.
US5	Add medication	As a user, I want to add medication to your profile.
US6	Delete medication	As a user, I want to delete medication from your profile.
US7	Add cycle	As a user, I want to add cycles to your profile.
US8	Delete cycle	As a user, I want to delete cycles from your profile.
US9	Calendar	As a user, I want to view your symptoms and cycle on the calendar.
US10	Add new symptom	As an admin, I want to add new symptoms to the symptoms list using the web interface
US11	Add new medication	As an admin, I want to add new medications to the medication list using the web interface

Table 3 - Whole system user stories

4.3.2 Non-Functional Requirements:

Non-functional requirements are the quality attributes that a system must have, such as responsiveness, usability, and security. Non-functional requirements describe the capability and constraints that a system must have to enhance its functionality. Non-functional requirements are also known as the criteria used for evaluating how a system should perform [36]. Below is the quality attributes that the system must have:

No	Requirements
1	All user details should be store in a secure, password-protected database. Appropriate data inscription should be applied to protect this data.
2	Appropriate validation should be applied to all user input, e.g., email, password, and text input.
3	User login details should be verified and processed by checking this data against the data saved in the record for each user.
4	The same email should not be allowed to create two different user accounts. The email field in the database should be unique.
5	User passwords should be encrypted before storing them in the database.
6	Users need to create an account and log in before they can add symptoms, medications, and track cycles.
7	Only the admin can add new symptoms and medications to the system.
8	User data should be protected against different types of security attacks (injections and cross-site scripting).
9	Page load should be quick with no delay.
10	A web-based system must be responsive and fit any screen resolution, including mobile phones.

Table 4 - Non-functional requirements

4.3.3 Usability Requirements:

Usability means user-centric design. The user should be considered throughout the entire design and development process. Focusing on meeting the user requirements is critical to the success of building an efficient and easy-to-use product.

No	Requirements
1	A web-based system must be responsive and fit any screen resolution, including mobile phones.
2	A web-based system must be compatible with different platforms such as Windows and McIntosh, and the contents of each web page should display the same as other browsers.
3	All information displayed across different pages must be creditable.
4	Clarity; page titles should be clear and relevant.

5	Font size should be reasonable and easy to read.
6	A navigation bar should appear on each page to give the user freedom to move between pages.
7	The colours used should be accessible to all users, including colour blind users, and should not affect the text's readability.

Table 5 - Usability Requirements

4.3.4 Functional Requirements for the First Increment:

Functional requirements are the services that the system must offer. It can be any functionality that the software is expected to perform, such as user interaction, data manipulation, or calculation [36].

The table below contains the first increment's functional requirements:

No	Requirement	User Story Addressed	Technical Specification
1	Create a database to store menopause symptoms and medications to display them on the UI so the user can view them.	No user story has been addressed in this requirement.	These were for the customer demo; no functionalities included.

Table 6 - Functional requierements - First increment

4.3.5 Wireframes:

Wireframes are used to create layouts for websites, web apps, and mobile apps. A wireframe is a blueprint that provides an overview of the page structure, layout, functionality, and behaviours. Wireframes help evaluate the effectiveness of the web application against the usability requirements. They also help define the development process requirements to achieve the target specified in the wireframe [39]. Wireframes were designed for the user interface, and each new functionality was developed within each increment.

4.3.5.1 Wireframe for the User Interface:

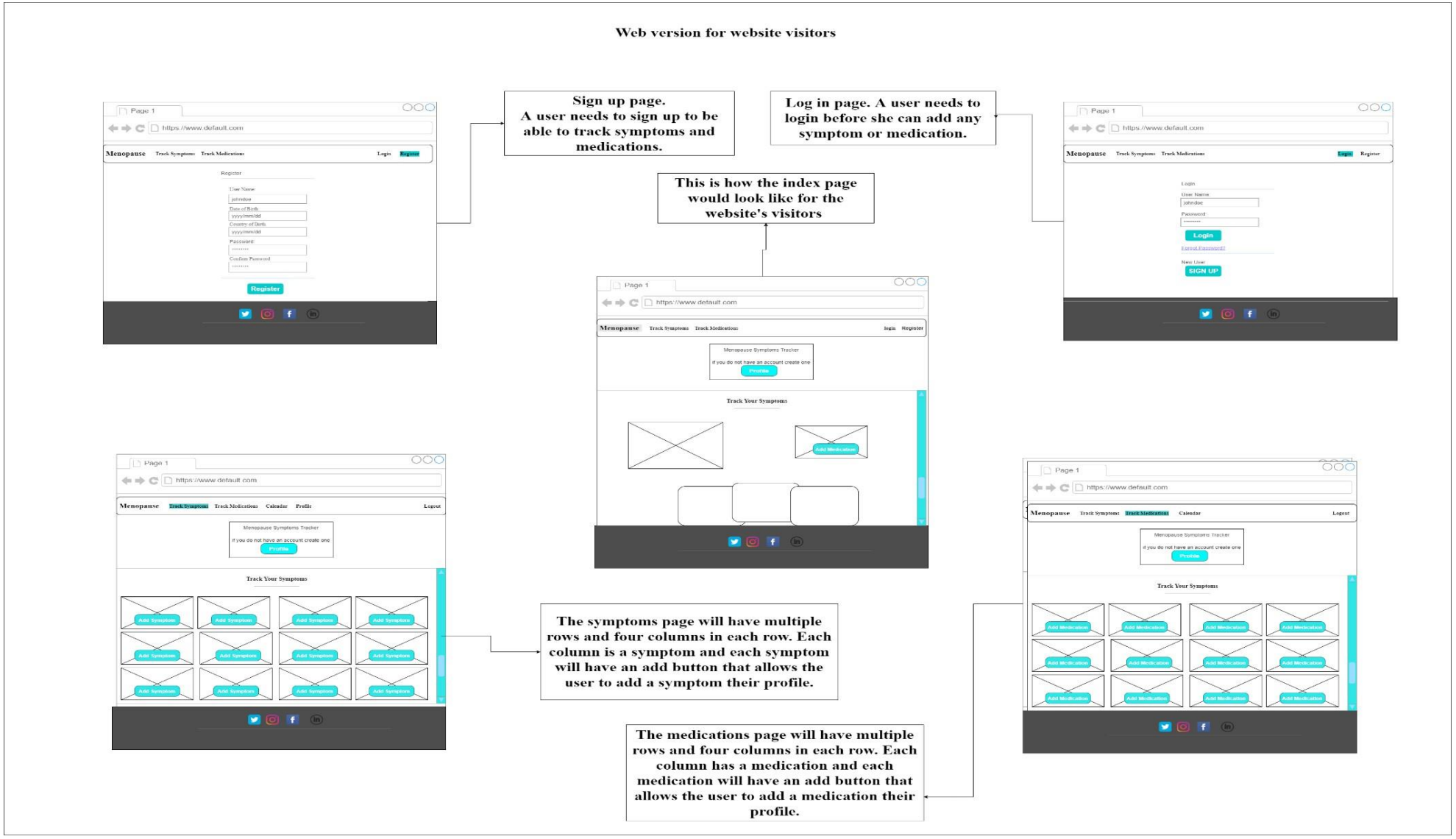


Figure 6 – Wireframe UI web version - First increment

4.3.5.2 Wireframe for the User Interface – Mobile Version:

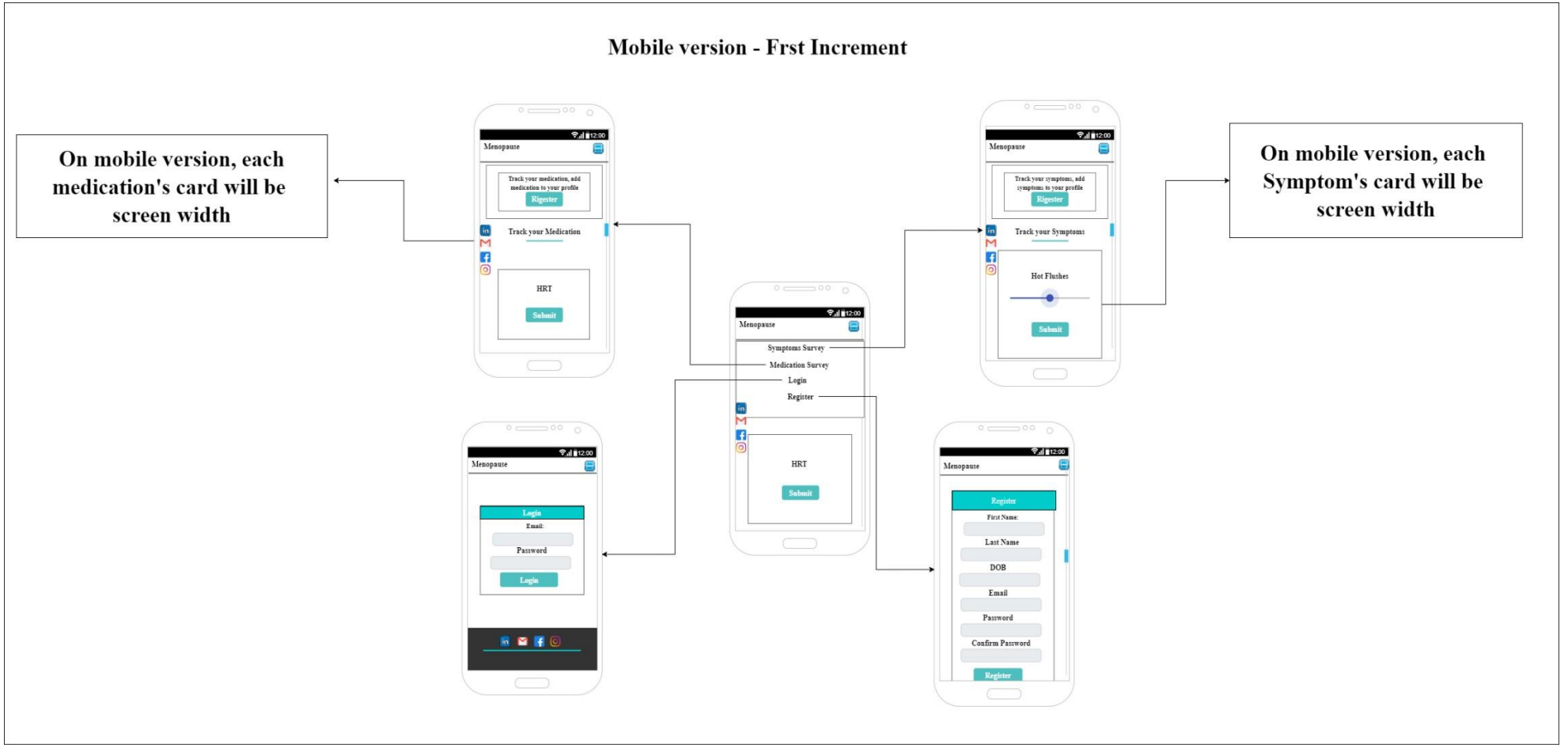


Figure 7 – Wireframe mobile version - First increment

4.4 Development and Implementation:

This section highlights the methods and tools used to develop the web application, explaining the development process for each requirement. It also clarifies the problems faced during implementation and how they were handled.

This increment was focused on setting up all required resources, creating the project template with different files and classes, creating a quality database, and connecting it to the system. This increment aims to deliver a usable, responsive user interface (UI) that allows efficient user interaction with the system. The increment goal was discussed and agreed upon with the customer.

4.4.1 Methods and Tools Adopted:

Below is a list of tools that were deployed to build the web application. These will only be mentioned during this increment as these tools did not change and were adopted throughout the project.

4.4.1.1 PhpStorm:

The integrated development environment (IDE) was used to develop the web application. PhpStorm supports all innovative technologies used in web development (HTML, CSS, Javascript). PhpStorm has a live javascript editor where developers can see the effect of their code instantly. It also provides features such as refactoring, debugging, autocompletion syntax highlight, and error prevention [40].

More importantly, phpStorm allows for easy connection to databases, editing tables, and executing queries [40].

4.4.1.2 MySQL:

MySQL, the relational database management system, was used to create and manage the project database. MySQL is compatible with all operating systems. It also provides a wide range of APIs that can be downloaded for different programming languages, including PHP. Importantly, MySQL has high speed and performance. Using MySQL, it was easy to create, update, and delete tables [41].

4.4.1.3 MVC:

MVC design pattern was used as the development technique for the web application. MVC is used to develop applications that have a user interface. It helps to organise and break down

applications by separating the presentation(view), logic(controller), and data(model). This separation between the MVC element allows the model to be independently implemented and tested [42]. The diagram below gives an example of how the data flows through the system:

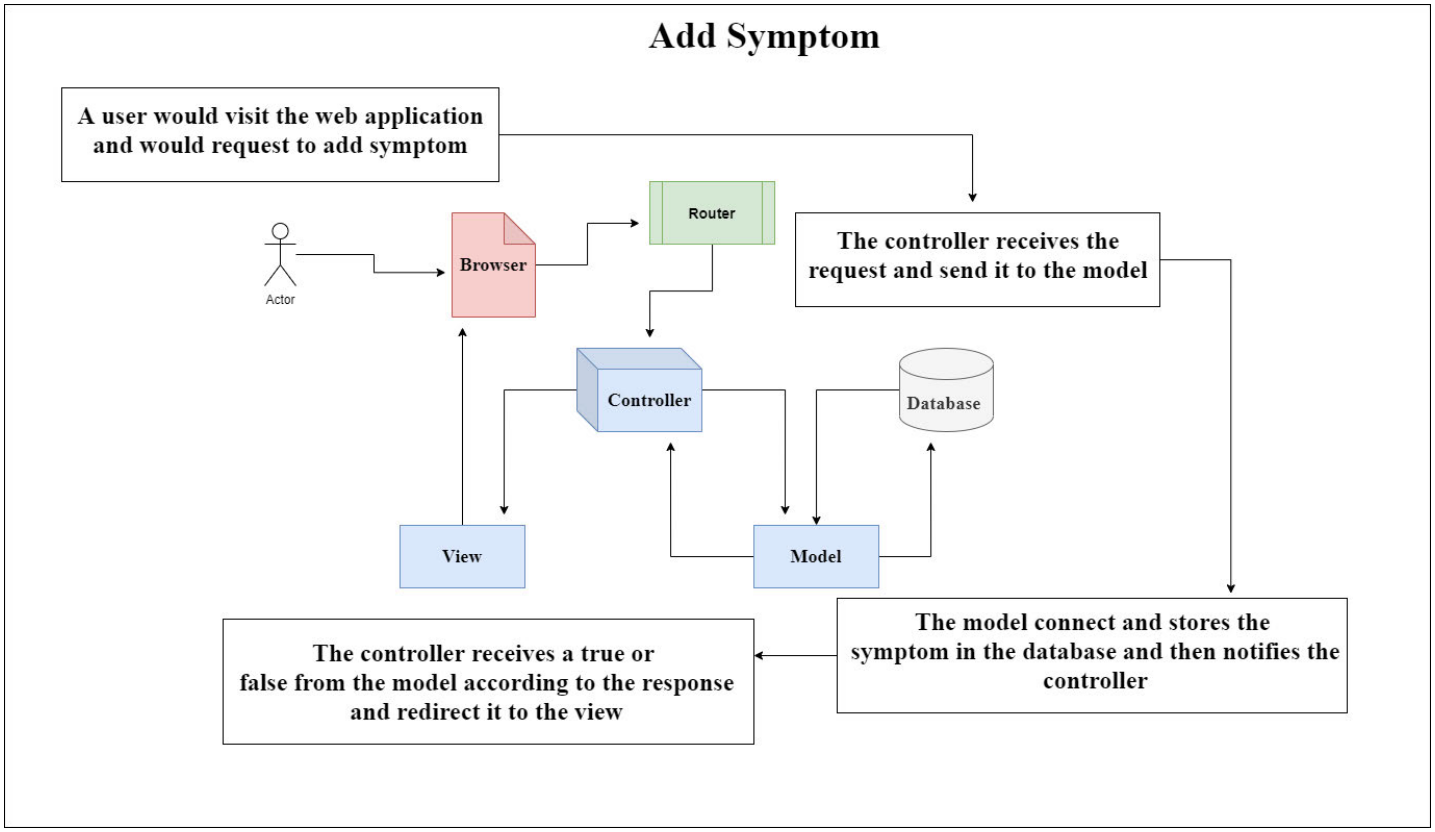


Figure 8 - System data flow for add symptom function

4.4.1.4 HTML, CSS and Javascript:

HTML, CSS, and Javascript were used to develop the user interface as these programming languages are considered the main components of a web application. HTML was used to develop the web application layout, CSS was used for styling the web application, and Javascript was used for user interaction and form validations.

4.4.1.5 Bootstrap:

Bootstrap was used to make the web application responsive to different devices, including mobile phones. Bootstrap is a library of reusable components, every component of which can be reused instead of recreating. Bootstrap is an open HTML, CSS, and Javascript library (open-source library) [35]. The bootstrap grid system was used to create responsive symptoms and medication questionnaires; it was also used to display symptoms, medications, and cycles on the user's profile.

4.4.1.6 Php:

Php is the back-end development language, a prevalent language for web development [32]. It is open-source, giving freedom to the developer. It is also compatible with most relational databases [32]. PHP is platform-independent, which means it can run on most platforms.

4.4.1.7 JSON (JavaScript Object Notation):

JSON is considered the most popular data interchange format for web applications [43]. JSON was used for storing and exchanging data between the server and a web page. Using JSON, it was possible to format the data retrieved from the server (user symptoms and user cycle) and send it for display on the calendar.

4.4.1.8 Ajax (Asynchronous JavaScript and XML):

Ajax was used for communication between the client-side and the server-side. Using ajax, it was possible to check if specific actions/data were successfully processed by the server and send error or success messages according to the ajax response.

4.4.1.9 Trello:

This project management tool was used to organise all tasks required for each increment. Using Trello was very beneficial; it helped track each task's progress and keep a log of all requirements related to each increment**.**

4.4.1.10 Draw.io:

This software was used to design all diagrams and wireframes for this project. Draw.io is easy to use and is a tool for creating and developing graphs and diagrams.

4.4.2 Development Process – Incremental Methodology:

The development process enables the developer to transform previous requirements into an operational system. Having a customer and implementing a design and build project made an incremental methodology the best choice for this project. The incremental process for Agile will ensure a high-quality product, as testing will help to track and fix any issues [36]. This methodology's flexibility allows the project to cope with changes the customer may ask for [36]. Implementing this web application is based on delivering the project in small parts rather than all at once, which will help maximise productivity and minimise risk while building this project [36].

All tasks related to this increment were organised and managed using Trello boards. Trello was very beneficial as it helped keep track of the project progress and unfinished tasks. Trello boards containing different activities for each increment were set at the beginning of each increment. The figure below shows a Trello board with the activities related to the first increment.

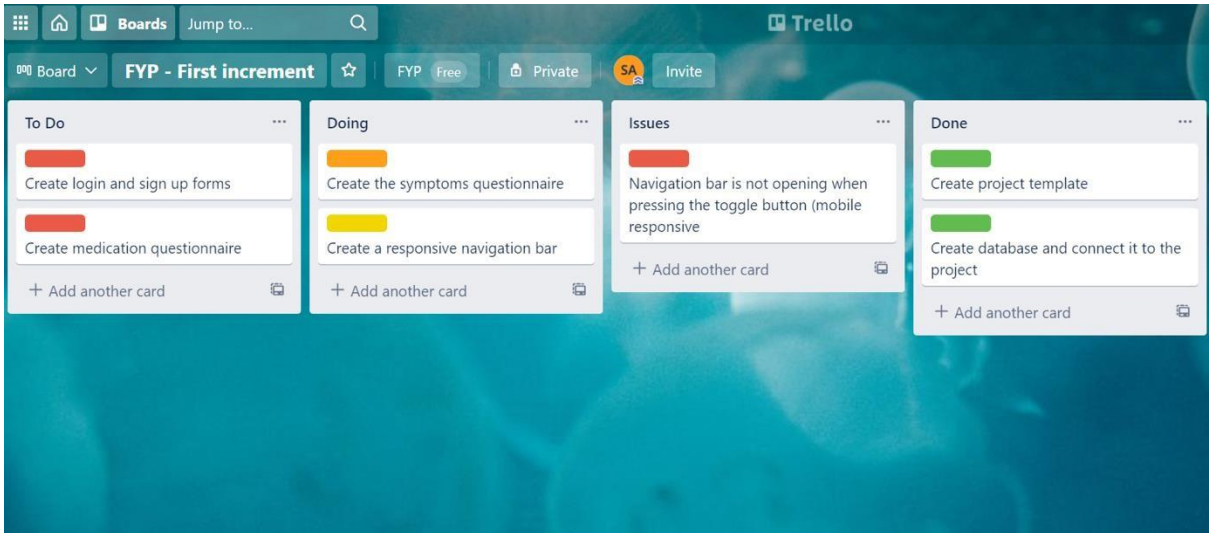


Figure 9 - Trello board - First increment

4.4.2.1 Database:

The development phase was started by creating the project template MVC with the different files and classes required for achieving the project goal. This task was followed by creating the database with its basic tables (user, symptoms, and medication) and then connect it to the system to display the menopausal symptoms and medication on the project UI.

4.4.2.2 User Interface (MVP):

The increment aim was to produce a MVP, a small product with enough features to satisfy the user's needs. In this case, the customer's main requirement was a product easier to use than existing products.

With this in mind, the main focus for the MVP was to create a thoughtful project UI that satisfies the user requirements.

Symptoms and medication pages:

The design ideas for these pages came from the research of similar products while intending to design more accessible software to satisfy the user's experience. Doing this research brought awareness of usability issues that most competitors had. The issue is often that, to choose a symptom, the entire questionnaire needs to be undertaken as each page only contains one

symptom. However, if the user only has one symptom at the end of the questionnaire, the user needs to complete the whole questionnaire to choose this one symptom, and the same applies to medication. This issue instigated the design of a questionnaire where all symptoms would be displayed on one page. The figure below shows a design for the symptoms questionnaire:

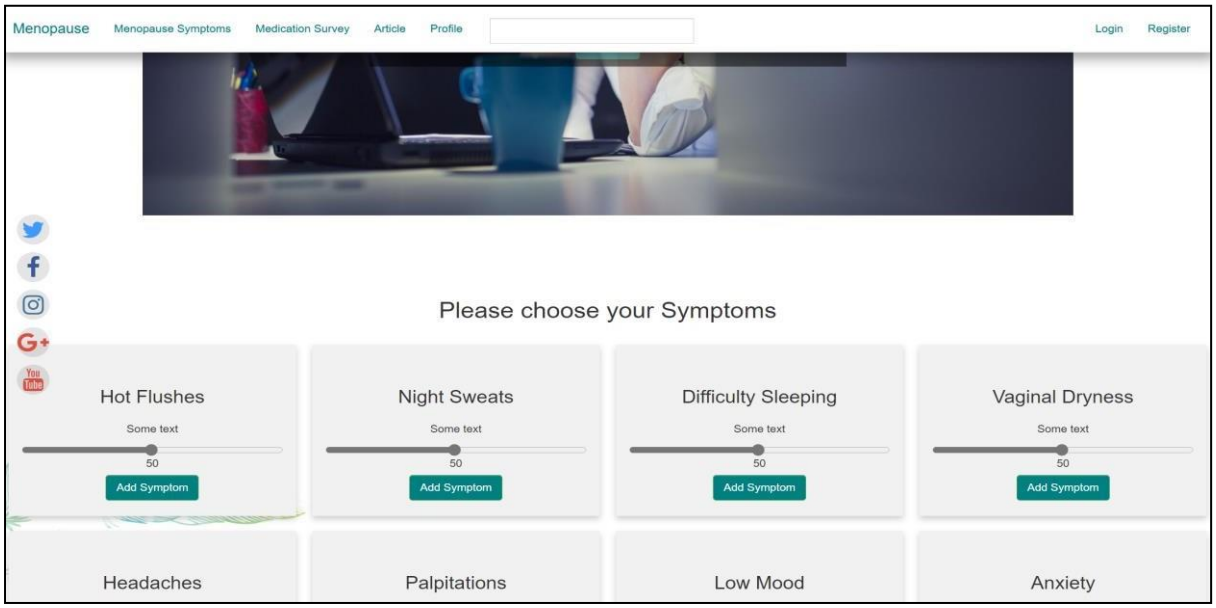


Figure 10 - Symptoms page showing that all different symptoms were listed on one page.

The bootstrap grid system was used to ensure a responsive UI.

4.4.3 Security Consideration:

Type of Security	Protection Against	How it Protects
Form validation	Header injections and cross-site scripting	Form validation can restrict the user input to be the required data type, such as email, password, date, and text. It can also prevent the text input from accepting special characters.

Table 7 - Security implemented - first increment

4.4.4 Acssissbilty Consideration:

Web accessibility is critical, particularly for people with vision difficulties such as colour blindness, who have more problems browsing the web [45]. Therefore it was necessary to consider those with vision difficulties when developing my web application.

Acssissbilty consideration	How it Helps
Added ALT-tags for all images	It provides textual descriptions of images for those who cannot see them (screen reader users).
Used high-quality font (Open Sans, Sans Serif), the most popular Google Web font available.	It helps to maximise the legibility of the web content.
Used descriptive labels for all forms (registration and login forms)	To make it accessible for the screen reader users.
Validated required fields to send an alert.	To alert the screen reader users.
Tried to voided using colours that are not accessible for colourblind users (greenand red) for page contents.	To make it accessible for colourblind users.

Table 8 - Accissebality consideration

4.5 Testing:

4.5.1 Usability Testing:

Three users were asked to test the web interface after being notified that this is only a web interface and has no functionality. They were made aware that running this type of testing was to check its ease of use. Observation and note-taking were conducted while each user was testing the web application. The general feedback from each user was that they like the theme and colours used, and it was easy to use and understand.

4.5.2 Browser and Platform Independence Testing:

Platform independence refers to an application's ability to run on various operating systems, computers, and web browsers. The web application has been thoroughly reviewed and proven compatible with various browsers and platforms, including mobile devices.

This test will be performed at the end of each increment. However, due to the word limit will only be included in the first and last increment.

The inspect service was used to test the web application's responsiveness on different devices,

including mobile phones. It was also tested on different browsers (Google Chrome, Microsoft Edge, and Internet Explorer 11), and no compatibility or responsiveness issues were found.

4.6 Summary:

By the end of this increment, a responsive user interface was fully implemented and demoed to the project supervisor and customer, receiving positive feedback. The goal of this increment to produce an MVP was achieved to the highest standard.

Chapter 5: Second Increment

Increment goal: *"This increment's primary goal is to create a login system, user profile and implement adding symptoms, medications, and track cycle functionalities, also to implement deleting symptom, medication and cycle".*

5.1. Introduction:

After designing the project UI in the previous increment, this increment focused on implementing the main functionalities. It explains the development process for these requirements and highlights the problems faced during the development process and the solutions adopted. Finally, it shows different tests performed during this increment.

5.2 Specification and Design:

5.2.1 User Stories:

The table below lists the user stories addressed in this increment:

No	Story Title	Story Description
US1	Log-in system	As a user, I want to create an account and log in.
US2	User profile	As a user, I should have a user profile page to view and edit my details.
US3	Add symptom	As a user, I want to add symptoms to my profile.
US4	Delete symptom	As a user, I want to delete symptoms from your profile.
US5	Add medication	As a user, I want to add medication to your profile.
US6	Delete medication	As a user, I want to delete medication from your profile.
US7	Add cycle	As a user, I want to add cycles to your profile.
US8	Delete cycle	As a user, I want to delete cycles from your profile.

Table 9 - User stories - second increment

5.2.2 Functional Requirements:

This list of requirements was discussed and agreed upon with the customer.

No	Requirement	User Story Addressed	Technical Specification	Source of Requieremnt
1	A user should create an account and log in using the required user input to use the system services.	US1	• Registration should be email-based. • The user password should at least contain eight characters, a number and an uppercase letter. • All input fields should contain their valid corresponding input.	Brainstorming
2	The user should be able to add symptom and view their added symptoms in the user profile.	US2 and US3	• User should select symptom date and intensity before they can add a symptom to their profile.	Customer
3	The user should be able to delete unwanted symptoms from their profile.	US2 and US4	• Symptom should permanently be deleted from the database.	Brainstorming
4	The user should be able to add medication and view their added medication in the user profile.	US2 and US5	• User should select medication date before they can add a symptom to their profile.	Customer
5	The user should be able to delete unwanted medication from their profile.	US2 and US6	• Medication should permanently be deleted from the database.	Brainstorming
6	The user should be able to add cycle and view	US2 and US7	• User should select cycle date and cycle length before they can add a cycle to their profile.	Brainstorming

	their added cycles in the user profile.			
7	The user should be able to delete unwanted cycles from their profile.	US2 and US8	• A cycle should permanently be deleted from the database.	Brainstorming

Table 10 - Functional requirements - Second increment

5.2.3 Usability Requirements:

Below is the list of usability requirements for this increment.

No	Requirements
1	A user should be redirected to the login page when successfully registered.
2	A user should be redirected to the index page if they successfully log in.
3	The user should be able to view the profile and logout tabs on the navigation bar if they have successfully logged in.
4	A logged off user should be redirected to the login page if they press the add button for a symptom or medication, or cycle.
5	A descriptive error message should be displayed to the user if they press the add symptom button without selecting the date and the intensity.
6	A descriptive error message should be displayed to the user if they press the add medication button without selecting the date.
7	A descriptive error message should be displayed to the user if they press the add Cycle button without selecting the date and the cycle flow.

Table 11 - Usability requirements - Second increment

5.2.4 Wireframes:

5.2.4.1 Mobile Version:

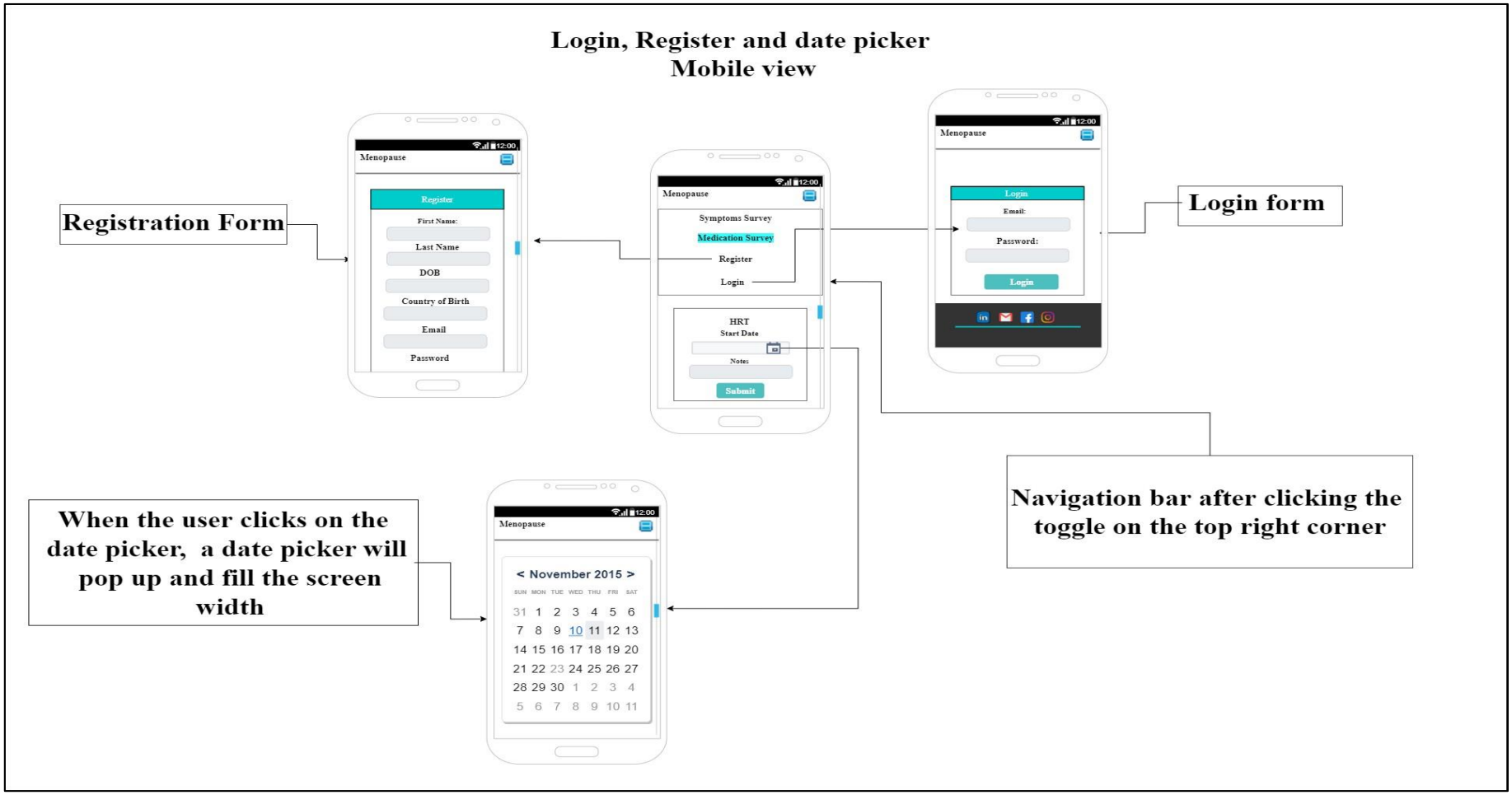


Figure 11 – Wireframe mobile responsive – second increment

5.3 Development and Implementation:

The figure below shows all activities associated with this increment:

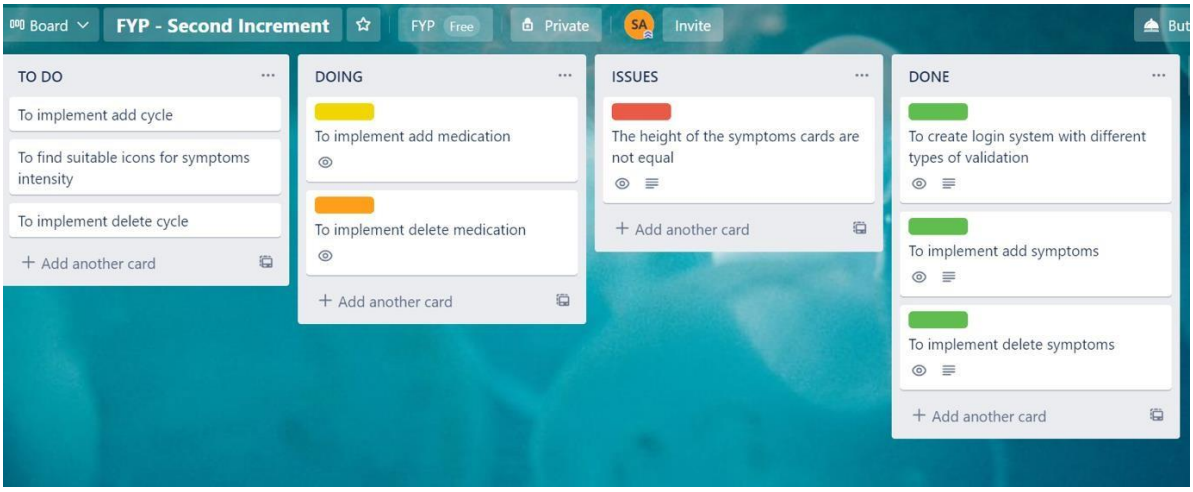


Figure 12 - Trello board - second increment

5.3.1 Login System:

Creating a login system was the first task undertaken for this increment. Client-side validations were previously added when implementing the user interface for login and registration forms. However, to ensure a secure login system, server-side validation has been added. Examples of server-side validations:

- ✓ Checking if the user's email already exists in the database.
- ✓ Checking that the first password matches the second password when a user is creating an account.
- ✓ Email and password validations.

5.3.2 Add Symptom:

To allow for efficient implementation of this function, research was undertaken to find the best way of describing a symptom's intensity. Following this research, the range slider used for choosing the intensity level was removed. This was because it became apparent that the most popular way of describing the intensity of a symptom was using three terms (mild, moderate, and severe). Three radio buttons with these values were then added to make it easier for the user to decide their symptom intensity levels, as the numbers between 1-100 on the range slider would confuse the user.

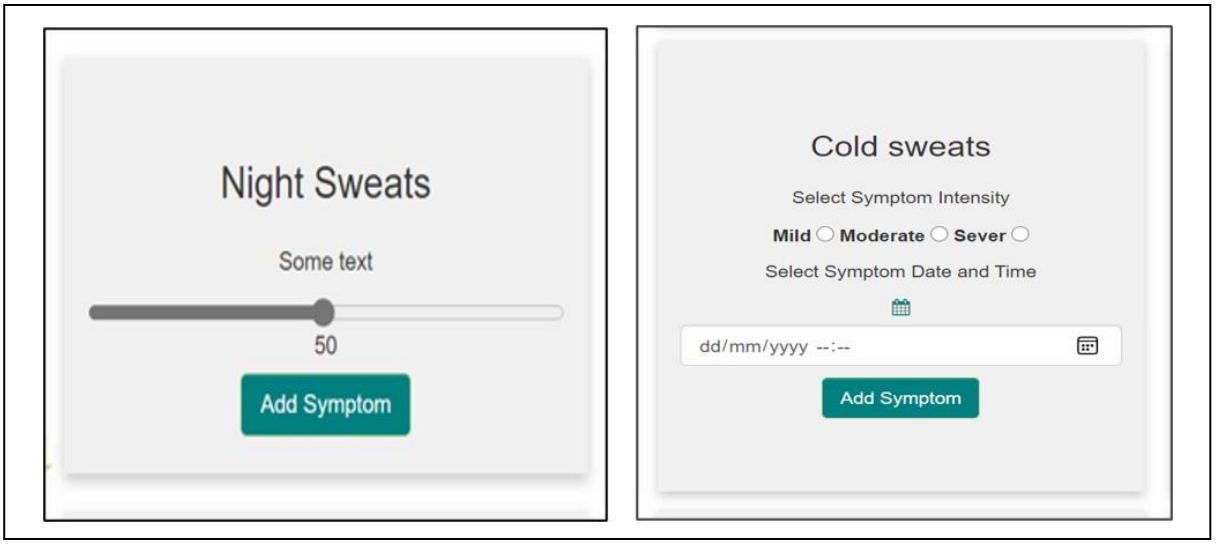


Figure 13 - Symptom's intensity pickers in first and second increment

A date picker was also added to each symptom to enable the user to choose a symptom date.

How Adding Symptoms Works

- ✓ The user should choose the symptom date and intensity and then press the submit button.
- ✓ All selected symptoms will be added to the database. Each symptom will have an icon describing the intensity.
- ✓ All user's symptoms will be added to the user's profile.

5.3.3 Add Cycle:

To implement this function, a form was added to the profile page. This form contains a date picker for the cycle date and a length picker for the cycle length.

The user needs to select their cycle date and length and press the submit button. Upon submitting the cycle form, the following happens:

- ✓ The cycle date and length inserted by the user get added together as the next expected cycle date.
- ✓ The cycle date, cycle length, and the next expected cycle date will be added to the cycle table in the database.

- ✓ This data will then be added to the user's profile under the cycle section.

All user symptoms, medications, and cycles are saved in cards on the user's profile. Each under a distinct section, as shown in the figure below:

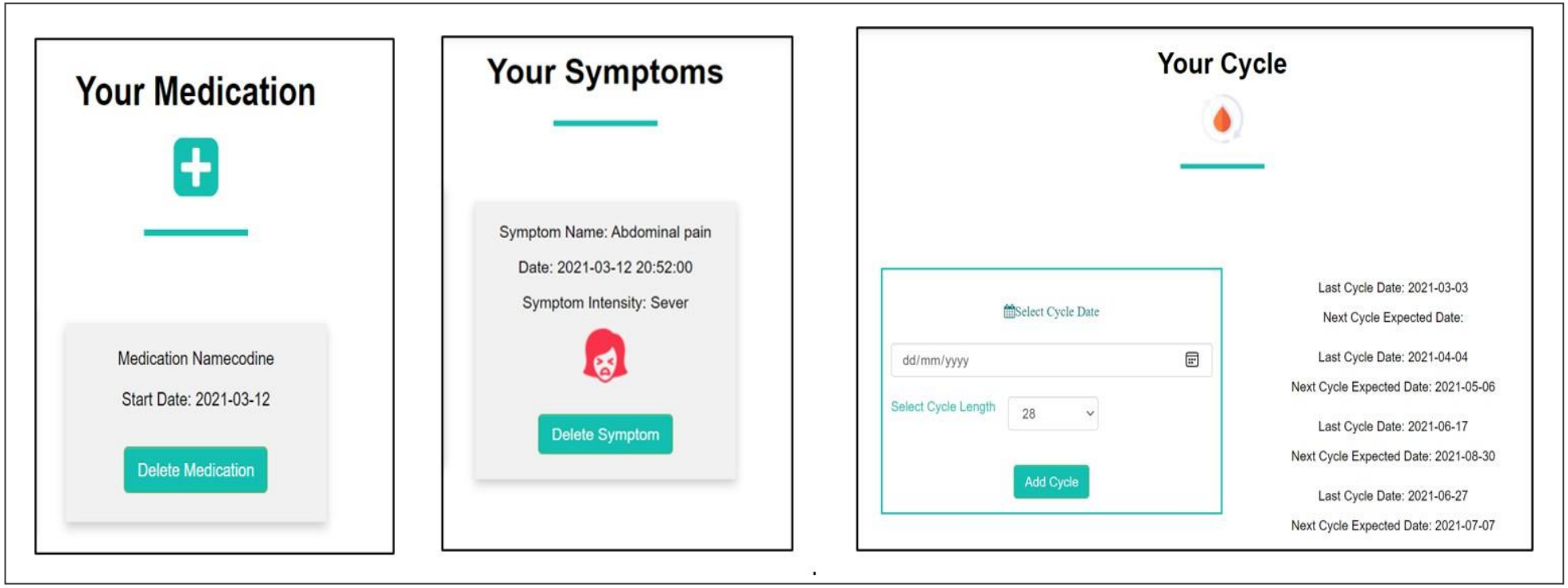


Figure 14 – User profile displaying the user symptoms, medication and cycle

5.3.4 Security Consideration:

Type of Security	Protection Against	How it Protects
Password encryption	Password stealing	It hashes the password before storing it in the database. The password becomes unreadable for attackers if they gain access to the database.
PHP Data Objects (PDO) prepare statement:	SQL injection	Escapes quotes and characters that get injected by attackers.
Javascript and Php functions	Special characters that get injected into a text input by attackers	• Javascript function was written to prevent attackers from typing any special characters in a text input; it deletes them while typing. • Php function: Containing a call to the perg_replace() function, a PHP function that performs a regular expression search and replaces.

Table 12 - Security implemented - second increment

5.3.5 Problems Faced and the Solutions Adopted:

Database decisions:

At the beginning of this increment, the main problem was finding an efficient way to store user symptoms and add these symptoms to the user's profile.

How it Was Solved:

An associative table (base table) was created. In a relational database, an associative table is required to resolve a many-to-many relationship.

Associative tables map two or more tables together by referencing the primary key for each [46]. Therefore, two associative tables were created for user symptoms and medication.

A user symptom table contains a user ID, symptom ID, symptom date, symptom intensity, and intensity icon. When a user chooses a symptom, the symptom ID and user ID are added to this table alongside the user's input (date and intensity icon). To fetch this data to the user's profile,

the “symptom” table is left joined with the “userSymptom” table. The same approach was used for medication.

```php
/**
 * @return array Fetch the user's symptoms stored in the database
 */
public function fetchSymptom($userId)
{
    //To fetch the symptom name from the the symptoms table alongside all the symptom data
    // stored in userSymptom, left join these two tables
    $sqlQuery = "SELECT * FROM symptoms LEFT JOIN userSymptoms ON symptomId = userSymptomsId
                 WHERE userId = '" . $userId . "' ORDER BY date DESC;";
    $statement = $this->_dbHandle->prepare($sqlQuery); // prepare a PDO statement
    $statement->execute(array($userId)); // execute the PDO statement
    $dataSet = [];
    while ($row = $statement->fetch()) {
        $symptom = new UserSymptomsData($row);

        $dataSet[] = $symptom;
    }
    return $dataSet;
}
```

Figure 15 - Fetch user's symptoms function

Issues when working with “bindparam”:

When trying to insert data to the “userSymptoms” and “userMedication” tables, the bindparam function did not work. Although the issue was debugged multiple times, the issue was not resolved. Therefore the “array“ function was used.

5.4 Testing and Results:

5.4.1 Usability Testing:

The customer undertook this test during a demo. They were asked to test the web application during the demo and were observed to improve on what had been implemented at an early stage. Usability issues were found during this test. A list of improvements was discussed and agreed upon with the customer. These improvements are listed in table 13.

5.4.2 Functional Testing:

Functional testing is a form of software testing that verifies that the software system meets the functional requirements [24]. Doing this type of testing allowed the detection of two issues. The first issue was related to the registration form where the user can insert numbers into the text input. The second issue was a usability issue where a user will be redirected to the index page even when the login has failed. These issues were added to the list of tasks to be achieved in later increment. Full system functional testing was performed at the end of each increment. However, due to the word limit, only some of these tests will be included. Below an example of some of the functions that were tested in this increment:

No	Functionality tested	Status	Function Description	Severity
Valid input				
1	Sign up	Pass	Users can create an account by filling in the registration form with valid data and pressing the “Register” button.	High
2	Log-in	Pass	A user with a valid user account can log into the system by filling in the login form using their registered email and password and pressing the “Login” button.	High
3	Add Symptom	Pass	A logged-in user can add symptoms to their profile by filling in the required details for each needed symptom, "date and intensity", and pressing the “Add Symptom” button.	High
Invalid Input				
1	Sign up	Pass	A user inserts numbers in any text input (First name, Last name or country) and presses the submit button.	High

2	Login	Fail	A user inserts numbers or invalid email in the email text input and presses the submit button (error message).	High
3	Add Symptom	Fail	A user presses the add symptoms button without choosing the intensity and the date (error message).	High
4	Add Cycle	Fail	A user presses add cycle button without choosing the cycle date and the cycle flow (error message).	High

Table 13 – Functional testing with valid and invalid input

5.5 Summary:

All planned tasks included in tables 10 and 11 were successfully met. The new changes were demoed to the project supervisor and customer. All new requirements that the customer requested were added to the next increment's requirement lists, and all were addressed in the third increment.

Chapter 6: Third Increment:

Increment goal: "*The main goal for this increment is to achieve all requirements listed in table 15 and 16*".

6.1 Introduction:

System's main functionalities (add symptoms, add medication and add cycle) were implemented in the previous increment. However, during the second increment's demo, the customer added new requirements. Some were functional requirements, and others were usability requirements. The first section of this chapter will list all requirements implemented in this increment. The second section will explain the development process to achieve these requirements, the problems encountered during the development, and the solutions adopted. The final section includes all testing performed to ensure the new functions are fully operating.

6.2 Specification and Design:

6.2.1 User Stories:

Below is the list of user stories addressed in this increment. Some of these user stories were revisited for enhancements as per the customer request:

No	Story Title	Story Description
US2	User profile	As a user, I want to have a user profile page to view and edit my details.
US3	Add symptom	As a user, I want to add symptoms to my profile.
US5	Add medication	As a user, I want to add medication to your profile.
US7	Add cycle	As a user, I want to add cycles to your profile.
US9	Calendar	As a user, I want to view your symptoms and cycle on the calendar.
US10	Add new symptom	As an admin, I want to add new symptoms to the symptoms page using the web interface
US11	Add new medication	As an admin, I want to add new medications to the medication page using the web interface

Table 14 - User stories - Third increment

6.2.2 Functional Requirements:

Below is the list of functional requirements for this increment:

No	Requirement	User Story Addressed	Technical Specification	Source of Requirement
2	The user should be able to add notes to their symptoms and view these notes in their profile.	US2 and US3	• User notes are optional; the user should still be able to add symptom without adding their notes.	Customer
4	The user should be able to add notes to their medication and view these notes in their profile.	US2 and US5	• User notes are optional; the user should still be able to add medication without adding their notes.	Customer
6	The user should be able to view their added cycles in the user profile.	US2 and US7	• The cycle length should be calculated for the user after adding two cycles to their profile.	Customer
8	The user should be able to view their symptoms on the calendar.	US9	• All user's added symptoms should be displayed on the calendar alongside their intensity.	Customer
9	The admin should be able to add a new symptom to the symptom page using the UI.	US10	• Only admin user can add a symptom to the symptom page.	Brainstorming
10	The admin should be able to add a new medication to the medication page using the UI.	US11	• Only admin user can add a medication to the medication page.	Brainstorming

Table 15- Functional requirements - Third increment

6.2.3 Usability Requirements:

Below is the list of usability requirements that the customer requested during the second increment demo:

No	Requirements
1	The register button positioned in the middle of each page's top picture should turn into a profile button when a user logs in.
3	A user should be able to collapse and expand each section on the profile page to save them time scrolling down to view each section.
4	The user should not be redirected to the profile page after adding a symptom or medication.
5	The symptom page and medication page should not reload when adding a symptom or medication.
6	If an admin is logged in, add symptom and add medication tabs should appear on the navigation bar.
7	The user should not be redirected to the index page if the login has failed.

Table 16 - Usability requirements - Third increment

6.2.4 Wireframes:

6.2.4.1 Mobile Version for Logged-in Admin:

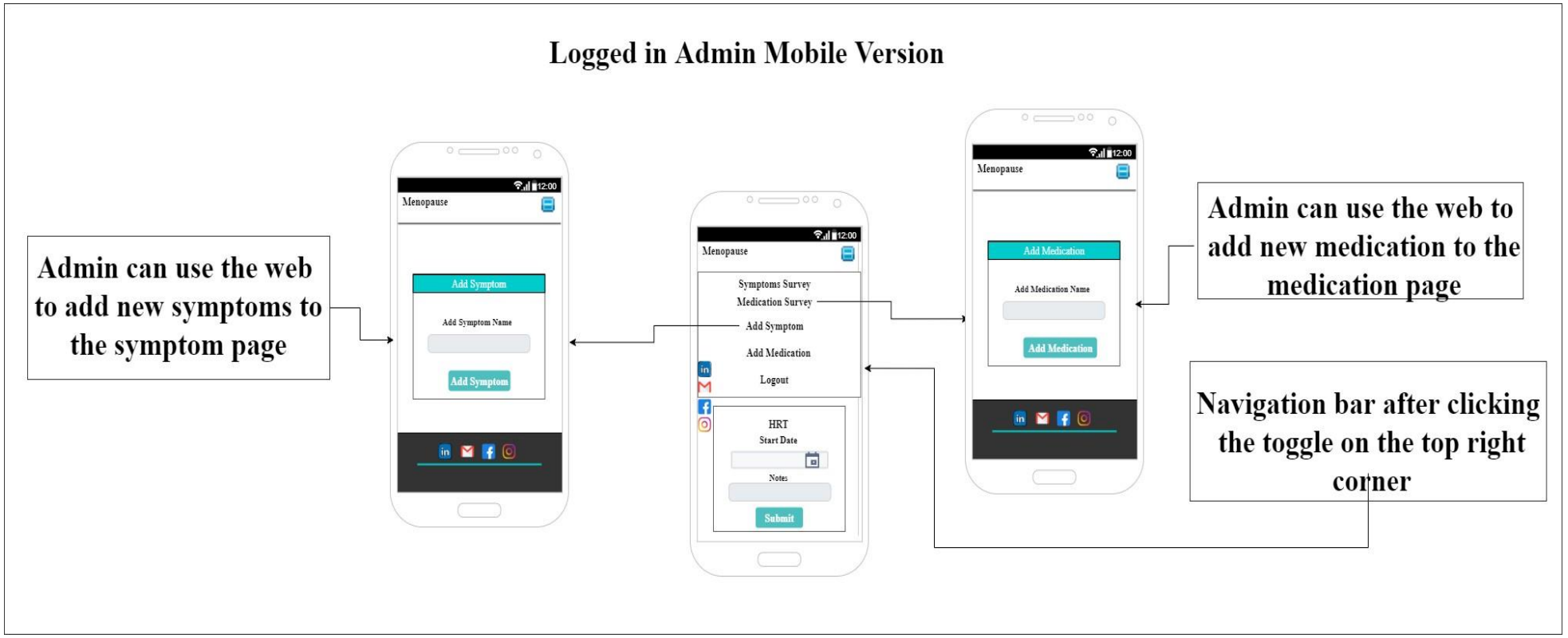


Figure 16 – Wireframe mobile version logged-in admin

6.2.4.2 Mobile Version for Logged-in User:

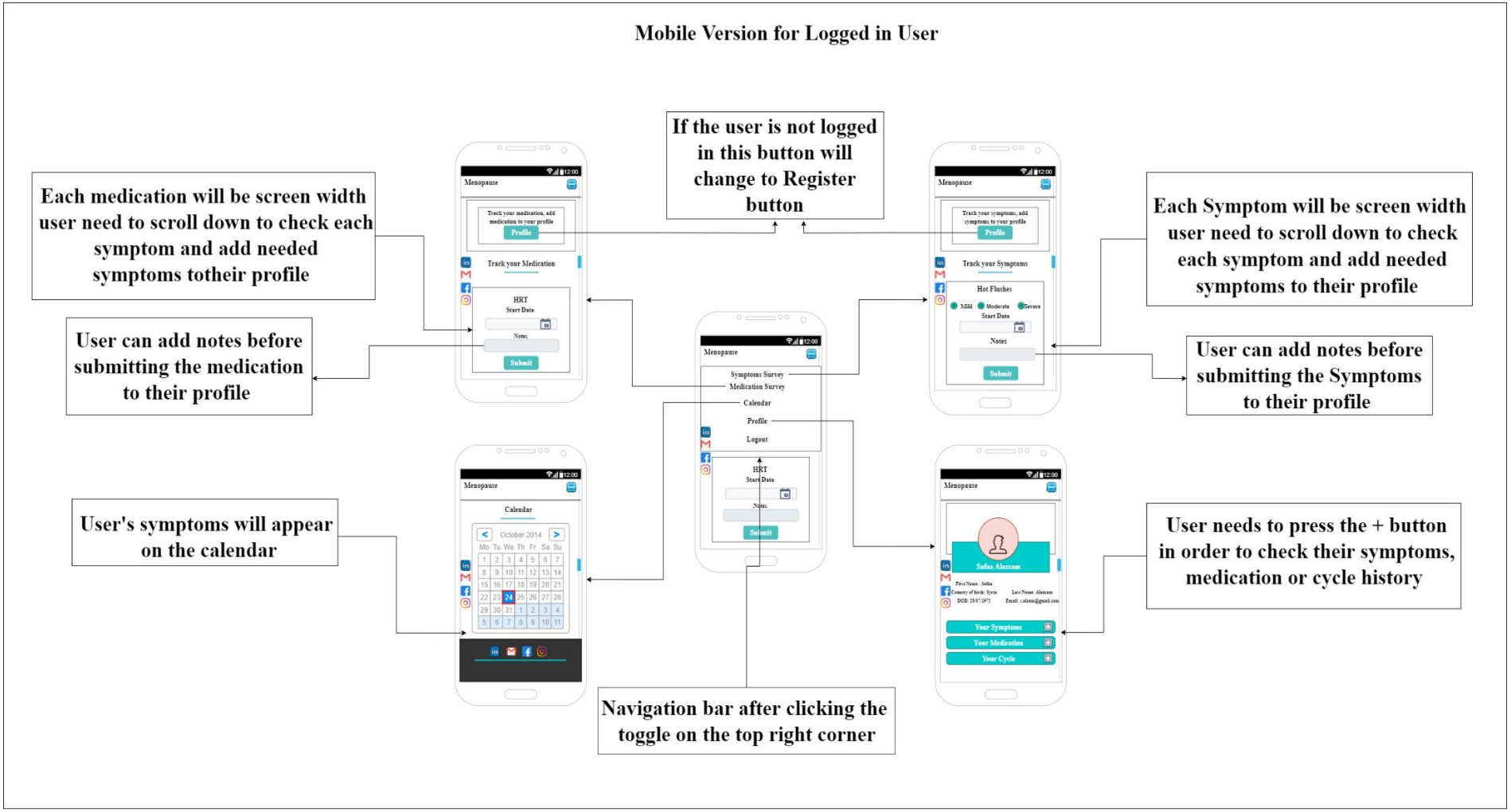


Figure 17- Wireframe mobile version logged-in user

6.2.4.3 Calendar:

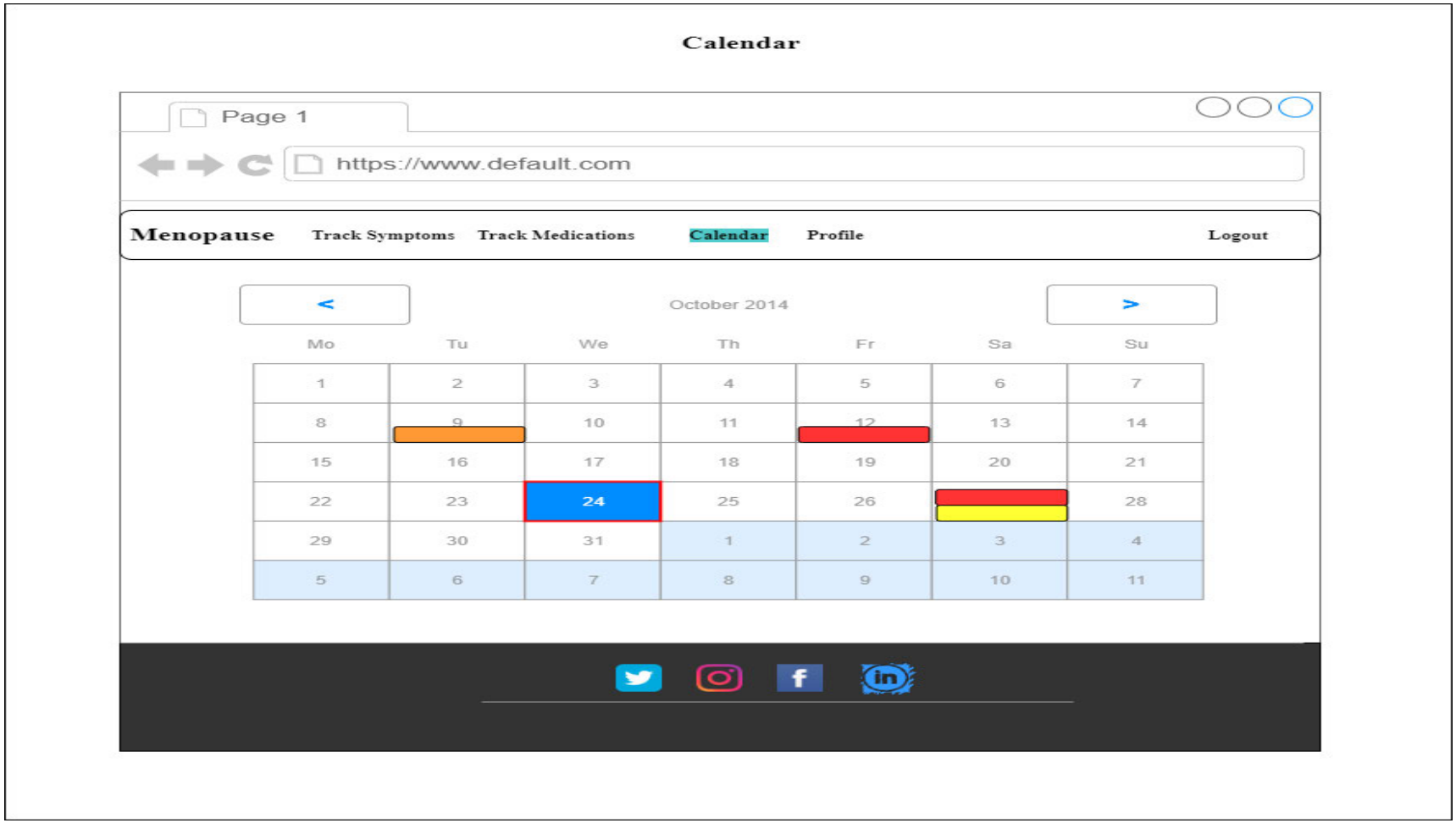


Figure 18 - Wireframe for the calendar

6.2.5 Entity Relationship Diagram (ER):

An ER Diagram is a visual demonstration of the relationship between database Entities [46]. Below is the ER diagram for the project's database tables.

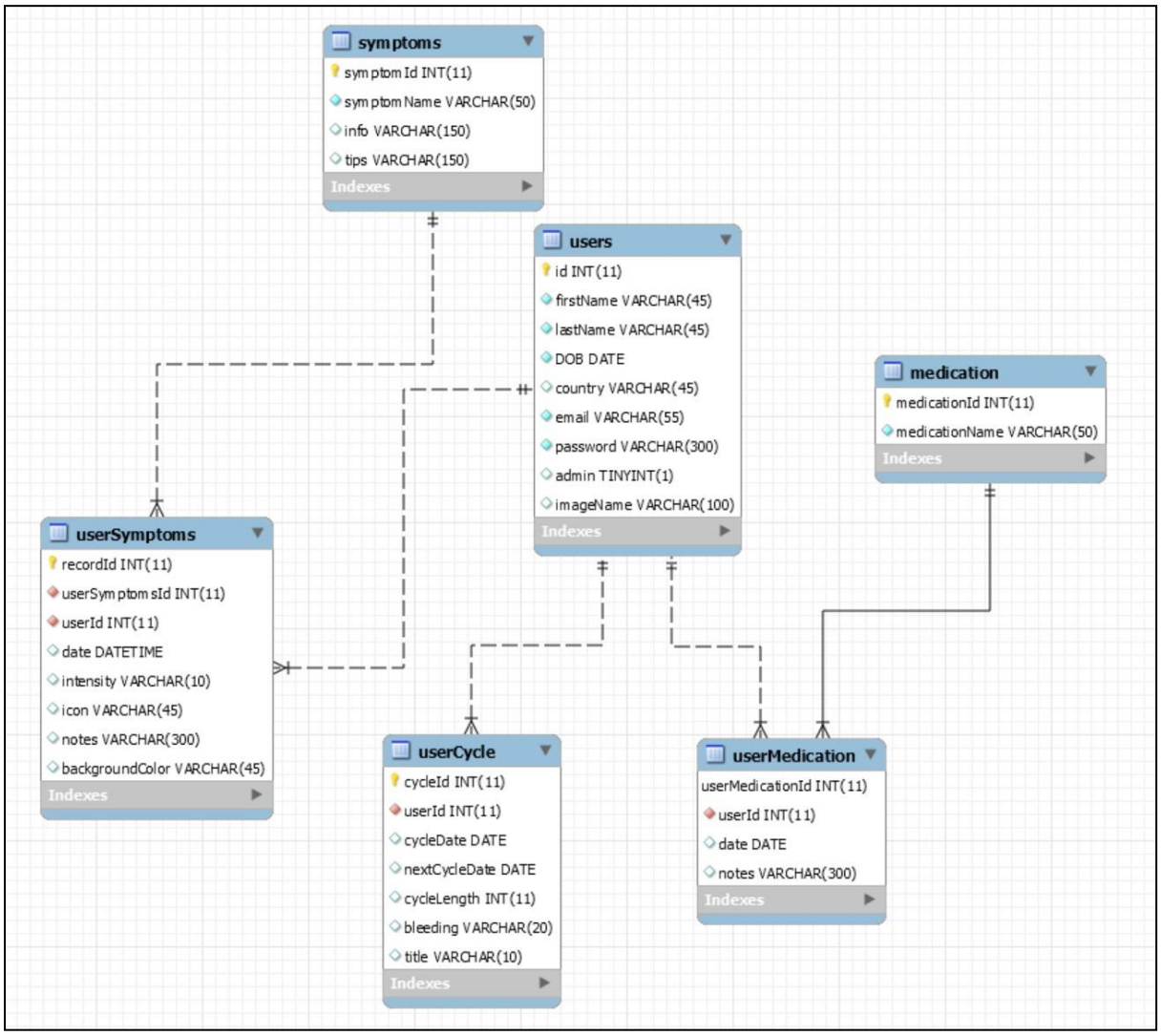


Figure 19 - ER diagram for the database tables

6.3 Development and Implementation:

The Trello board below shows all the activities associated with this increment:

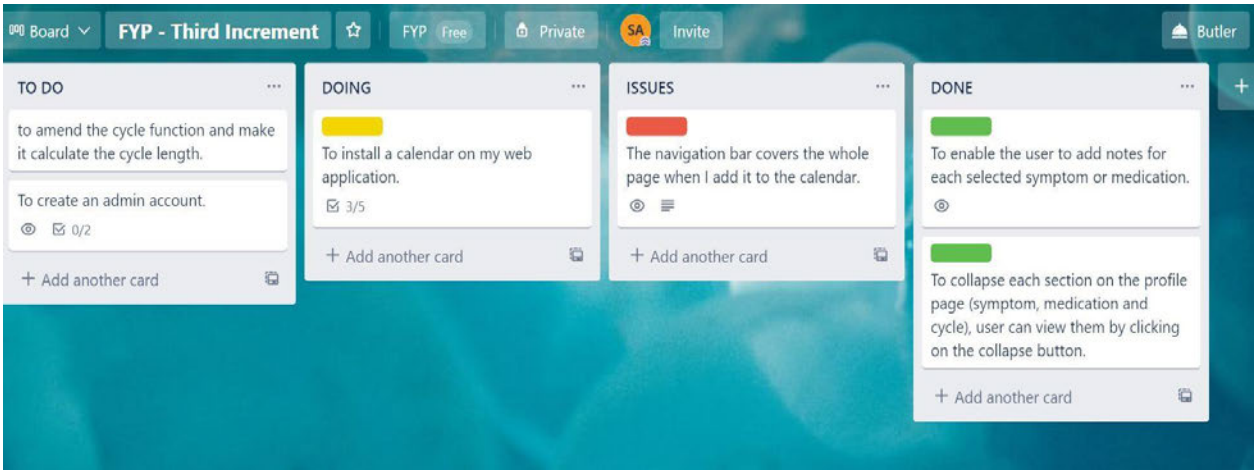


Figure 20 - Trello board – third increment

6.3.1 FullCalendar:

As a first step, the fullCalendar was installed on the web application to display user symptoms. The full calendar is a javascript component imported from (fullcalendar.io). The events shown on the calendar were JSON objects.

How Are Events on the Calendar Displayed?

A function was written to extract user symptoms as an array of events and used Jason encoding to format this array. This function was then used to add these symptoms in a PHP file, then passed the URL of this file (JSON feed) to display Event Objects on the calendar.

After successfully managing to display user symptoms on the calendar, the symptoms colours were changed on the calendar according to the symptom intensity. A tooltip was added that appears while hovering over a symptom. These tooltips contain the symptom's name and intensity with the icon associated with it, as shown in the figure below:

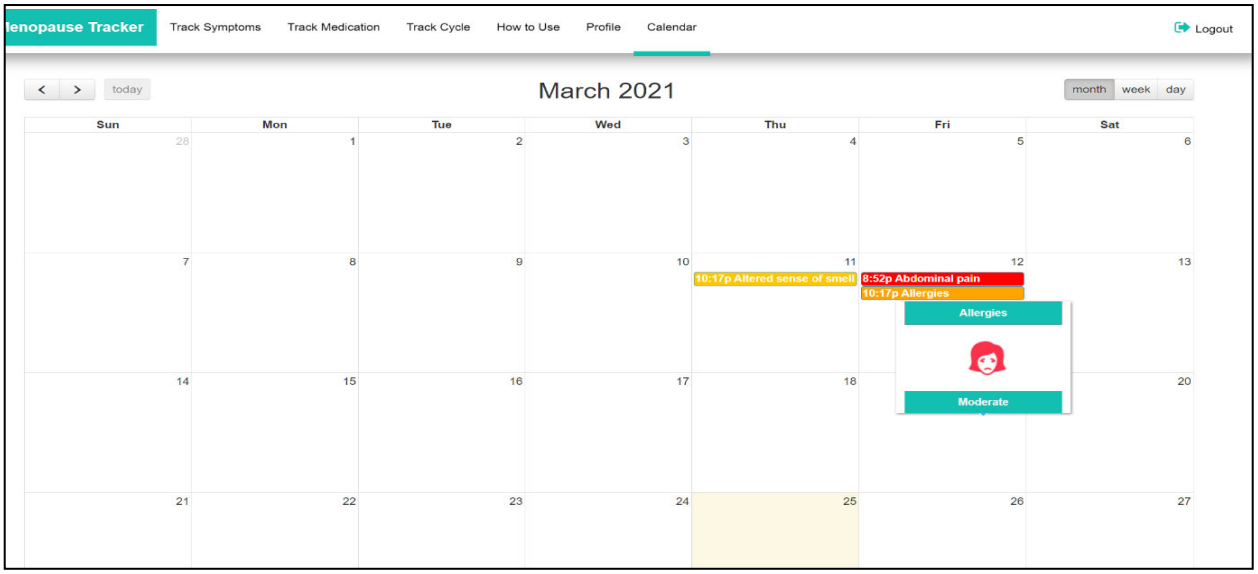


Figure 21- Calendar with the tooltips appearing on hover

6.3.2 Cycle Length:

How Did the Cycle Previously Work?

Initially, the user selected the cycle date and length from a drop-down list. However, the customer did not want the user to calculate the cycle length themselves. Therefore, they asked for the cycle length to be calculated for the user.

How it was Changed

- The cycle length option was removed from the cycle form.
- A function that retrieved the last stored cycle date for the user was written.
- The difference between the retrieved cycle date and the new cycle date as cycle length was calculated.
- The cycle length was used to calculate the next expected cycle date by adding the cycle length to the new cycle date.
- The new cycle date, cycle length, and next expected cycle date were stored in the cycle table.
- The stored data was added to the user's profile.

6.3.3 Add Symptoms and Medications (Admin):

To achieve this task, an admin user type was created; if the logged-in user was admin, two new tabs would appear on the navigation bar (Add Medication and Add Symptom). Each page has a form that allows the admin to insert new medication or symptom names. By submitting this form, this data will get added to the database.

6.3.4 Security Consideration:

Type of Security	Protection Against	How it Protects
Tokens	Cross-site request forgery (CSRF) [37].	Tokens are unique strings randomly generated for each session and get sent with each request. Token gets included in every single form as a hidden input. The system then validates the form by comparing the token with the one stored in the user's session. This makes it hard for attackers to perform CSRF as they will not be able to do it without knowing the token value [37].

Table 17 - Security implemented - Third increment

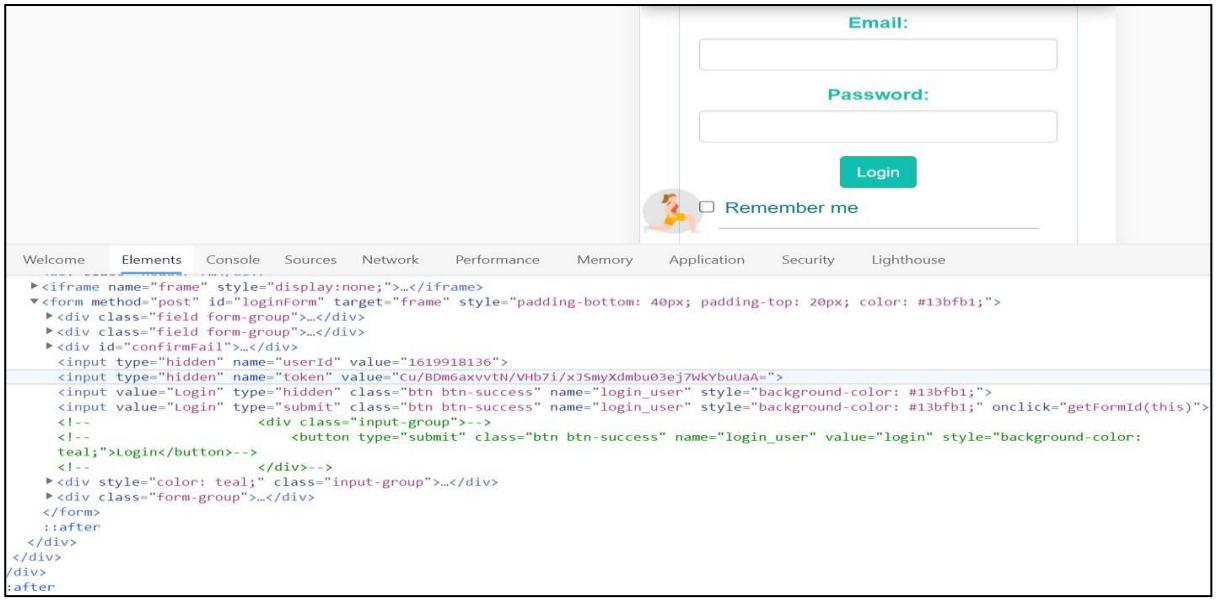


Figure 22 - The randomly generated token - login form

6.3.5 Problems Faced and the Solutions Adopted:

6.3.5.1 Adding User Symptoms to the Calendar:

At the start, it was not possible to display symptoms on the calendar. When testing the value returned from the function that extracts the user's symptoms, the value returned was the required value. However, after researching the problem, it became evident that the event attribute of the fullCalendar plugin should contain just a single echo statement. That echo

statement should return the data event to be displayed. Calendar.php is where the function fetching the events were called. This file(calendar.php) includes another file (calendar.phtml) which makes another echo statement.

How it was Solved

A new file was created (calendar-symptoms.php), and the function that fetches the symptoms was added to this file. The URL was then passed for this file to the calendar.

6.3.5.2 Responsiveness and Layout Issues

When adding the rest of the menopause symptoms during this increment, some of the medications and symptoms had long names. This made the cards containing these symptoms or medications differ in height, affecting the layout of both pages and the responsiveness on different devices.

How it was Solved

A javascript function was written that matches the height of all cards. Below is a screenshot of this function:

```
//    Fix height Function to check the height of each element and make every
//    box same height by getting the max height card
function fixHeight() {
    // selecting a class to select all cards
    gpt_box = jQuery('.card');
    //initializing an auto height to it so every box will be in normal height
    // of where it is by default
    gpt_box.attr('style', 'height: auto !important');
    // assuming the max height is on the 0 index means first card in a page
    max = jQuery(gpt_box[0]).height();
    jQuery.each(gpt_box, function (index, value) {
        //this loop checking if the current card's height is grater then the max
        // so it will change max value in short it's detecting the highest card
        if (jQuery(value).height() > max) {
            max = jQuery(value).height();
        }
    });
    //time to change the height to the detected maximum height
    jQuery.each(gpt_box, function (index, value) {
        // changing max value and adding 2 in it just to get a space on bottom a little bit
        max = max + 2;
        //changing the height of each element
        jQuery(value).attr('style', 'height: ' + max + 'px !important');
    });
}
fixHeight();//calling the function
```

Figure 23 - The javascript function used to match the height for all the cards in the symptoms, medications, and profile pages

6.4 Testing:

6.4.1Usability Testing:

Three users performed usability testing. Each user was asked to perform a specific test while being observed. Two users tested using a mobile phone, and one user used a laptop. The general feedback from all users was positive. However, there were the following suggestions from two users:

- To use positive imagery across the web application to offer positivity to the user.
- To create a tips bar that reminds the user of healthy tips.

These suggestions were considered in the fourth increment. The figure below shows some users while testing the web application:

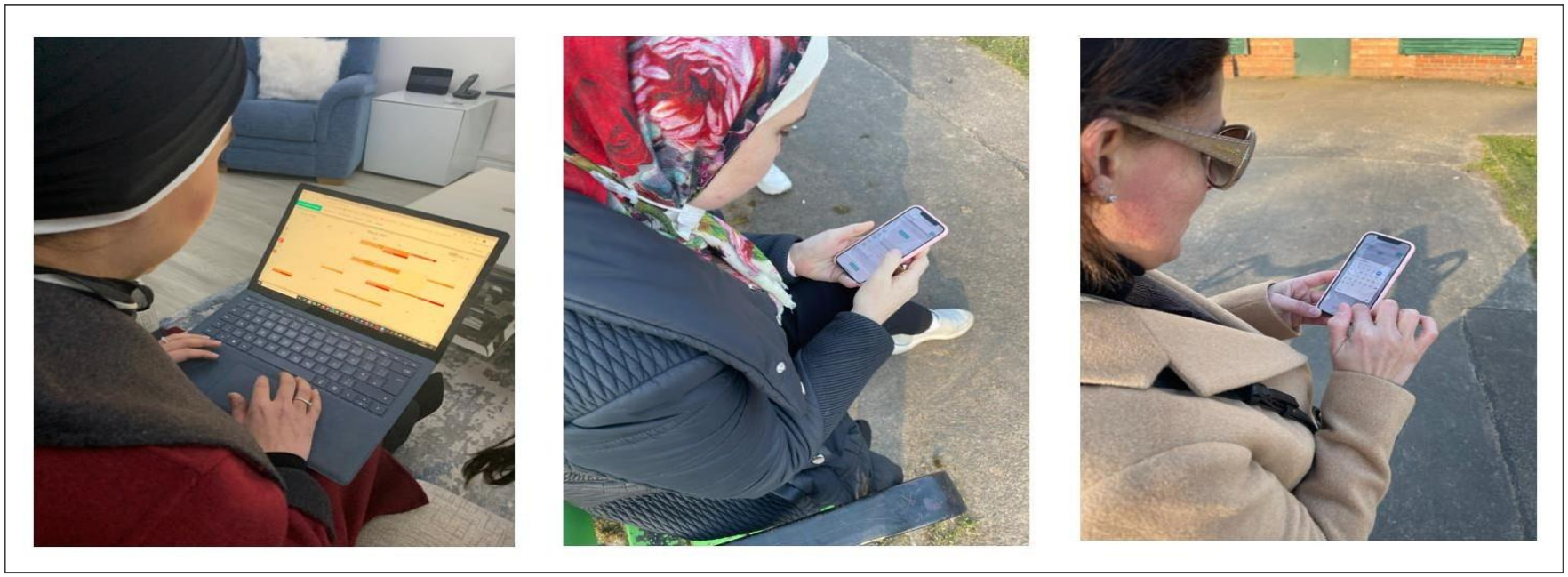


Figure 24 - Usability testing – Third increment

6.5 Summary:

All increment goals were fully met, and all requirements were fully implemented and tested. All new changes were demoed to the project supervisor and customer. Both were satisfied with the new functionalities, especially the calendar.

Chapter 7: Fourth Increment

Increment goals: *"This increment's primary purpose is to achieve all requirements listed in tables 19 and 20. This increment is mainly focused on improving the user's experience."*

7.1 Introduction:

The main focus for this increment was improving usability, security and performance. The first section of this increment lists the functional usability and functional requirements for this increment. The second section explains the development process for these requirements. The third section explains all types of testing performed to ensure a functional and usable web application.

7.2 Specification and Design:

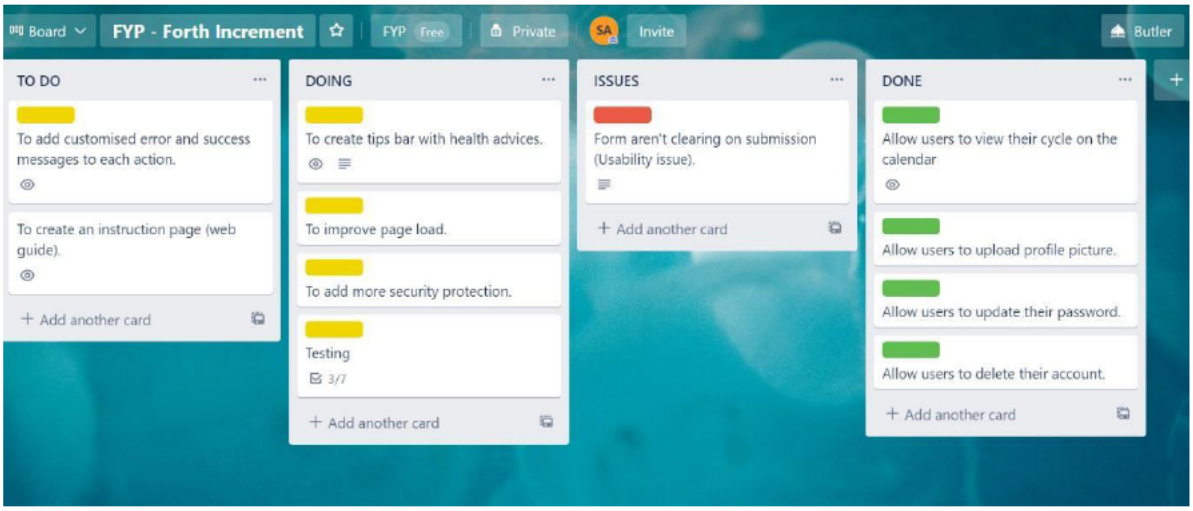


Figure 25 - Trello board - Fourth increment

7.2.1 User Stories:

No	Story Title	Story Description
US2	User profile	As a user, I want to have a user profile page to view and edit my details.
US7	Add cycle	As a user, I want to add cycles to your profile.
US9	Calendar	As a user, I want to view your symptoms and cycle on the calendar.

Table 18 - User stories - Forth increment

7.2.2 Functional Requirements:

No	Requirement	User Story Addressed	Technical Specification	Source of Requirement
1	The user should be able to track their cycle flow (mild, moderate or heavy).	US7	• User should select cycle date and cycle flow before they can add a cycle to their profile.	Brainstorming
2	The user should be able to view their added cycles on the calendar.	US7 and US9	• All added user cycle should be displayed on the calendar alongside their cycle flow.	Brainstorming
3	The user should be able to upload a profile picture.	US2	• A user can only add images with a valid extension (png, jpg, jpeg and gif).	Brainstorming
4	The user should be able to delete their profile picture.	US2	• The profile picture should be deleted permanently from the database.	Brainstorming
5	The user should be able to reset their password.	US2	• The user needs to know their current password to be able to reset it.	Brainstorming
6	The user should be able to delete their account.	US2	• The account should be deleted permanently from the database.	Brainstorming

Table 19 - Functional requirements - Fourth increment

7.2.3 Usability Requirements:

No	Requirements	Source of Requirement
1	Customised error and success messages should be sent to the user when performing any action.	Brainstorming
2	To use positive imagery across the web application to offer positivity to the user.	Brainstorming
3	To add a tips bar that reminds the user of health tips.	Brainstorming
4	To make general improvements that may attract users, like adding more icons and hover effects.	Brainstorming

5	To improve the page load speed.	Brainstorming
6	To create a page that has instructions on how to use the web application.	Brainstorming
7	To improve the colour contrast in some areas on the web.	Supervisor
8	A user should be able to find information and tips for each symptom by clicking an information button attached to each symptom.	Brainstorming

Table 20 - Usability requirements - Fourth increment

7.3.3 Flow Chart:

The diagram below shows the logic flow for each page on the web application:

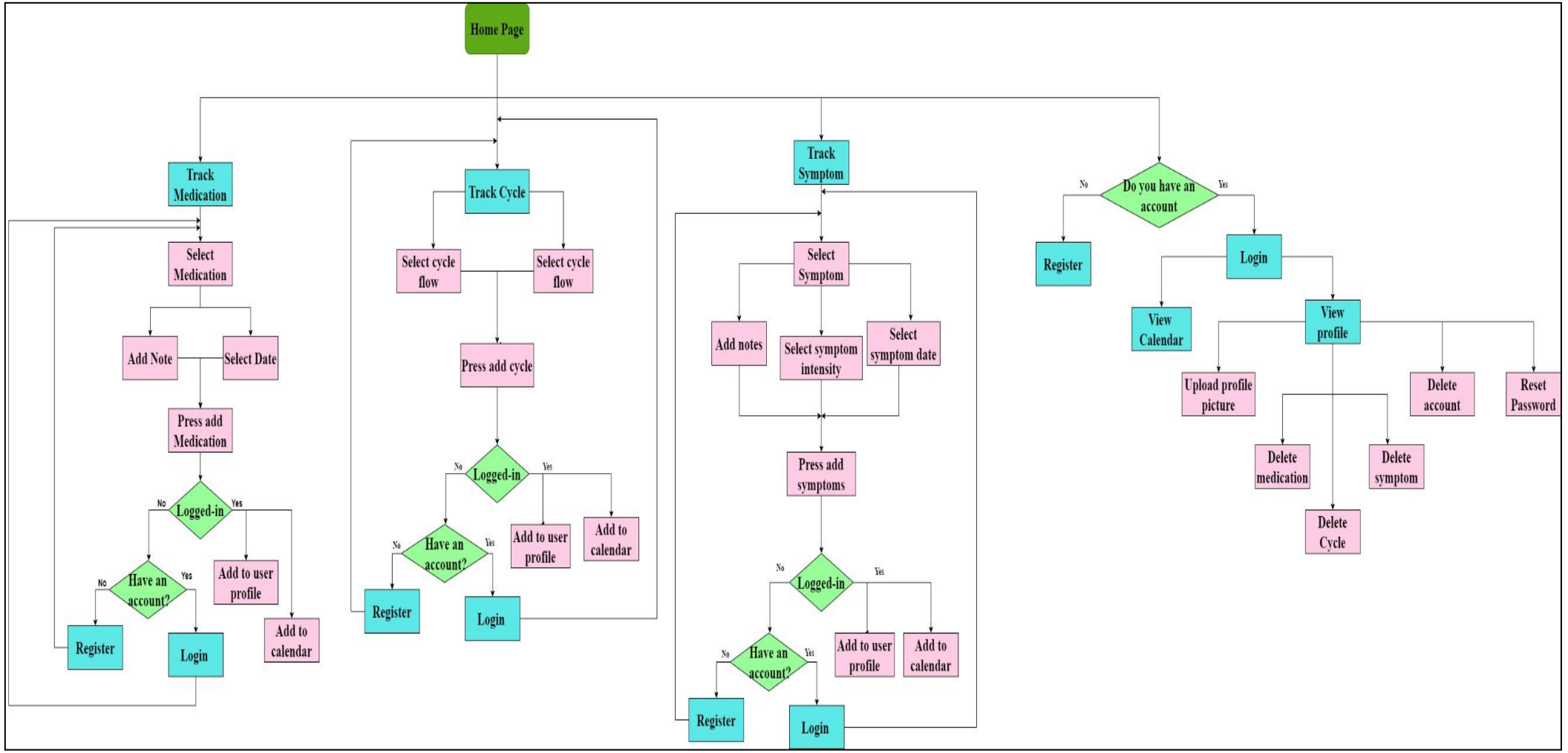


Figure 26 - whole system flow chart

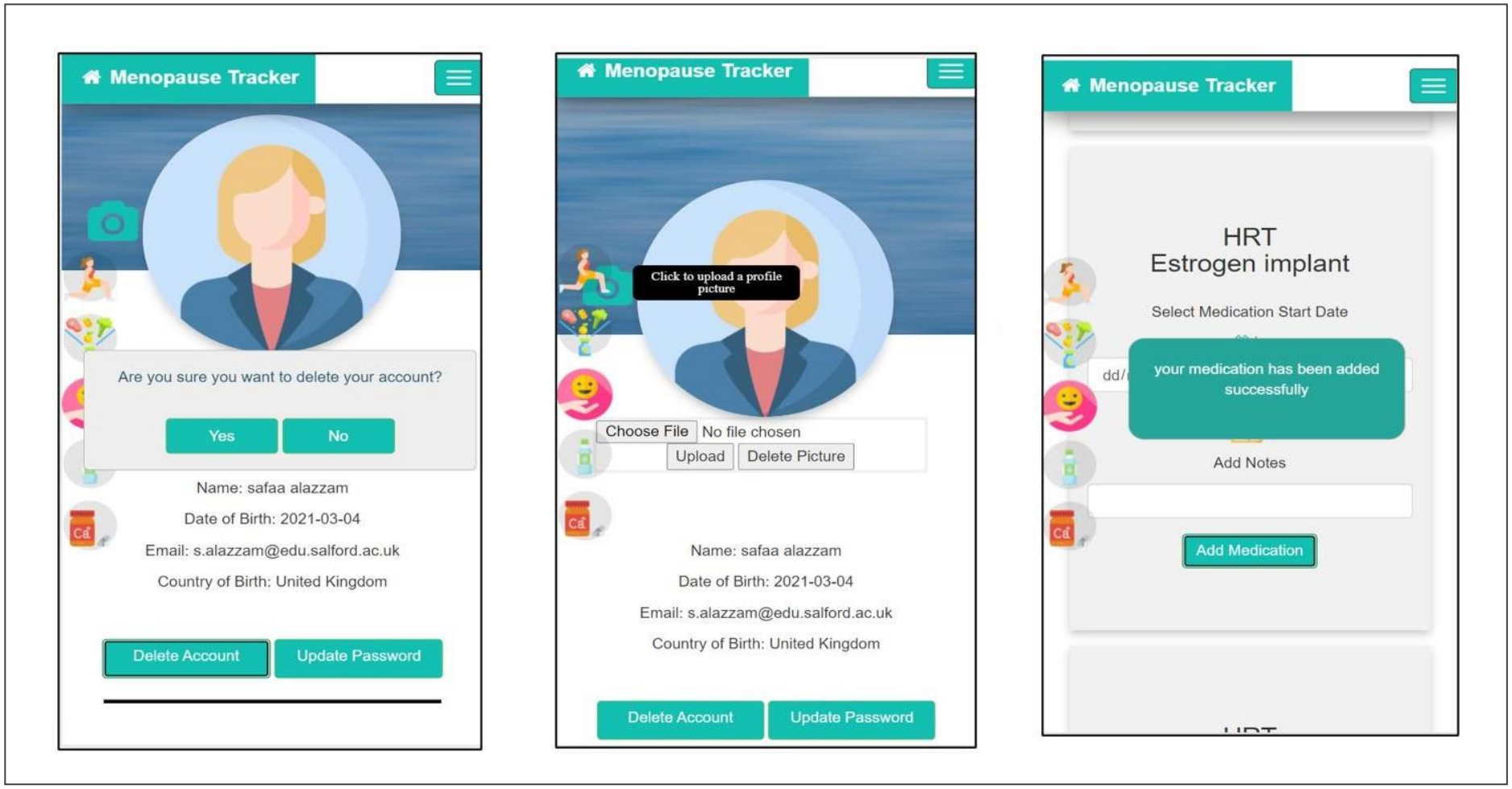
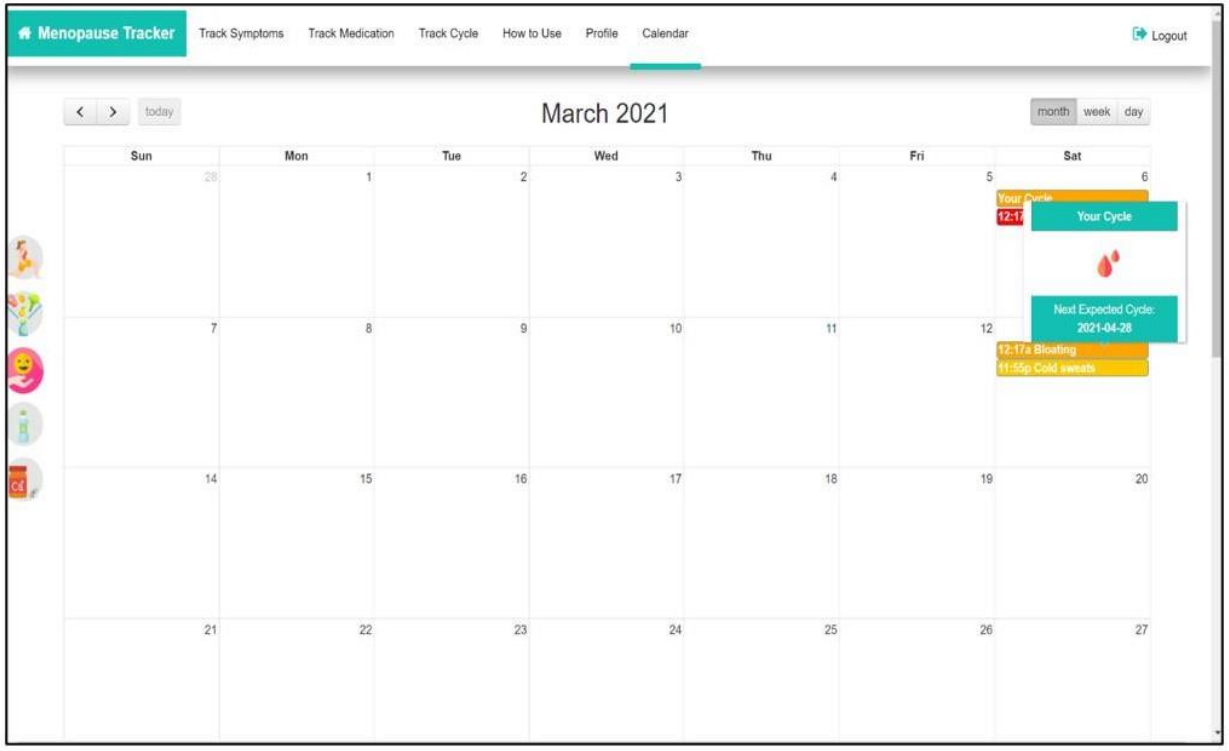


Figure 27 - Confirmation messages used to confirm user action, hover effect to gives users more information and success messages that appear to the user on success



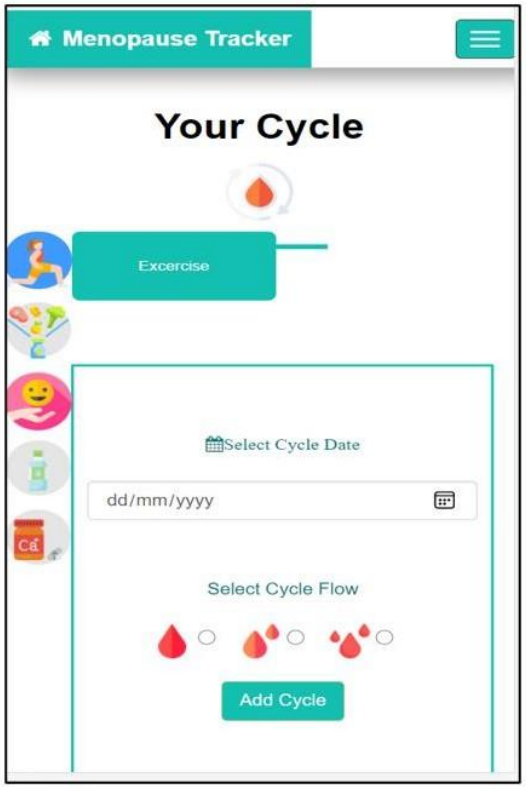


Figure 28 - Two screenshots showing user cycle on the calendar, cycle flow added to the cycle form and the tips bar showing health tips on click

7.3 Development and Implementation:

7.3.1 Update Password:

According to [48], it is recommended to update your password every 30, 60, or 90 days, depending on what is the password used for. Updating password is very important forprotecting user accounts against possible attackers. Some users tend to use the same passwordfor multiple accounts, so if this password gets hacked on one account, the user needs to have the option to reset their password. For these reasons, users can update their password by addingan update password button to their profile.

7.3.2 Delete Account:

Adding this functionality is to satisfy the user's experience. Some users may not want to keep their account if they do not feel that the web application is benefiting them. Other users may wish to delete their account if they do not have symptoms anymore.

7.3.3 Upload Profile Picture:

This feature was implemented to satisfy all users. Many users want to have the option to upload their profile picture to their account**.**

7.3.4 Cycle Flow:

During menopause, women usually suffer from irregular cycle patterns. Cycle flow can also get heavier or lighter. Tracking the cycle flow can be beneficial for users. For these reasons, users can track their cycle flow by adding radio buttons to the cycle form with three options (light, moderate and heavy). Icons represent these options to satisfy visual users.

7.3.5 Symptom Information and Tips:

This feature was to give the user information and tips about each symptom. The logic for this feature has been implemented. However, it could not be fully implemented as completing this feature needed deep research for reliable information, requiring more time. However, this feature will be developed during future work. The figure below shows how this feature should look:

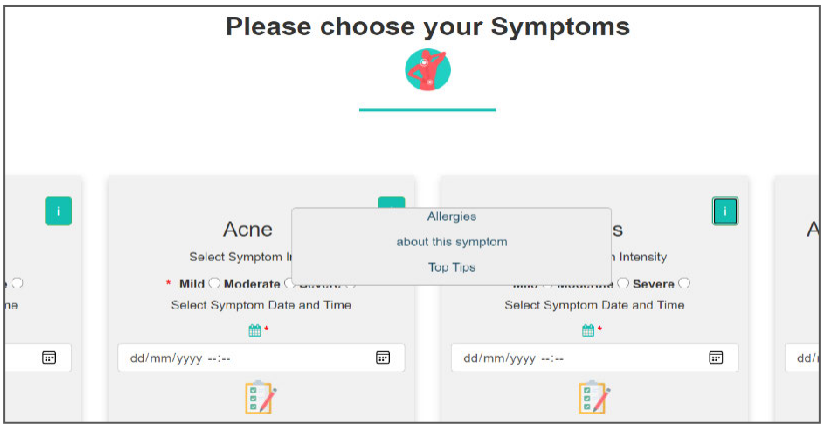


Figure 29 - symptom information and tips box

7.3.6 Security Consideration:

Security Headers		
Type of Security	**Protection Against**	**How it Protects**
x-content-type-options[29]:	MIME sniffing vulnerabilities, which attackers can leverage to send an XSS attack (Cross-Site Scripting) when a user uploads content to the web page (profile picture) [28].	Disabling the MIME sniffing functionality of both browsers (IE and Chrome) forces the browser to use the MIME type sent by the origin server [29].
x-frame-options[30]:	Clickjacking attack occurs when attackers use a transparent iframe with a button or a link to another server with an identical look and trick the user into clicking on it [31].	Preventing a page from being rendered inside a frame, iframe or an object [30].
x-XSS-protection [33]	XSS attack, where attackers inject code that carries out an action in a user's browsers on behalf of the website [34].	Enabling the cross-site scripting filter (XSS) built into modern browsers. This filter is usually enabled by default. However, using x-XSS protection enforces it [33].
Content-Security-Policy(CSP)/ frame-ancestor [32]	It protects or reduces the risk against XSS and clickjacking [32].	CSP is a set of instructions the website administrator sets by declaring which dynamic resources are allowed to load. The

		CSP frame store can be used to protect a page from being placed into a frame or iframe [32].

Table 21 - Security implementation – Forth increment

7.3.7 Performance Consideration:

Web page load speed is the time spent when a user makes a query until the page becomes available for viewing. The loading speed of a website impacts the satisfaction level of web users, so it is crucial to ensure that the web application loads quickly. Below is the list of techniques used to improve page load speed:

No	Technique Used	How it Helps
1	Images were compressed and resized.	Reduces the size of the image and makes it load faster.
2	Gzip.	Gzip is a compression tool used by the server to compress a page's content before sending it to the user. Gzip can reduce the file size up to 80%, improving the page load speed and reducing bandwidth cost [35].
3	Expires header.	Expires header notifies browsers of what resources (images, CSS files, etc.) can be stored in the browser's cache and for how long; this will help speed up the site by fetching these stored elements from the cache and not from the server. It also reduces HTTP requests on subsequent page views [38].
4	CSS and JavaScript minifying tools [49] [23].	Online tools were used to remove white spaces from CSS and javascript files, which helped reduce the file size and improve the page load.
5	Moving the JS code to the footer.	JavaScript gets executed by the browser upon loading. So, putting JavaScript at the top will make the browser execute the

		JavaScript before loading the rest of the page. Therefore, moving JS to the bottom will make the browser quickly render the page as it makes JavaScript defer its execution to a later stage, hence improving the page load time.

Table 22 – Techniques used to improve the performance

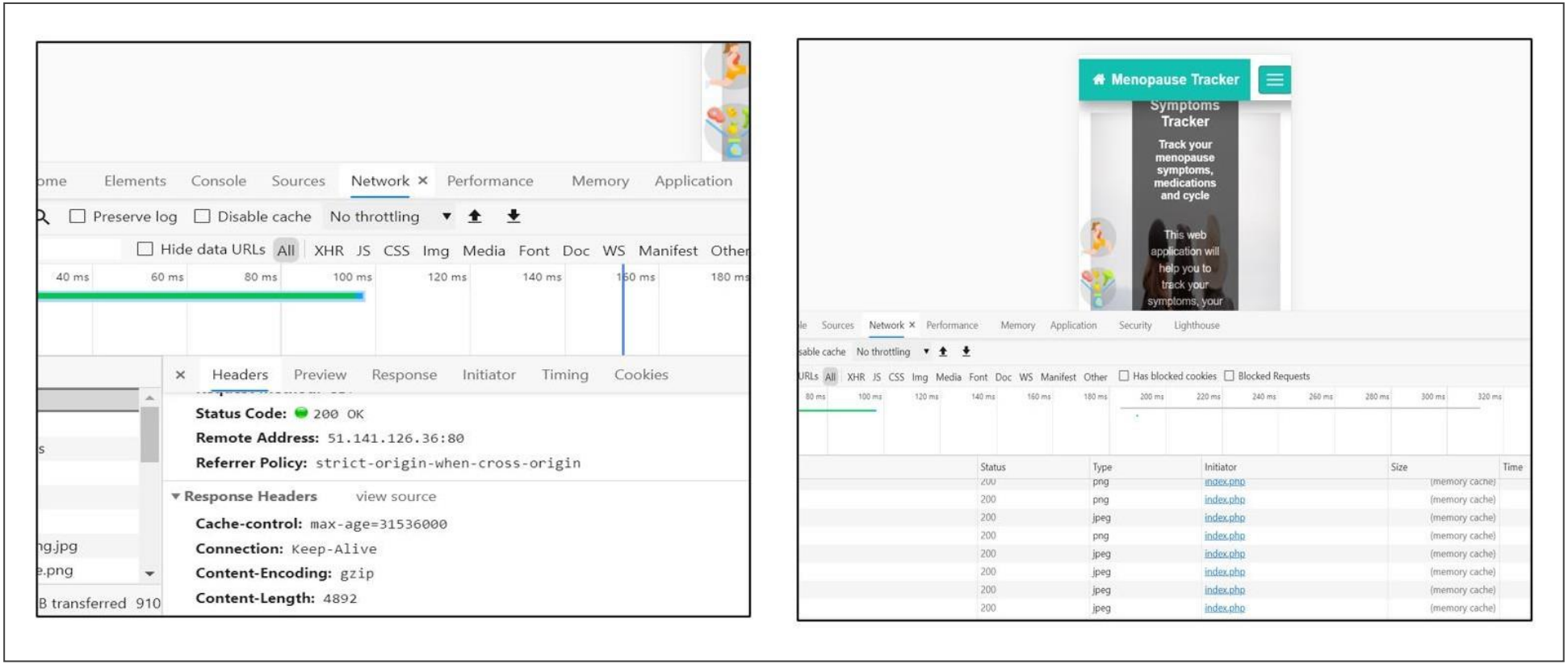


Figure 30 - Two screenshots showing the use of gzip, and the effect of expires header on page content where all images were cached

7.4 Testing:

7.4.1 Usability Testing:

A survey was created to evaluate the web application from the user's point of view. This survey included questions that evaluate the following areas:

- ✓ The ease of use, how hard or easy it was to perform a specific task.
- ✓ The simplicity of the text, and if it was simple and easy to understand.
- ✓ The colours and style, and if the colours used affect the readability of the text.
- ✓ The performance, such as page load.
- ✓ The accessibility, and if this web application can be accessed on different devices and using different browsers.
- ✓ Easy navigation, and if the user can navigate to different pages easily.

Twenty users took part in the usability testing. The first thirteen users have tested the web application with no instruction sheet. This was to check if the web application was easy to use when users find it online. Seven users were given an instruction sheet. This instruction sheet explains the web application and a list of tasks that can be performed using this web application. The survey result shows that the web application was easy to use and is fully functional. Below are some screenshots of user responses to different survey questions and the feedback list that was received.

Q18 What improvements would you recommend to be made to this website to make it meet your needs?
Essay

Date	Answers
3 days ago	The website looks very good and, met all my needs. I think it doesn't need any amendment
3 days ago	I don't think it needs any additions. Such a useful website which I will surely use in the future!
3 days ago	Excellent website it was easily accessible and it has very useful information
Mar 21	the website needs to contain more explanation and may be to add some videos .
Mar 17	It's well designed, I like the colours used and the format. It is easy to find information. Some small issues remain when used on an iPhone as mentioned in previous pages
Mar 16	Just to make the cycle tracking diagrams easier to understand ie. which is heavy and which is light flow.
Mar 16	I think a Welcome page would be nice, and an overview to Menopause. There are some typo errors on the site: you / your and so on. It would be good to get someone to proofread the site for. I think it is a great resource. Well done :-)
Mar 16	Feels like it may be more useful as an app that could send you reminders than a website... Great concept could be really useful. As mentioned, add date ranges where appropriate and take away time.
Mar 16	This seemed like a great website although I felt like it wasn't really of use to me as I am not in menapause yet
Mar 16	I don't feel that any improvements would be required

Figure 31 – Usability testing user's feedback

Figure 32 – User evaluation of the design and the readability of the text used across different pages

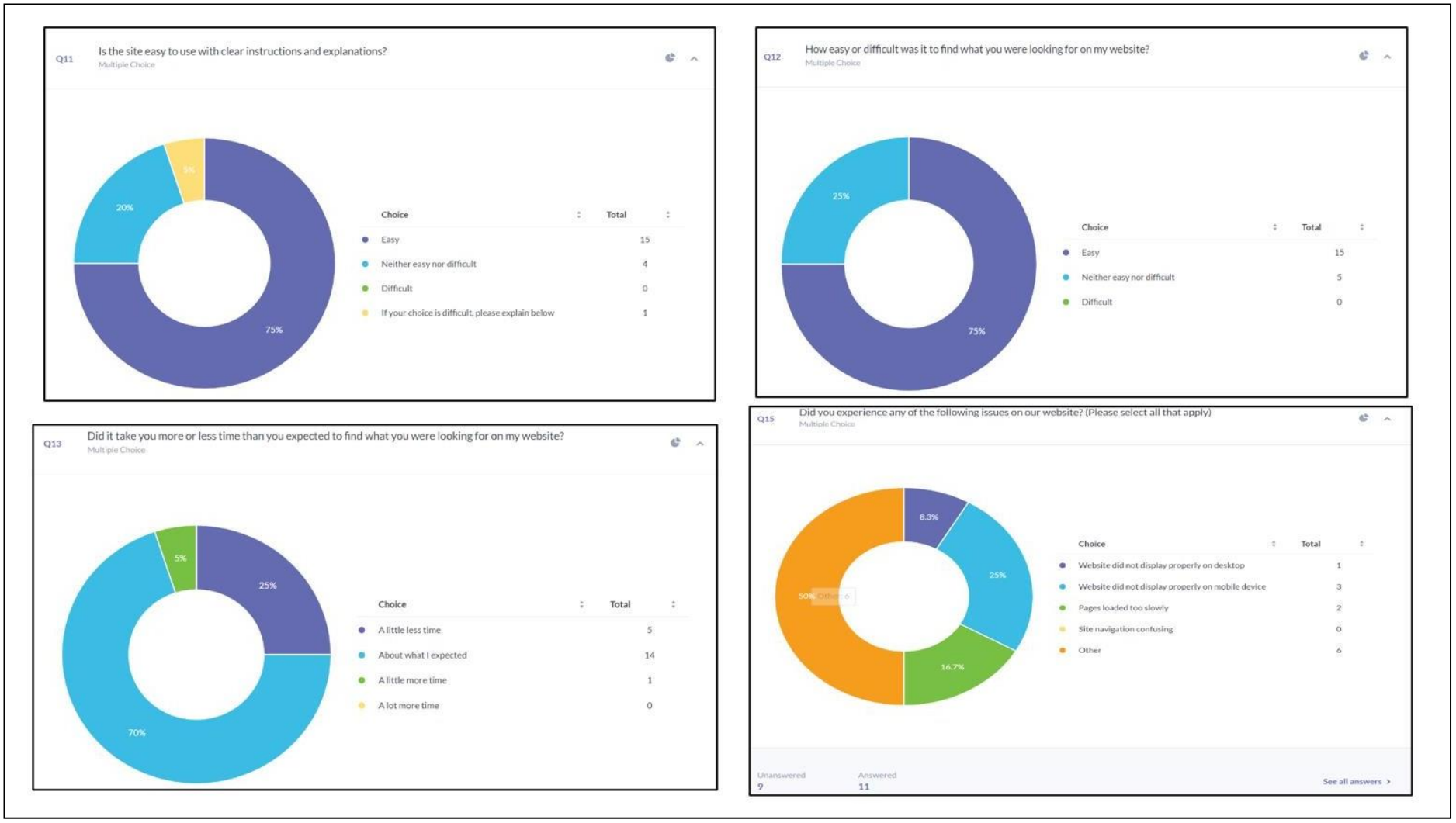


Figure 33 - User's evaluation for the ease of use and problems faced

7.4.2. Functional Testing:

No	Functionality Tested	Status	Function Description	Severity
Valid Data				
1	Add Symptom	Pass	A logged-in user can add symptoms to their profile by filling in the required details for each required symptom, "date and intensity", and pressing the “Add Symptom” button.	High
2	Add Medication	Pass	A logged-in user can add medication to their profile by filling in the required details for each required medication "date" and pressing the “Add Medication” button.	High
3	Add Cycle	Pass	A logged-in user can add a cycle to their profile by filling in the required details for each cycle, "date and cycle flow," and pressing the “Add Cycle” button.	High
4	Delete Symptom	Pass	A logged-in user can delete a symptom from their profile by clicking the delete button associated with the required symptom.	Low
5	Admin Add Symptom	Pass	A logged-in admin user can add a symptom to the symptoms list by adding the symptom name to the Add symptom form on the "Add Symptom" page and pressing the “Add Symptom” button.	Medium

6	Reset Password	Pass	A logged-in user can reset their password by filling in the required valid data in the reset password form "old password, new password and confirm password" and pressing the confirm button.	High
7	Upload Profile Picture	Pass	A logged-in user can upload a profile picture to their profile page by clicking on the camera icon, choose the picture, and then click the upload picture button.	Medium
8	Delete Profile Picture	Pass	A logged-in user can delete the profile picture from their profile page by clicking on the camera icon and then clicking the delete picture button.	Medium
9	Delete Account	Pass	A logged-in user can delete their account from their profile page by clicking on the delete account button.	High
Invalid Data				
1	Register	Fail	A user inserts numbers in any text input (First name, Last name or country) and presses the submit button (error message).	High
2	Login	Fail	A user inserts numbers or invalid email in the email text input and presses the submit button (error message).	High
3	Add symptom	Fail	A user presses the add symptoms button without choosing the intensity and the date (error message).	High

4	Add Medication	Fail	A user presses the add medication button without filling in the date (error message).	High
5	Add Cycle	Fail	A user presses add cycle button without choosing the cycle date and the cycle flow (error message).	High

Table 23 - Functional testing – Increment 4

7.4.3 Page Load Testing:

To ensure that the web application's loading speed was reasonable, the Google developer online tool (pageSpeed Insight) was utilised to test the page load speed on both a mobile phone and desktop. Below are two figures showing the results.

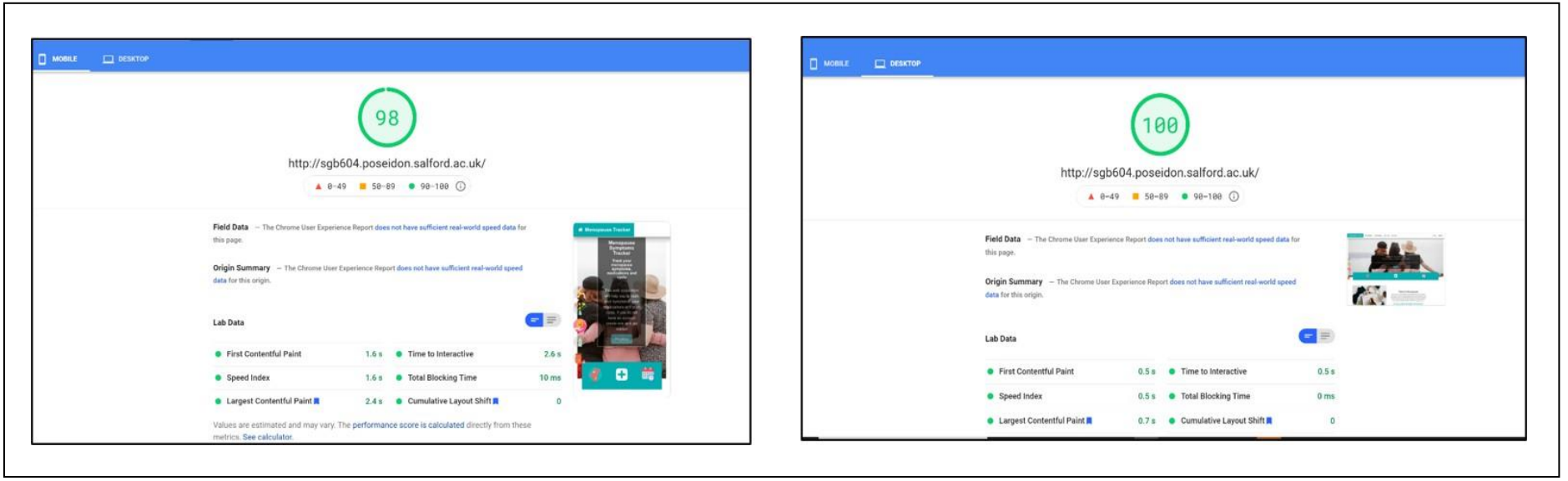


Figure 34 - Page load performance tests for both mobile phone and desktop

7.4.4 Colour Blindness Testing:

Research was conducted before the implementation phase of the web application to ensure that the colours used to style the web application are clear and accessible to all users, including colour blind users. Moreover, an online tool (RGBlind – Google extension) has been used to test if the web application is accessible for colourblind users. The figures below show that all texts and icons are clear and readable for colour blind users.

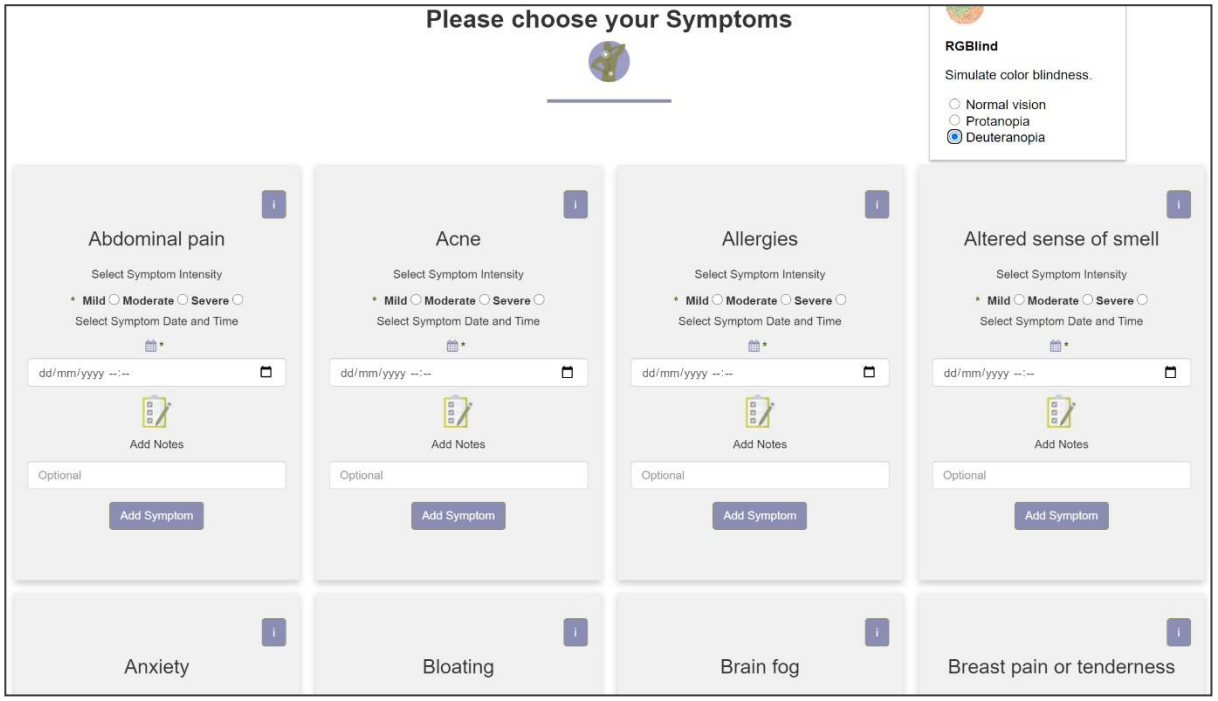


Figure 35 - Accessibility test for Deuteranopia colour blind users

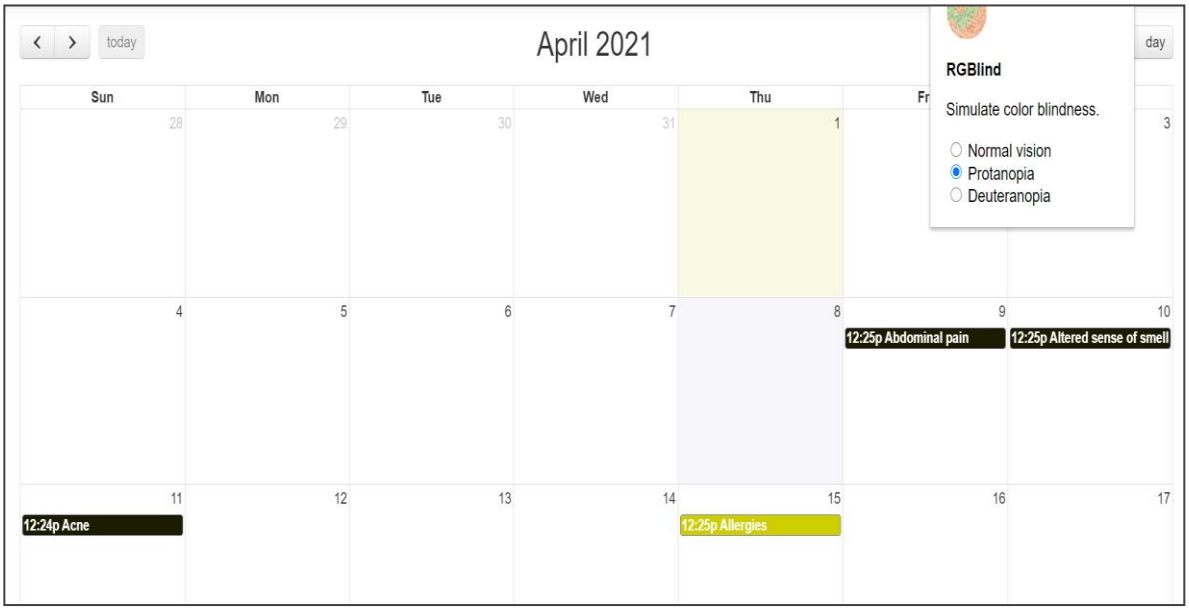


Figure 36 - Accessibility test for Protanopia colour blind users

7.4.5 Browser and Platform Independence Testing:

The table below shows a list of web browsers and platforms that tested to ensure that the web application is responsive and compatible with all of them. However, a technical issue was identified with the sessions when testing the web application on Firefox. This issue will be tackled in future developments.

No	Browser	Platform
1	Google Chrome	Microsoft Windows 10 (Surface laptop 2)
		Microsoft Windows 10 (Dell laptop)
2	Microsoft Edge	Microsoft Windows 10 (Surface laptop 2)
		Microsoft Windows 10 (Dell laptop)
3	Internet Explorer 11	Microsoft Windows 10 (Surface laptop 2)
		Microsoft Windows 10 (Dell laptop)
4	Safari	iOS 14.4 (iPhone XS)
		iOS 14.4 (iPad Pro)
5	Mozilla Firefox	Microsoft Windows 10 (Surface laptop 2)
		Microsoft Windows 10 (Dell laptop)

Table 24 - Accessibility testing - Fourth increment

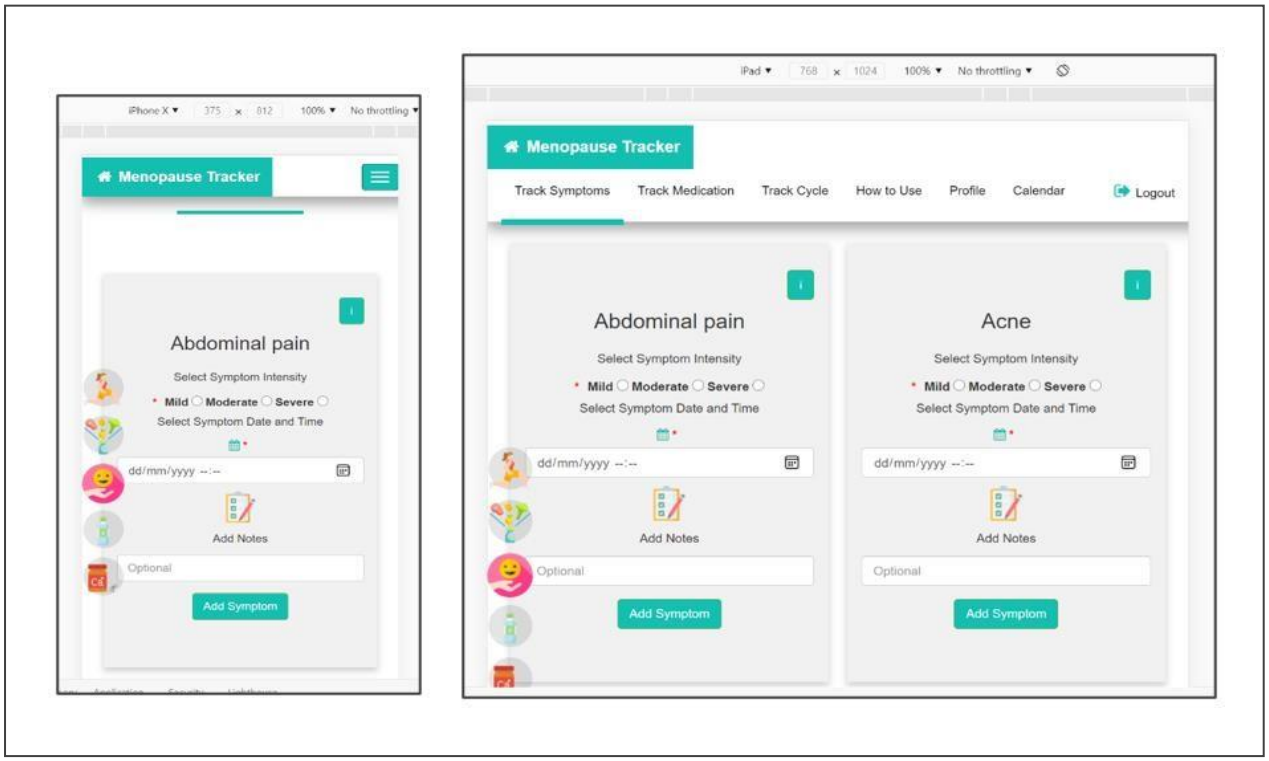


Figure 37 - Responsiveness test for mobile phone and iPad

The usability testing survey shows that users have tested the web application on different devices and used different browsers.

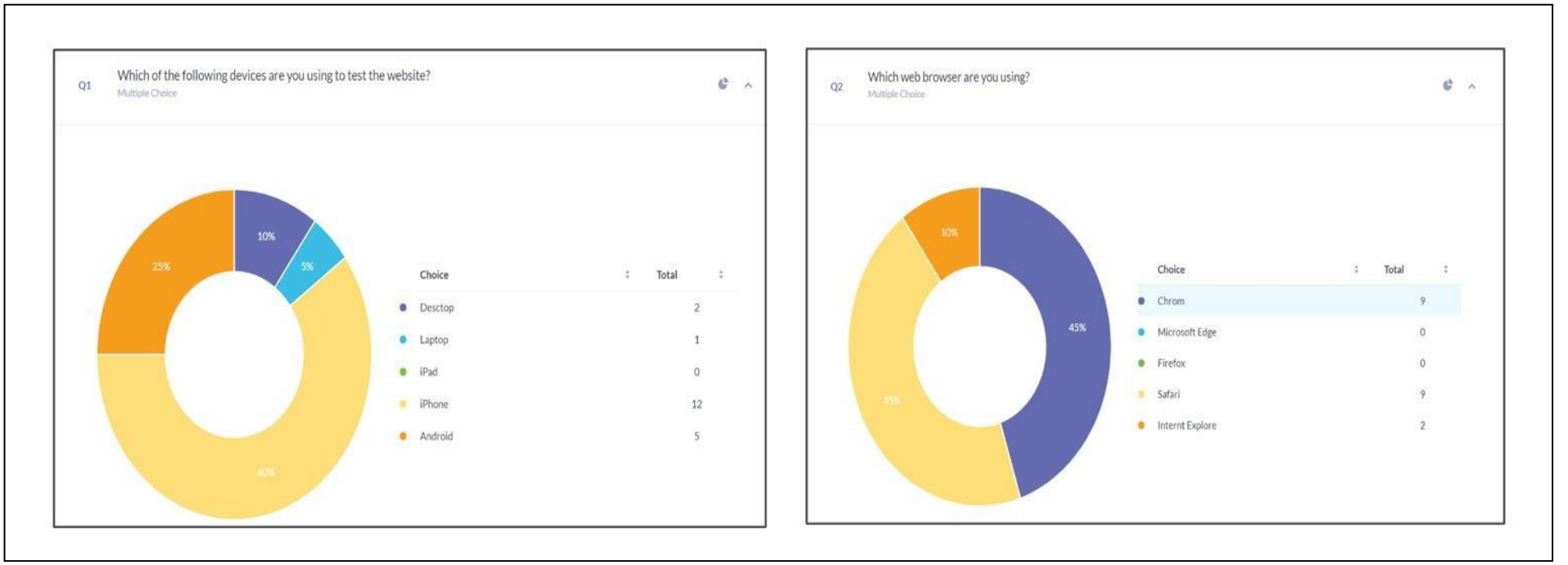


Figure 38 - Two screenshots from the usability test showing that the web application was tested on various devices using different browsers

7.4.6 Security Testing:

7.4.6.1 XSS and SQL Injection Testing:

- **A javascript function was written** that removes special characters while typing immediately to prevent attackers from performing XSS attack or SQL injections. To test, the following script was injected (**<script> alert("hello")</script>**) into the notes text input for a symptom, and the javascript function deleted the characters as they were typed. Also, the following SQL injection (**‘ or 1=1; —**) was injected into the notes text input for a symptom. The figure below shows that all special characters have been removed from the notes:

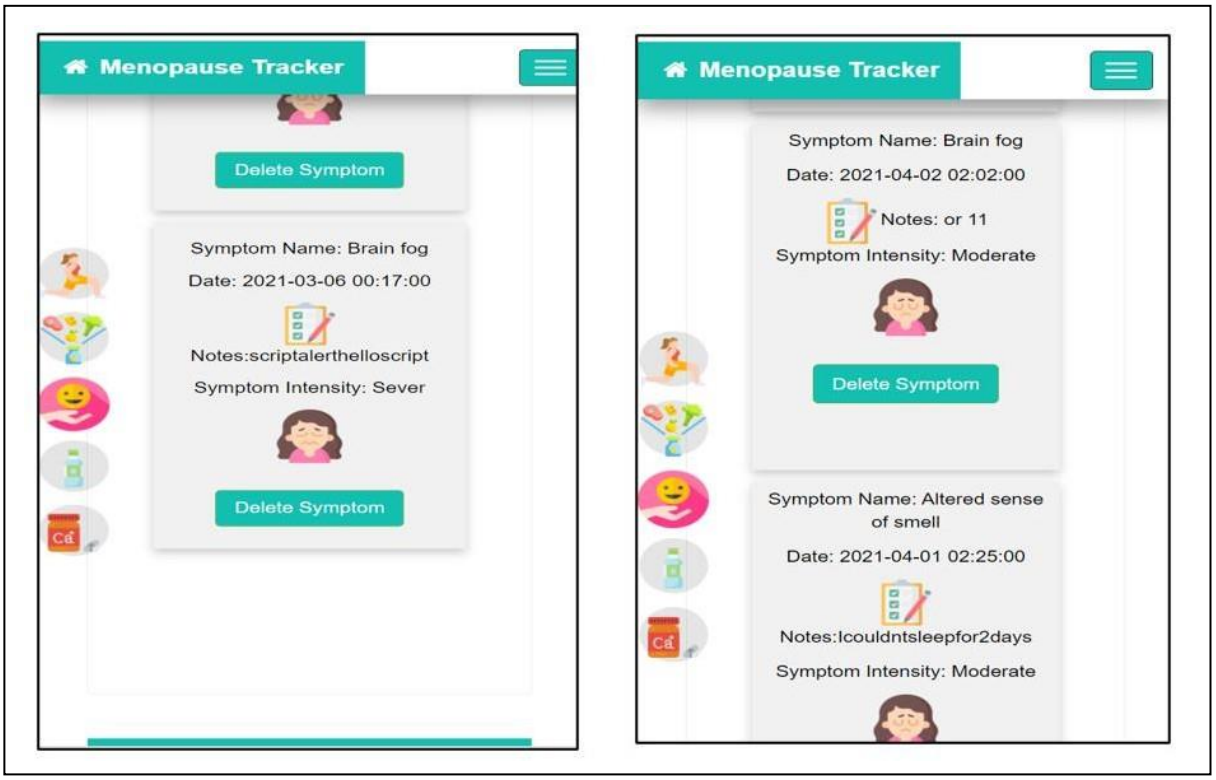


Figure 39 - Screenshots showing that the javascript function removed all special characters from the script injected to the notes text input for a symptom

- **A PHP function was also written** that does a call for the perg_replace() function. Perg_replace() is a PHP function that performs a regular expression, search and replaces. To test this function, the javascript function was disabled, and the following tests were performed:

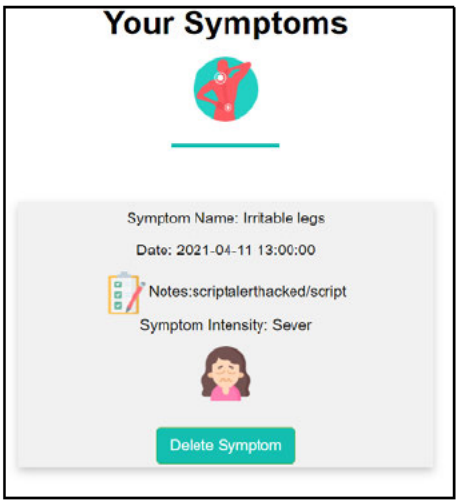
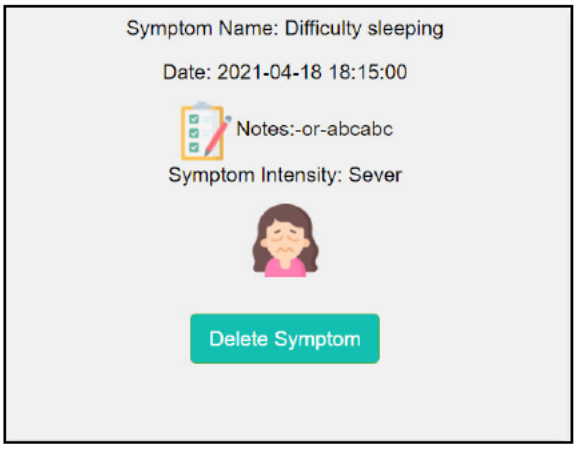
Attack	Performed Test	Result
XSS attack	Injected (<script>alert('hacked');</script>) into the notes text input for a symptom	 *Figure 40 – XSS attack test result*
URL XSS attack	Attached (test.asp?pageid=2&title=Testing%20Title) to the web application URL. If the attack was successful then the HTML code will include (Testing Title)	 *Figure 41 - URL XSS attack test result*
SQL injection	Injected ('or 'abc'='abc ';–) to the notes text input for a symptom	 *Figure 42 - SQL injection test result*

Table 25 - List of security tests

7.4.6.2 CSS Rules Validation:

W3C validation service was used to validate the CSS file used to style the web application. This service helps to ensure that the web application follows web standards.

Figure 43 - The use of W3C validation service

7.5 Summary:

This was the final increment, and all requirements associated with this increment were fully achieved. A meeting was arranged with the customer to present the final product, and they were delighted with the product.

Chapter 8: Critical Evaluation

8.1 Review of the Project's Achievements Against its Objectives:

The project aims and objectives were identified in the earliest stage of the project. These objectives contained both core objectives and optional objectives. As mentioned before, some of these objectives changed throughout the development of the project. All dropped or changed objectives were discussed and agreed upon with the project supervisor and customer. All of these objectives are explained in section 8.2. The table below contains the final list of objectives:

No	Objectives	Type	Met
1	Research menopause and its symptoms to better understand menopause and gather information for this web application.	Core	Yes
2	Research similar applications related to menopause to improve upon the currently available applications.	Core	Yes
3	Identify the system's functionalities that help to achieve the project goal.	Core	Yes
4	Research programming languages that meet the system specifications.	Core	Yes
5	Design a user interface that contains all functional specifications identified in the earlier stage, focusing on usability to ensure a good user experience.	Core	Yes
6	Design and create a quality database to store the required data.	Core	Yes
7	Implement functionalities specified in the earlier stage.	Core	Yes
8	Evaluate the application in terms of; performance, quality, and security to ensure a good user experience.	Core	Yes
9	Create a tips generator; this should generate tips according to the user's symptoms. These tips are based on scientific research to help users manage their symptoms.	Optional	No
10	Create a calendar that displays user symptoms and their intensity to help the user to understand the patterns of their symptoms	Optional	Yes

Table 26 - Review on the objectives against achievements

8.2 Review of the Plan and Explanations for Any Deviations From It.

The final product was slightly different from the product initially planned. However, the product's core functionality (tracking menopause symptoms) has not changed. Some new functions have been added, and some have been removed. All changes were discussed and agreed upon with the project supervisor and customer.

- **Search Engine (dropped):**

The initial plan was to add a search engine where a user can search for symptoms. However, having all symptoms listed on one page made the search engine less important. So, this objective was dropped.

- **Articles (dropped):**

An article page was meant to be implemented. This page would contain different articles about menopause, menopausal symptoms, and medication. However, this objective was dropped as it would require deep research, and the time scope given would not allow for such a feature.

- **Calendar (added):**

It was agreed with the customer to create a visual feature that would make symptom tracking effective. A calendar that would show the user's symptoms was chosen, as this would be more beneficial and improve the user's experience.

- **Tracking Cycle (added):**

Cycle track was not one of the initially planned features. However, research made it clear how beneficial this feature would be for women going through menopause, where women would usually have an irregular cycle.

8.3 Evaluation of the Product, Including Strengths and Weaknesses.

Menopause is a common condition with a considerable impact on women. The hormonal changes affect women's bodies, usually between the ages 45 and 55 [28], and cause various symptoms.

The main goal of developing this web application was to help women going through menopause track their symptoms, medication, and cycle.

Testing was undertaken during each increment to ensure all newly implemented features were fully functional. Usability testing was an essential part of each increment. After the web

application was fully implemented, twenty more users took part in usability testing. All users were asked to complete an evaluation questionnaire. The questionnaire results confirmed that all the functions implemented were fully functional.

Many users admired the layout of this web application. They described it as attractive, and the colours used were relaxing. Some users found the track cycle very beneficial as it makes this web application useable for all women, regardless if they are going through menopause or not.

Another feature that amazed some users was the calendar, especially the tooltip that appears upon hover. They thought that there may be no need to check the profile by having the calendar as all symptoms can be tracked on the calendar. Also, adding different background colours to each symptom according to its intensity helped give an overview of how mild or severe the symptoms were during the month.

75% of users were using a mobile phone for testing. Users thought responsiveness was a fantastic feature. One user said, "I would not have used it if it was not mobile responsive". However, three users had responsiveness issues. This issue was resolved during the testing phase.

Some users were pleased with the option to upload a profile picture, update it, and delete it. Also, one user thought having a guide page was very useful. Another user suggested having a date range for symptoms. She said this could be very useful as some symptoms remain for longer than one day. However, due to the time scope, this task will be kept for future developments.

During the final increment testing, a technical issue was found when using Mozilla Firefox, where the session goes on and off randomly. However, this issue needs debugging and testing due to the lack of time. As user testing showed that none of the 20 participants had used Firefox, this issue will be for future developments.

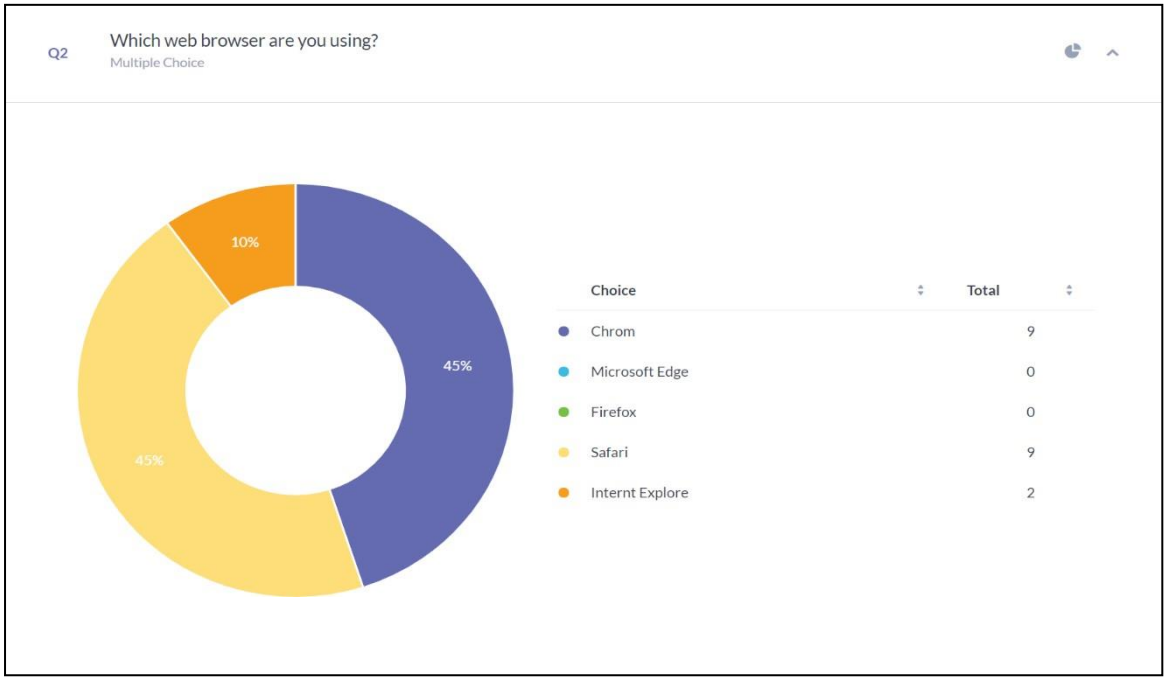


Figure 44 - The usability testing showed that none of the users used firefox

Following the useability testing conducted to evaluate this web application, it can be concluded that the menopause symptoms tracker is a functional web application that would be useful for women going through menopause.

8.4 Lessons Learnt During This Project.

Doing this final year project gave me the opportunity to demonstrate everything learnt throughout university and an industrial placement (software engineering methodologies and web-based development tools and techniques). It also helped me to develop a deeper understandingof menopause.

Working for a customer provided an excellent, authentic experience. It made me more engaged with every single phase, from the requirement elicitation phase to the final product delivery phase. Communicating effectively with the customer, receiving effective feedback in each increment,and receiving encouragement greatly supported this project.

The technical issue found when using Firefox made me aware of how important it is to focus more on details and test the responsiveness and logic on several different browsers. Firefox was used only to test responsiveness and not the logic before this technical issue was identified.

After completing this project, it was evident that adopting the incremental methodology helped to get maximum productivity. The regular feedback sessions with the customer and supervisor helped me develop a fully functional product.

Completing a final year project alongside all the other final year modules has developed further time management and organisational skills. It was necessary to focus on both skills to deliver high-quality projects and reports.

Doing intensive research for the final year project has developed deeper researching and information gathering skills, which was extremely useful for other modules that are report based. Writing a dissertation starting from the proposal and ending with the third deliverable has alsodeveloped writing and presentation skills.

Completing the project, meeting the project objectives, and receiving positive feedback from the customer and users who tested this web application boosted my confidence.

Finally, this project made me realise how passionate I am about web development and slightly changed my career plans

8.5 Reflection on the First Two Dissertation Deliverables:

- **First Deliverable:**

The biggest mistake during this deliverable was undertaking two part-time jobs, as this did not allow for enough time to plan the project. Gantt chart was not well thought out when I first designed it. However, the mistake was identified when receiving feedback on the first deliverable. As areflection of my supervisors' feedback, I redesigned the Gantt chart to include all iterations and deadlines for different modules.

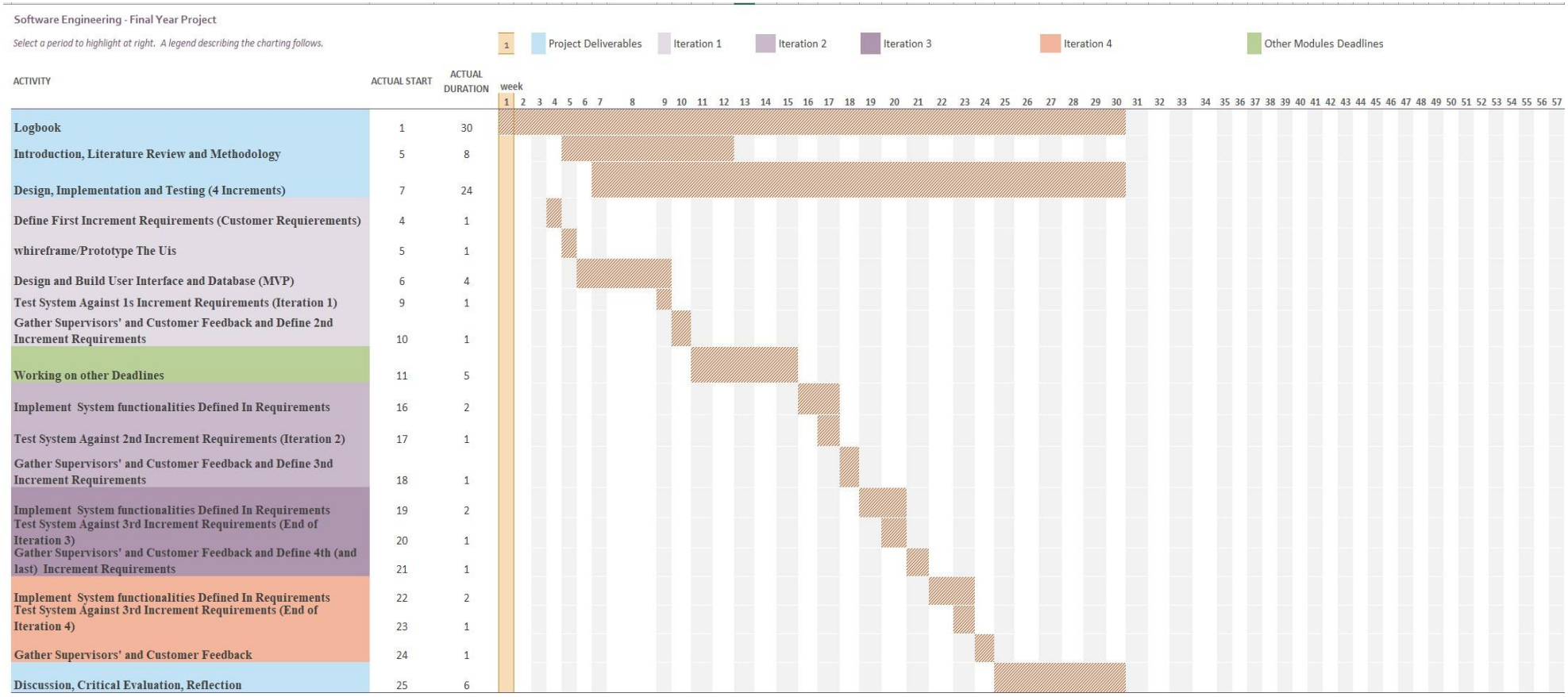


Figure 45 - Gantt chart second version (improved version to contain all iterations and deadlines)

- **Second Deliverable:**

During this time, one part-time job was alleviated to put more time into this project. As a result, this deliverable was deeply researched and planned, and the effects of this were evident through higher grades.

8.6 Conclusion:

The aim of this project was to build a web application that would help women going through menopause track their symptoms, medication and cycle. The aim of the project was fully achieved. This includes building a responsive web application that can be used on any device, be compatible with different web browsers, and help women track their menopausal symptoms, medication and cycle. This product can be used on any device, is available to all users, and provides easier symptom tracking than other existing products, e.g. the Balance app.

Usability testing was part of each increment, where some users were recruited to test each newly implemented functionality, and user feedback throughout each stage was always considered. Moreover, twenty users were recruited to test the final product to ensure the usability of the software that satisfies the user's needs. All feedback was positive, and all users agreed that the web application was easy to use and functional.

A state-of-the-art comparison with the Balance app was drawn as regards to the validity of the system. The calendar on the Balance app only shows cycle history, unlike this product, which displays both cycle and symptoms. Also, the cycle tracking functionality in the Balance app only shows cycle flow and does not provide cycle length and next expected cycle date, whereas this product will show cycle flow, cycle length, and next expected cycle date. Furthermore, the Balance is a mobile app; therefore, it cannot be used on desktops or laptops. With the above in mind, it can be concluded that this web application provides more efficient symptoms and cycle tracking than the Balance app.

During a final year project lecture, it was highlighted that it would not be feasible to produce complete software due to the time scope and other factors. At the time, it was not apparent; however, developing this project made it clear that there is always room for improvement, especially with emerging technologies. It will always feel as though the project scope would fit more features. If allocated more time, activities and diet trackers would have been

implemented as the continuous research outlined the effect that diet and physical activities have on a symptoms' frequency and intensity. A tips generator would have also been created that would show user tips when selecting a symptom. These tips would be based on their diet and physical activities. Completing the implementation of the symptom's information and tips box would have also been beneficial, as would the possibility for the users who have forgotten their password to reset it via a link sent to their email.

A web developer must be aware of all ethical and legal issues that may encounter. For example, the developer should not publish any images without the permission of the owner of this image. Being aware of this legal issue, all images and icons published on this web application were free images; therefore, no legal issue will be encountered by using them.

Also, user details are classed as sensitive data. Users were promised that all data will be protected and will not be shared with anyone. The user's data was stored in a password-protected database; a hashing algorithm was used to encrypt the user's password and protect it from theft.

Overall, the project core objectives were fully achieved by providing usable menopause symptoms tracking tool, “Menopause Symptoms Tracker” that can be used to help women going through menopause track their Symptoms, medication and cycle.

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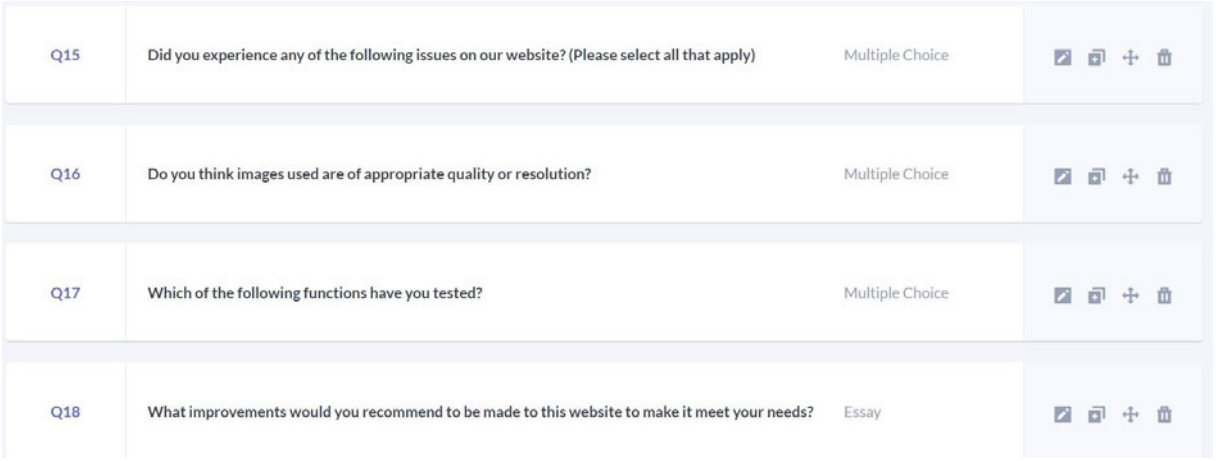
10. Appendices Appendix:

10.1 Appendix A, Usability Test:

Q1	Which of the following devices are you using to test the website? *	Multiple Choice
Q2	Which web browser are you using?	Multiple Choice
Q3	How visually appealing is my website?	Multiple Choice
Q4	Is the font size easy to read?	Multiple Choice
Q5	Does any page have a background or colour that makes reading the text difficult?	Multiple Choice
Q6	Is the language used clear and easy to understand?	Multiple Choice
Q7	Is content meaningful?	Multiple Choice

Q8	Are page titles used across the website self explanatory?	Multiple Choice
Q9	Are the navigation labels clear and consise?	Multiple Choice
Q10	Does navigation work correctly? (Navigation between different pages)?	Multiple Choice
Q11	Is the site easy to use with clear instructions and explanations?	Multiple Choice
Q12	How easy or difficult was it to find what you were looking for on my website?	Multiple Choice
Q13	Did it take you more or less time than you expected to find what you were looking for on my website?	Multiple Choice
Q14	Is the site well organised?	Multiple Choice



Q15	Did you experience any of the following issues on our website? (Please select all that apply)	Multiple Choice
Q16	Do you think images used are of appropriate quality or resolution?	Multiple Choice
Q17	Which of the following functions have you tested?	Multiple Choice
Q18	What improvements would you recommend to be made to this website to make it meet your needs?	Essay

10.2 Appendix B, User Testing Consent Form:

User Testing Informed Consent Form

Study administrator is: _____

Participant is: _____

This is a study about Menopause Symptoms intended for women aged between 45-55. My goal is to make the web application appealing, intuitive and user friendly. Your participation will help us achieve this goal.

In this session, I'll ask you to perform tasks a typical user might do, such as creating an account and taking the Menopause symptoms questionnaire. I will sit in the same room, quietly observing and taking notes. I will sit near you and help you if you are stuck or have questions.

All information collected in the session are for testing purposes and will be used to improve the web application. I will not videotape and/or audiotape the session. I may publish our results from this and other sessions in my reports, but all such reports will be confidential and will not include your name.

This is a test of the software. I am not testing you. I want to find out what aspects are confusing, so I can make it better. You may take breaks as needed and stop your participation in the study at any time.

Statement of Informed Consent

I have read the description of the study and of my rights as a participant. I voluntarily agree to participate in the study.

Print Name: _____

Signature: _____

Date: _____

10.3 Appendix C. Testing Guide:

Menopause Symptoms Tracker

Safaa Alazzam

This is a study about Menopause Symptoms Tracker intended for women aged between 45-55. My goal is to make the web application appealing, intuitive and user friendly. Your participation will help me achieve this goal.

This paper contains tasks a typical user might do, such as creating an account and taking the menopause symptoms questionnaire. You may do all the tasks in the sheet or any list of tasks of your choice. Please complete the online survey and include tested tasks in the related section after finishing testing.

All information collected is for testing purposes and will be used to improve the web application. I will publish the results from this in my reports, but all such reports will be confidential and will not include your name.

No	Task
1	Create an account.
2	Login to your account.
3	Add menopause symptoms to your profile.
4	Add menopause medications to your profile.
5	Add your cycle to your profile.
6	Check your symptoms and cycle on the calendar.
7	Delete symptom(s) from your profile.
8	Delete medication(s) from your profile.
9	Delete cycle(s) from your profile.
10	Reset your password.
11	Upload a profile picture.
12	Delete profile picture.
13	Delete account.

10.4 Appendix D, Logbook:

Logbook

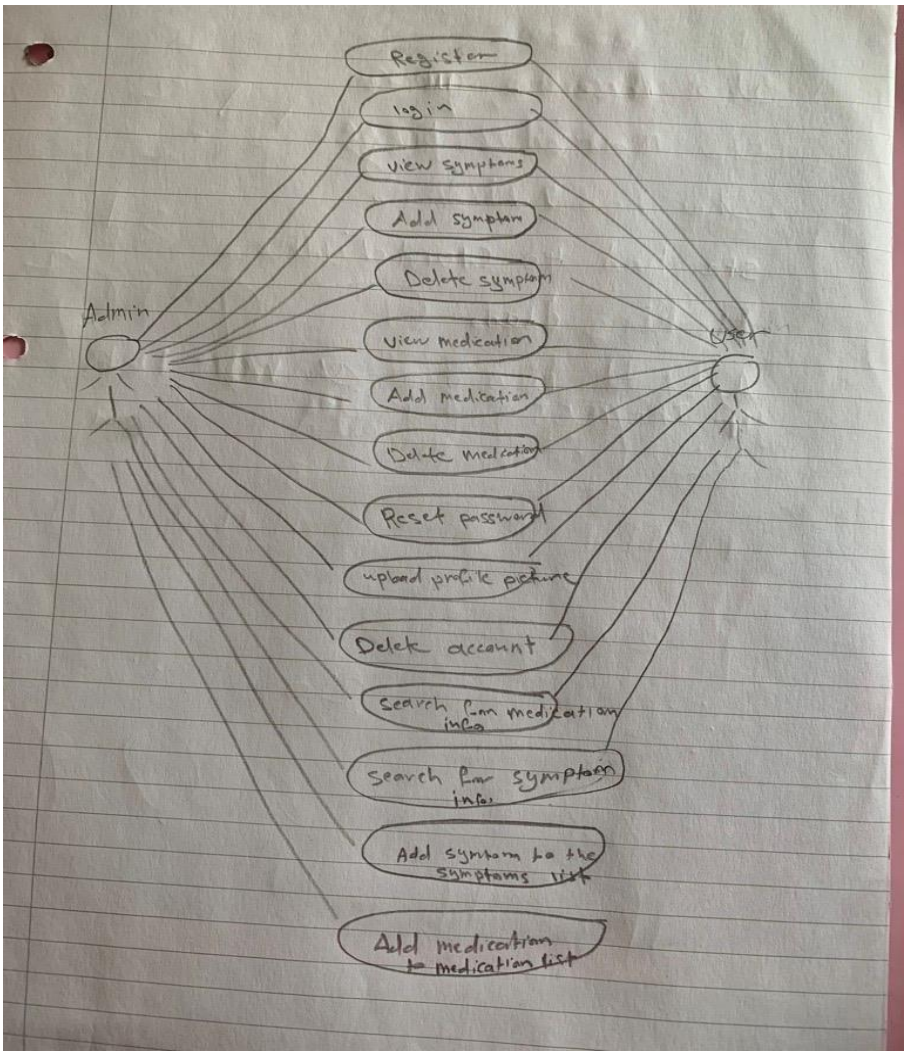
Date	Notes: work completed/plans
Week 1 30/09/20	**Lecture by Dr Murray** This lecture is an overview of FYP, and the following advice has been given: • Read the project guide and try to understand it. • Keep your logbook up to date. • Upload your logbook to OneDrive and share the link with your supervisors. This is to keep them up to date with your work. **Seminar by Dr Bass and Dr Gaber** This lecture was about FYP and included the following tips: • Choose a project idea if not yet decided. • Some ideas about projects that may interest them as supervisors include "a multichannel application, systems that allow collaboration, and systems that interpret data via sensor". • Choose a project idea as soon as possible, as it will give us the chance to discuss it with our selected supervisors to ensure that a suitable project idea has been selected. **Tasks to be achieved by next week:** • Read FYP guide. • Think about possible project ideas and write a list to discuss with the supervisor.
02/10/2020	**Final year project guide:** • I read through the FYP guide and tried to understand it. • I wrote some questions for points I was unsure about. • I noted each deliverable with the time given to set a plan for my project. **Researching Project Idea:** • Following the advice given to us, which is to choose something we love, I decided to opt for a medical/healthcare-based project. • I have researched some ideas, and I came up with two. The first idea is a healthy lifestyle monitor. This project is to help users track their diet, activities, and sleeping patterns. The second idea is an A&E pre-assessment. This project is to reduce pressure

	within the A&E department. A patient can take this assessment; the app will tell them if their symptoms are emergency symptoms, and if not, it will provide tips to help control the symptom. • I have written a brief for both ideas and emailed them to my chosen supervisor Lee Griffith.
Week 2 05/10/2020	**<u>Project Idea:</u>** • I researched further into the A&E project as it was my preferred idea. I looked for similar products and discussed the idea with an accident and emergency consultant. He said that the idea is good, and if users use it, it will help reduce the pressure within the A&E department. However, he said this is a huge project and needs lots of research and time and won't be possible to cover all diseases and their symptoms in such a short time. • I received a reply from my supervisor stating that many projects concern monitoring a healthy lifestyle, so pursuing this project wasn't recommended. He also explained possible issues I might face during the A&E pre-assessment project, especially ethical issues. • My supervisor suggested a health-related project proposed by a customer, "menopause symptoms tacker". • I liked the suggested idea and decided to take this project.
07/10/2020	**<u>Lecture by Dr Murray:</u>** • The main aim of this lecture was to help us write our project proposal. • Dr Murray encouraged us to finish the proposal early and send it to our supervisor for review and feedback. • He confirmed that our project should meet real-world needs and should serve a certain purpose. **<u>Seminar:</u>** • This week was focused on choosing a final year project. Also, the importance of defining the primary goal of your project, who it is for, and the main feature the project should contain. **<u>Tasks to be achieved by next week:</u>** • Research menopause symptoms. • Research current software/apps that help menopausal women track their symptoms.
08/10/2020	**Seminar:**

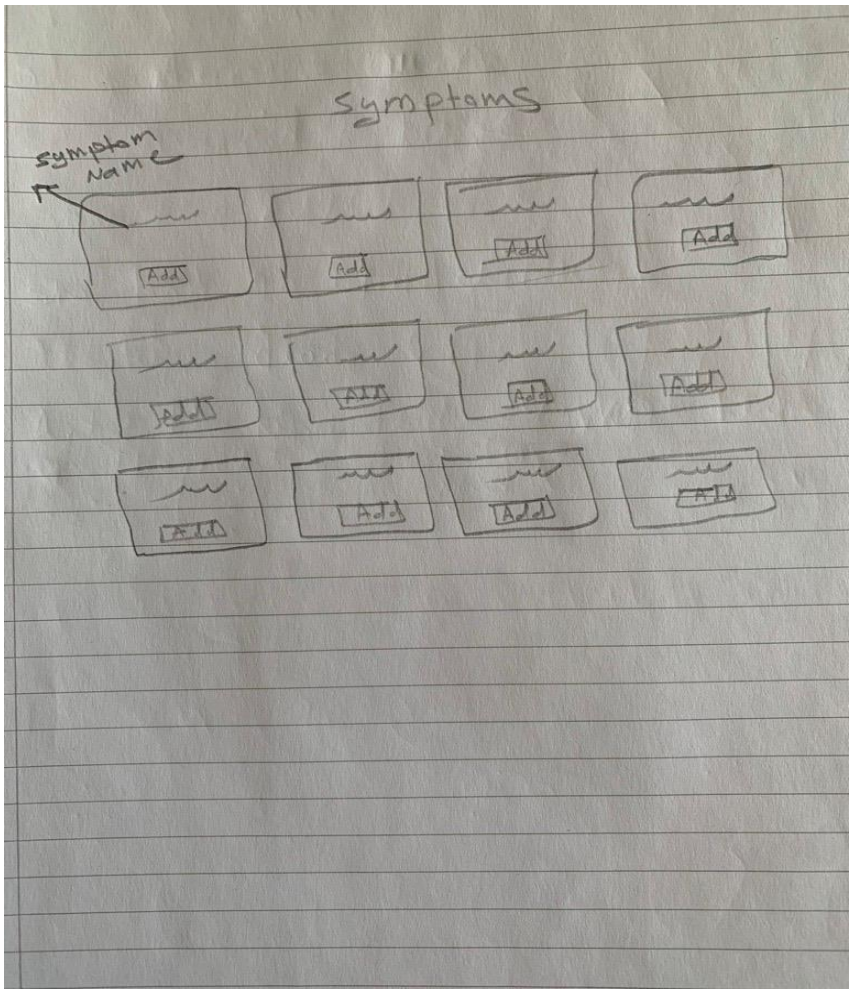
<table>
<tr><td></td><td>Important point:
You don't need to use new technology to get a higher grade.
There is a list of projects to choose from if we haven't got an idea yet.
Lee has listed some advantages for PHP.</td></tr>
<tr><td>09/10/2020</td><td><u>Project-related research:</u>
I started to research menopause symptoms. I looked at the NHS website for symptoms and more information on menopause as the most reliable source of information.
I found library resources that outline the menopause stages, symptoms, and medications. Reading these materials gave me a better understanding of menopause.
<u>Tasks to be achieved by next week:</u>
Research current software/apps that help menopausal women.
Arrange a meeting with the customer to gather her requirements and get more details on the required software.</td></tr>
<tr><td>Week 3

12/10/2020</td><td><u>Project-related research:</u><table><tr><th>Symptoms</th></tr><tr><td>Hot Flushes</td></tr><tr><td>Night Sweet</td></tr><tr><td>Difficulty sleeping</td></tr><tr><td>Reduce Sex Drive</td></tr><tr><td>Virginal Dryness</td></tr><tr><td>Headaches</td></tr><tr><td>Low Mood</td></tr><tr><td>Anxiety</td></tr><tr><td>Palpitation</td></tr><tr><td>Joint Stiffness, Aches and Pains</td></tr><tr><td>reduced muscle mass</td></tr><tr><td>urinary tract infections (UTIs)</td></tr><tr><td>Weak Bones</td></tr></table>
I continued looking for library materials that could give me more knowledge on menopause.
I created a table and noted all menopause symptoms found on the NHS website. These symptoms and medications will be used as primary resources when building the web application.</td></tr>
</table>

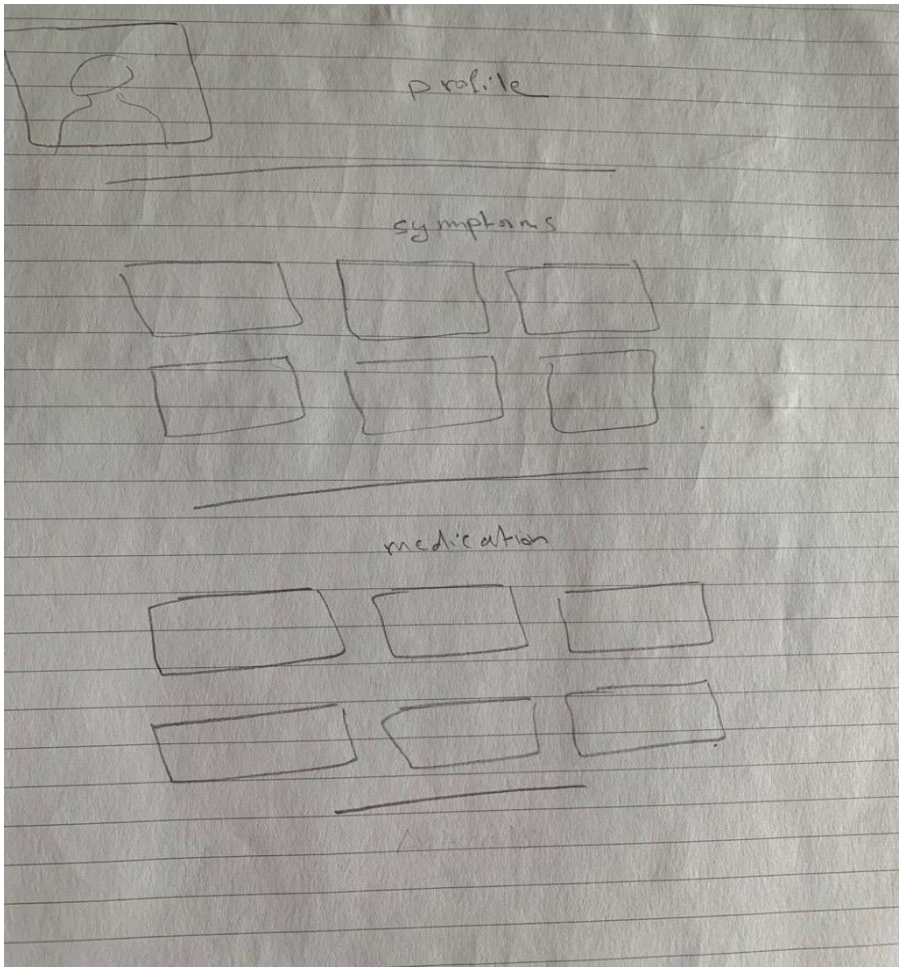
	• I researched websites that concern menopause to find gaps that this project could fill. This also helped form an idea of how these apps help women who are going through menopause. • I contacted my supervisor, asking to arrange a meeting with the customer to elicit the project requirements.
14/10/2020	**Lecture by Dr Bass:** • This lecture focused on the development methodologies that can be followed to deliver a project. • He explained Agile methodology and that incremental and iterative approaches may be ideal when developing a project, especially when having a customer that may change their requirements at any stage. • Having a customer led to the following of iterative and incremental approaches for agile methodologies due to the flexibility these approaches provide. • Dr Bass emphasised the importance of delivering a minimum viable product (**MVP**) by Christmas to get feedback and ensure that we are going in the right direction. **Tasks to be achieved by next week:** • Start writing my project proposal to finish it early and get it reviewed.
First Increment	
16/10/2020	**Customer meeting (Requirement elicitation):** • I held a meeting with the customer. • The customer's main concern was that there is no user-friendly and free software (app/web app) that tracks menopause symptoms. • The main requirement was to create a user-friendly web app accessible for all users that helps women track their menopause symptoms and medications. • I have been asked to research two apps: Balance and Clue. • I had a better understanding of the project requirements.

	• All requirements were noted on paper and were later transformed into a use-case diagram.  **<u>Tasks to be achieved by next week:</u>** • Research the Balance and the Clue apps. • Research web-related products.
18/10/2020	**<u>Project-related research/work:</u>**

- **I researched the Clue and Balance apps** to find gaps that this project can fill. When looking at the balance app, it took time to figure out what to do and how to add a symptom. The symptom questionnaire was also annoying as it displays only one symptom per page. Therefore, if the user had only one symptom and it was the last in the questionnaire, they would have to complete the entire questionnaire to choose this one symptom. This problem made me consider designing a more user-friendly questionnaire where all symptoms are on one page. Below is the sketch for this design idea:



- Another problem was that user could not view all of their saved symptoms and medications in one place. It took considerable time to view what I had saved and required me to go back day by day to view my saved symptoms. However, this problem made me consider designing a user profile page where all symptoms and medications are displayed. Below is the way I decided to design the profile page:

<table>
<tr>
<td></td>
<td>


I researched different websites and apps to see the currently available products. Doing this research made me aware of another problem: there are no web applications that track menopause symptoms, and only apps were available. However, some of these apps are only compatible with either Android or IOS, making them inaccessible to various users. Also, some of these apps cost, which is not ideal for some users. These problems made me decide to build a responsive web application accessible to all users, no matter what device they are using.

<u>Tasks to be achieved next:</u>

Decide on the project aim and project objectives.
Complete the proposal to get feedback from my supervisor and improve on it.

</td>
</tr>
<tr>
<td>Week 4

19/10/2020</td>
<td>
<u>Project-related research/work:</u>

I decided on my project aim: "To build a web application that would help women track their menopause symptoms and medications".

</td>
</tr>
</table>

- I decided on a list of project objectives, which are a combination of customer requirements and brainstorming requirements based on dedicated research. Below is the list of project objectives:

No	Objective	Core/Optional
1	to research menopause and its symptoms to gain a better understanding of menopause and to gather information for this web application	Core
2	To research similar applications related to menopause, to improve on the applications currently available	Core
3	To research suitable programming languages and suitable equipment/software that can help me to develop my web application.	Core
4	To design a user interface that contains all the functional specifications identified in the earlier stage, focusing on usability, ensuring a good user experience	Core
5	To develop a user profile system that allows users to register, login and edit and update their personal details	
6	To design and create a quality database to store the required data.	Core
7	To create the functionalities that allows the user to track symptoms and track medication	Core
8	To Create a Search engine for quick access to advice on symptoms and medications in order for users to read about them.	
9	To evaluate the application in terms of; performance, quality, and security to ensure a good user experience	Core
10	To create a tips generator that is based on the user's individual profile and lifestyle, some tips will be autogenerated when the user takes the questionnaire	Optional
11	To create a reference section by adding tabs that contain articles with helpful and relevant information. This will also be linked to the search engine	Optional

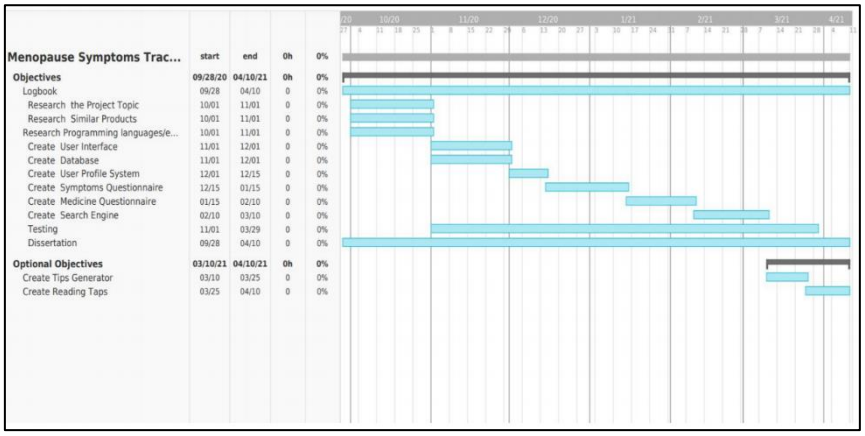
- I chose to use the development methodology. My decision was based on Dr Bass's advice, where he recommended the iterative and incremental approach for agile methodology when working on a design and build project.

Tasks to be achieved next:

- Draw a Gantt chart that highlights the project objectives.

21/10/2020

Project-related research/work:

	• I implemented a Gantt chart for the project objectives, as shown below.  • I sent the proposal to my supervisor for feedback. **<u>Lecture by Dr Chriss Hughes:</u>** • This lecture was about research methods "Quantitative and Qualitative". • He recommended doing deep critical research for the project to get a better understanding of the topic. • He emphasised the importance of planning the project. • He gave an overview of the literature review where he said that it is an introduction to your project. • He provided tips for writing a good literature review. **<u>Tasks to be achieved next:</u>** • Get ethical approval and complete a risk assessment.
22/10/2020	**<u>Supervisor feedback:</u>** • I received feedback from my supervisor who advised justifying the use of agile in the context of my project. He also mentioned that I do not need to be specific about the use of technologies, as I may change my mind after completing the research. **<u>Improvement on the proposal:</u>** • I justified the use of agile in the context of the project. • I amended the technologies section, as the technology will be chosen after researching which technologies are the most suitable for this project. **<u>Tasks to be achieved next:</u>** • Research the most suitable technologies for this project.

24/10/2020	**Project-related research/work:** • Research was undertaken to decide whether to use C# or PHP for the backend development. I wrote a comparison between the two languages in the literature review. After comparing the advantages and disadvantages of both languages, I decided to use PHP. • Choosing PHP as the backend development language made phpStorm the preferred software for developing this web application. I also have previous experience in using it, saving me time learning and finding new software. **Tasks to be achieved next:** • Get ethical approval and complete the risk assessment.
Week 5 26/10/2020	**Project-related research/work:** • I submitted the risk assessment and ethical approval. • Completing the risk assessment and ethical approval made me think more about confidentiality and user consent. Therefore, to

User Testing Informed Consent Form

Study administrator is: _____

Participant is: _____

This is a study about Menopause Symptoms intended for women aged between 45-55. My goal is to make the web application appealing, intuitive and user friendly. Your participation will help us achieve this goal.

In this session, I'll ask you to perform tasks a typical user might do, such as creating an account and taking the Menopause symptoms questionnaire. I will sit in the same room, quietly observing and taking notes. I will sit near you and help you if you are stuck or have questions.

All information collected in the session are for testing purposes and will be used to improve the web application. I will not videotape and/or audiotape the session. I may publish our results from this and other sessions in my reports, but all such reports will be confidential and will not include your name.

This is a test of the software. I am not testing you. I want to find out what aspects are confusing, so I can make it better. You may take breaks as needed and stop your participation in the study at any time.

Statement of Informed Consent

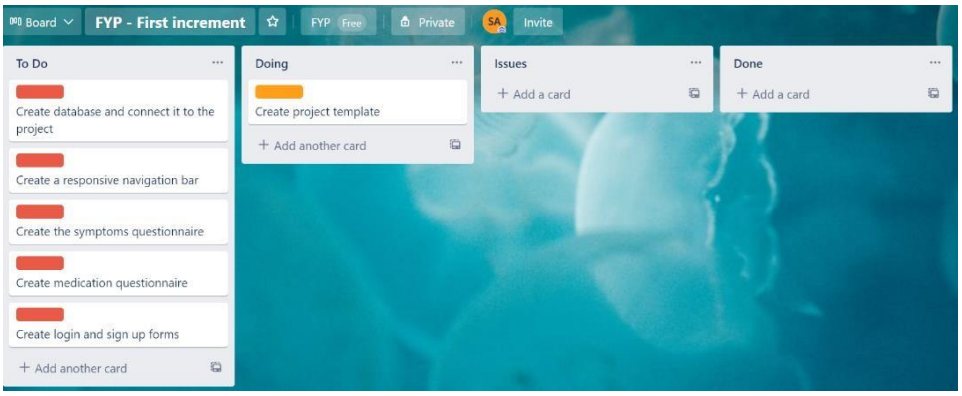
I have read the description of the study and of my rights as a participant. I voluntarily agree to participate in the study.

Print Name: _____

Signature: _____

Date: _____

	cover myself and reassure the user, I created a consent form that outlines the project details and promises that personal details will not be shared with anyone and will remain anonymous. • I emailed the risk assessment, ethical approval, and constant form to my supervisor for approval. **Tasks to be achieved next:** • Create a Trello board for the first increment's tasks.
28/10/2020	**Lecture by Dr Chriss Hughes:** • This lecture was about research methodologies. • Dr Hughes explained how following a methodology helps you decide what data to collect and what data to ignore. • He outlined the elements of a good methodology (robustness, reliability, and repeatability). • Repeatability means if anyone picks up from you, they should be able to continue your research following the same methodology. • He explained how important it is to justify your methodology and explain why it is robust, reliable, and repeatable, as this makes it easy to mark the work later.
29/10/2020	**Seminar:** • Lee explained how important it is to find reliable information for the research. • He recommended using the library database to find reliable materials. • He shared a library link for people who cannot access the library materials or find the online library.
1/11/2020	**Project-related research/work:** • After researching the best development techniques for this project, I decided to use the MVC design pattern. • I wrote the justification for the use of the MVC pattern in the literature review.

	• I designed a Trello board containing the tasks to be achieved during the first increment. Creating Trello boards helped me keep track of all the tasks needed for each increment. Please note that the colours used were to represent the status of each task, where red means not yet started and green means completed.  **<u>Tasks to be achieved next:</u>** • Finish building the project skeleton. • Connect the project to the database and create main database tables, e.g., the user medications and symptoms.
Week 6 4/11/2020	**<u>Lecture by Dr Julian Bass:</u>** • This lecture was about writing the introduction and literature review for your project. • He explained different writing approaches such as the top-down approach and bottom-up approach. • He recommended reading through our work many times to improve upon it, and never hand in the first draft. • He suggested using a grammar and spelling checker. Also, remove needless words to keep your sentences short and simple. • He recommended using dynamic language and not passive language. • He explained the elements of a good paragraph. • He detailed the structure of both the introduction and the literature review. • He said the in the literature review you need to identify a knowledge gap. • He recommended starting the research with broad sources like textbooks, then moving to more specific sources like articles and journals, and finally focusing on topics more closely related to your project like conference papers. • He recommended using phrase bank for Manchester university to help with writing.

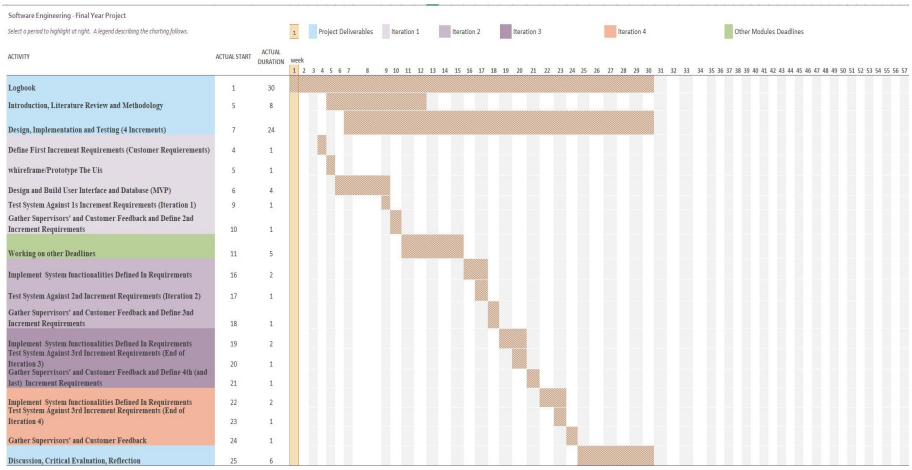
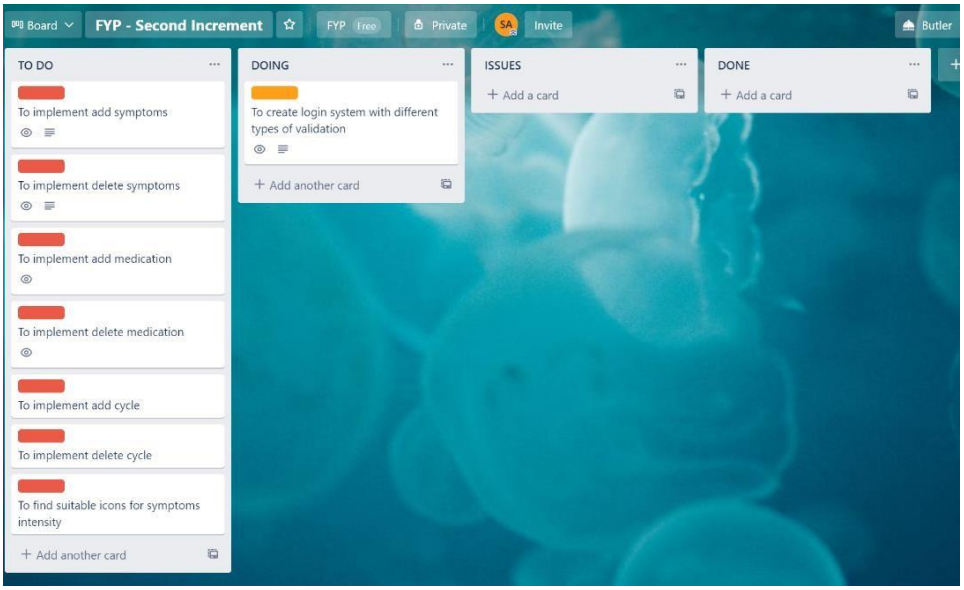
05/11/2020	**Seminar:** • My supervisors mentioned that they do not mind if the word limit is exceeded as long as it remains of high quality. • They also explained how it is important to get the MVP ready before the Christmas break to get feedback.
6/11/2020	**Project-related research/work:** • Finished building the project skeleton. • Created a responsive header. • Connected the project to the database. **Tasks to be achieved next:** • Start implementing the interface (symptom and medication pages).
Week 7 13/11/2020	**Project-related research/work:** • I designed the navigation bar. • Implement the symptoms questionnaire interface previously sketched. • I also made the navigation bar and the symptoms questionnaire responsive to mobile phones. **Tasks to be achieved next:** • Continue implementing the interface. • Create a medication questionnaire. • Create login and registration forms.
Week 8 16/11/2020	**Project-related research/work:** • I implemented a medication questionnaire interface. • I created login and registration forms. • I read the following article about menopause [1]. **Tasks to be achieved next:** • Continue implementing the interface, aiming to finish the (MVP) before the Christmas break. • Read the project guide for the next deliverable (introduction and literature review). • Start writing the literature review.
18/11/2020	**Lecture by Dr Ian Drumm:** • This lecture was about software architecture.

	• It discussed the high level of styling and designing. • He explained different levels of abstraction in computer science and explained some examples (e.g., design patterns and classes) • He outlined common architectural styles (component, connectors, and constraint) • He gave common examples of architectural styles such as OOP, Pipes, Filters, Layered Systems, Publish-Subscribe, Peer to Peer Style, Client-Server, and Representational State Transfer. He also explained the advantages and disadvantages of using each and recommended using the Representational State Transfer when designing software. • He also explained the advantages of using an architectural style, such as the flexibility of using classes in OOP libraries and the flexibility of reuse and recording filters of Pipes and Filters, etc. **Seminar:** • I asked my supervisors about the research methods as I did not understand them. My supervisors explained what they are, and based on his answers and research, the research method for this project will be qualitative (questionnaires and interview).
20/11/2020	**Project-related research/work:** • Today I re-planned my second deliverable and wrote the structure of the document (table of contents).
Week 9 23/11/2020	**Project-related research/work:** • Created a footer for the web app. • Implemented a primary index page interface (to be improved).
25/11/2020	**Lecture by Lee Griffith:** • This lecture was about requirement engineering. • He explained the things that can go wrong with software from a user's perspective (e.g., usability issues or no functionality), from the customer's perspective (e.g., late delivery or installation issues), and from the developer's perspective (e.g., the time scope given is not enough for effective functionality or lack of developer experience). • He explained software development phases (identifying requirements, designing phase, implementation, unit testing, integration and system testing, and operation and maintenance). • He confirmed that understanding the user requirements before implementing the system is very important. • He also explained different types of requirements. This includes functional requirements (what the system should do), non-functional requirements (how well the system performs), and usability requirements (meeting user requirements).

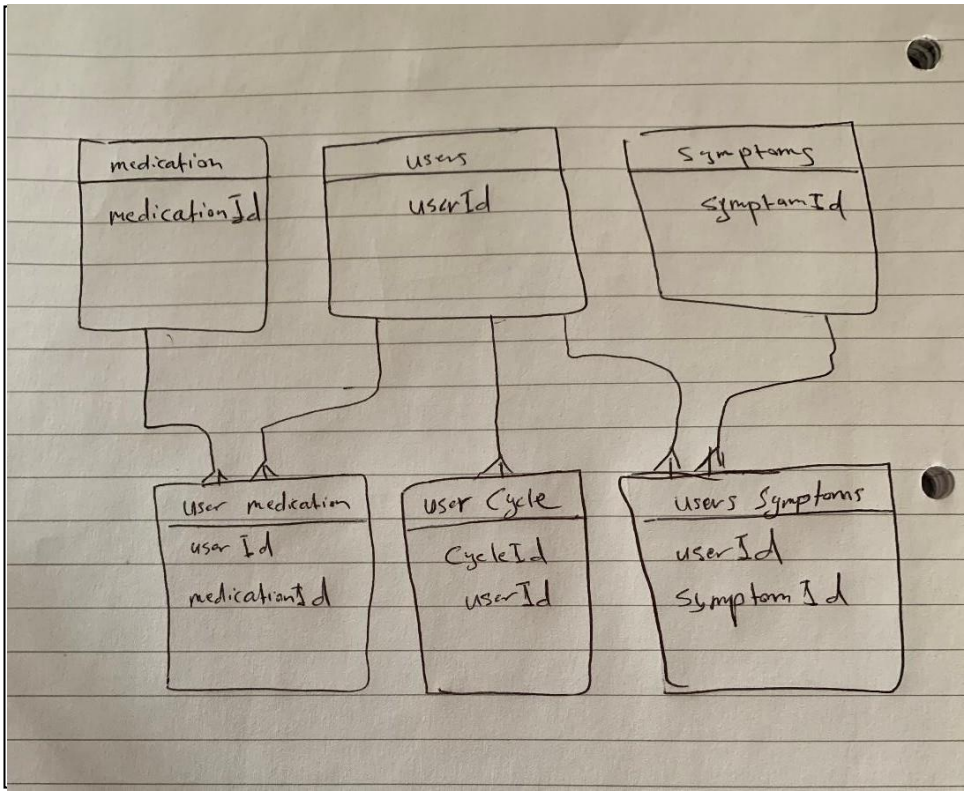
	• He explained different techniques that can be used for fact-finding or requirement definition, for example, interviews and observations. • The final section of this lecture was about drawing a use case diagram to help document the system's functionality, the system's scope, the interaction between the user and the system, and the notation of use case diagrams. **Lessons learned:** • Having a customer-based project made this lecture very beneficial, as it focusses on the importance of understanding customer needs before implementation. It also made me aware of different issues that I may face during implementation and capturing the user's requirements. Also, he made me aware of how important it is to research current system(s) and identify missing elements that can be fulfilled by this product, as this can help implement a more functional system.
26/11/2020	**Seminar:** • We should make sure not to use any images with copyright to avoid ethical issues. We should either use free or personal images.
27/11/2020	**Project-related research/work:** • I created social media icons and added them to all pages. • I started library research and read articles about menopause to begin writing my literature review.
Week 10 30/11/2020	**Project-related research/work:** • Finished implementing the user interface and achieved the increment goal by creating an MVP before the Christmas break. • Continued library research and started writing the literature review. **First increment Testing:** • I used the inspect service to test my web application on different devices. It was also tested it on Google Chrome, Microsoft Edge, and Internet Explorer. **Tasks to be achieved next:** • Provide a demo for my supervisor and my customer to get feedback on the MVP.

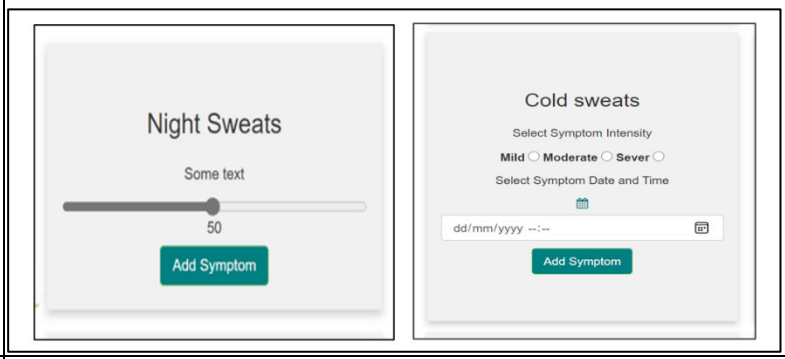
	• Continue working on the literature review and business management deadlines.
10/12/2020	**Seminar:** • I provided a demo of the web application interface in the weekly seminar to get feedback. • I received positive feedback on the design from my supervisor. He asked about the menopause symptoms design, and I justified my choice of design to him. • My supervisors explained the background research. They recommended finding products similar to this proposed product to compare them, as this will help me find gaps to fill when implementing. **Tasks to be achieved next:** • Contact the customer and arrange a meeting to get feedback on the product.
14/12/2020	**Project-related research/work:** • After starting to write the literature review and looking at more menopause products, I had second thoughts about the objectives. **I made the following amendments to the objectives:** • I moved creating an articles page from the optional objectives to the main objectives. The reason for this is that after completing the research for the literature review, I found a knowledge gap and reliability issue with the information provided in many websites or apps. Therefore, providing reliable information from trusted resources will be beneficial to the users. • I decided to add a new function to the system (**add cycle**). Women have irregular cycles throughout menopause, so enabling women to track the cycle will be very beneficial. • I moved creating a search engine from the main objectives to the optional objectives. The reason for this is that after designing the interface, the search engine became less important as the user can see all symptoms and medications on one page. Articles will also be implemented in the same way.
Second Increment	
15/12/2020	**Customer demo:** My customer gave the following feedback: • She liked the design and the way I implemented both the symptoms and medical questionnaires.

	• She suggested implementing a calendar showing the user's symptoms if I have time for it. She said this would be nice to have but not essential. • I agreed with the customer on delivering the main functionalities of the web application, track symptoms, track medication, and track cycle. **Project-related research/work:** • I added the customer suggestions to the second version of the objectives as an optional objective, aiming to implement this calendar. • I sent the literature review to my supervisor to get feedback.
16/12/2020	**Project-related research/work:** I received feedback from my supervisor on the literature review. The feedback was mainly positive; however, I also received a list of improvements: • Include screenshots of the products I am comparing my product with. • Reference all included diagrams, which I had already, but was not clear enough "was not placed under the diagram, it was in the paragraph referring to the diagram". • Write more about the qualitative evaluation plan. • Get the work proofread by a native English speaker.
17/12/2020	**Project-related research/work:** • I finished all required improvements on the literature review. • I arranged proofreading with a native English speaker.
18/12/2020	**Project-related research/work:** • I had my work proofread. • I submitted my literature review. • I hosted my web application on Poseidon. I also tried to host it on Azure but found some issues. **Tasks to be achieved next:** • Create a Trello board for the second increment's requirements.
19/12/2020	From 19/12/2020 to 19/01/2021, I worked on different deadlines, so no work was done on my FYP.

21/01/2021	**Project-related research/work:** • I redesigned the Gantt chart to include all the planned increments and modules deadlines after receiving the feedback for my proposal:  • I created a Trello board containing all activities for the second increment: 
24/01/2021	**Project-related research/work:** • I implemented the user login and registration logic where users can create an account and log in. I added different types of validations for the register logic. For example, a user cannot create two accounts using the same email address, and the first password should match the second password in the registration form.

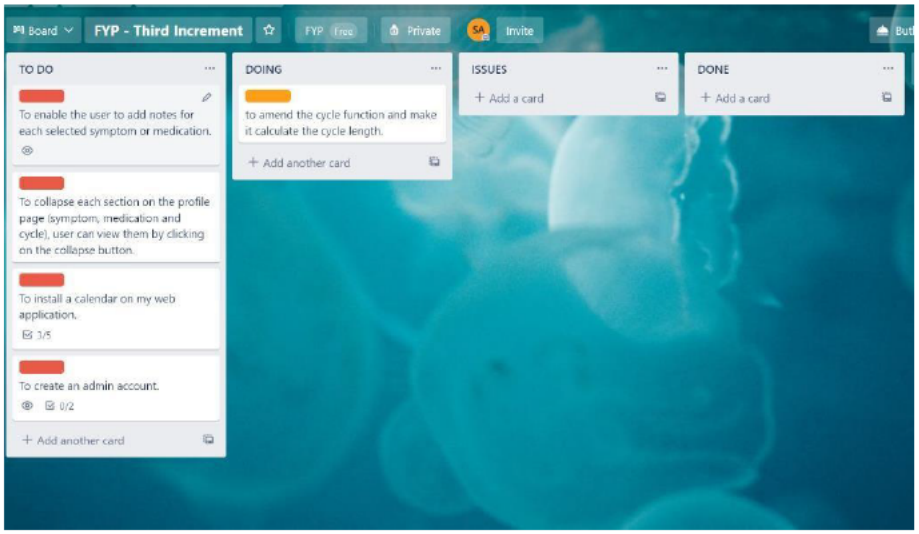
25/01/2021	**Project-related research/work:** • I conducted research to find an efficient way to store user symptoms and medications in the database. The research outcome was to create associative tables, one for the user's symptoms and another for the user's medications. In a relational database, an associative table is required to resolve a many-to-many relationship. Associative table maps two or more tables together by referencing the primary key for each table. The diagram below shows the relationships between different tables:

	 **<u>Tasks to be achieved next:</u>** • Connect user symptoms to the user's profile when the user adds a symptom, this symptom will be saved to the database and displayed on the user's profile.
26/01/2021	**<u>Project-related research/work:</u>** • I managed to attach the user's symptoms from the database to the user's profile. **<u>Issues:</u>** • I had issues writing to the database. I did some debugging and found that bindParam wasn't working; however, to check if the code for writing the user's symptoms to the user's profile worked correctly, I added data manually to the database. **<u>Tasks to be achieved next:</u>** • Try to fix the insertion issue. • Connect medication to the user profile.
28/01/2021	**Project-related research/work:**

	• I fixed styling issues with the login and registration forms, where labels weren't showing. • I made the profile show on the navbar only if the user is logged in. • I made the article tab show on the navbar only if the admin is logged in. **Tasks to be achieved next:** • Connect user data to the profile, so when a user registers and logs in, they should be able to view their data on the profile, e.g., name, email, etc.
29/01/2021	**Project-related research/work:** • I connected the user's data to the profile, so now, if the user logs in, they can view all of their data on their profile. • I added a date and time picker for the symptoms. The reason for adding a time picker was that after the research conducted for the literature review, I discovered that some symptoms may get more severe during night-time. Therefore, giving the user the option to add a time will offer a more accurate symptom tracking tool. • I changed the intensity selector for the symptoms from a range slider to radio buttons with three options to choose from "mild, moderate, and severe". This is to make it easier for the user to decide how intensive the symptoms are, as picking a percentage may not be a sensible way to describe a symptom. These three terms are commonly used to describe medical symptoms. 
Second Semester Week 1 2/2/2021	**Project-related research/work:** • I conducted research trying to find an efficient way to implement the articles page.
3/2/2021	**Seminar:** Important points: • Explain and justify the choice of database design in the report.

	• Explain and justify the design of the user interface. • Justify the choice of colours and whether you considered colour-blind people. **Project-related research/work:** • I fixed the insertion issue for adding symptoms by using an array () instead of the bind param. I did lots of debugging and testing but couldn't figure out why it was not working. Now the user can add symptoms, and these symptoms then get added to their profile. • Implemented the logic that allows users to add medications, and these medications get saved to the user's profile. **Testing:** • After implementing the logic that enables users to add symptoms and medications, I performed tests. I added many symptoms and medications. Doing this testing led to the discovery of an issue. This issue is that due to adding more symptoms and medications, the user needs to keep scrolling to view everything. To solve this problem, I will need to collapse the symptoms, and the user can view them by pressing the see more button. **Tasks to be achieved next:** • Prepare for a customer demo and seminar demo.
4/02/2021	**Project-related research/work:** • Added a delete button to the user's saved medication to enable the user to delete medication if it is no longer needed, or if the user has added the medication by mistake.
Week two: 8/02/2021	**Project-related research/work:** • I added icons to the user's symptoms to show a visual demonstration of the intensity level. When a user chooses a symptom, this symptom will be saved to the database with the appropriate icon representing intensity. • I downloaded free icons from: [3]. • I created a function that enables the user to track their cycle. The way this function was implemented, the user needs to choose the cycle start date and the cycle length. The reason for adding the cycle length is that throughout menopause, the cycle length differs between people. Some people may have a shorter or longer cycle length than usual, so when the user chooses the start date, the cycle length, and presses the add button. The next expected

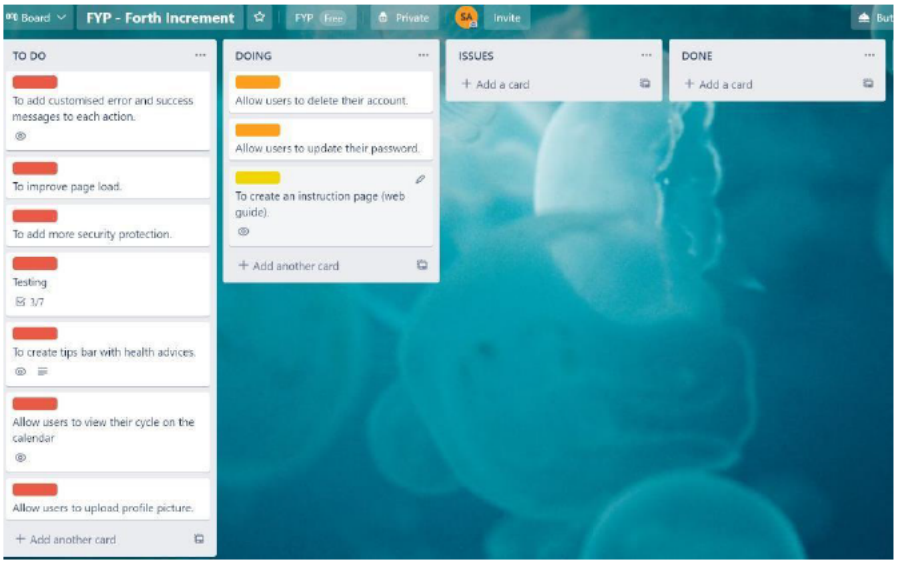
	cycle date will get calculated and added to the user profile alongside the cycle date.
10/02/2021	**Project-related research/work:** • I spoke with my supervisor about one of the objectives, "**adding reliable articles to the web application,**" and issues related to it, such as permission issues when publishing these articles on the web application. Also, the time scope is not long enough to ensure the reliability of each article. I discussed doing one of the objectives that the customer suggested. This objective is a calendar that shows all user symptoms highlighted with different colours according to the intensity. This objective will help the user track the patterns of their symptoms. • I emailed the customer and asked to arrange for a demo session. • I restyled the footer reason. I removed all unnecessary elements from the footer as per my supervisor's advice. **Seminar:** • **I did a demo in the weekly seminar** and received positive feedback. However, my supervisor advised doing user testing to check if the icons would make sense to the users. He recommended adding more icons to the web application, where appropriate.
12/02/2021	**Customer demo/testing:** **a.** I did a **customer demo**; I asked the customer to test the web app to see how usable the web application is. **b.** I recorded the following notes and the improvements required by the customer while they were testing it: **c.** When she went to the symptoms page, she noticed the register button at the top of the page. She went to the registration page, registered, logged in, and went back to the symptoms page. She found the button still there, got confused, and thought she needed to register again. We agreed on replacing this button with the profile button when the user is logged in to avoid this. **d.** When she was exploring the symptoms page, she wasn't sure if she needed to scroll more because of the size of the top picture. Therefore, she suggested making the height of the image smaller. **e.** When checking the profile page, she found the post button where the user can write how they feel and post it. I explained that this is to give the user a chance to describe how they feel, and this will get saved with the date attached. The post feature will help the user check the patterns of their feelings when experiencing specific symptoms. The customer suggested

	adding a note section to each medication and symptom to enable the user to add the note directly to the symptom or the medication instead of this post section. **f.** She then tested the add cycle feature. She thought that not everyone would like to calculate their cycle length. She suggested that the user could add the cycle date, and then when the user adds the next cycle, the web app should calculate the cycle length and display it to the user. The output on the user's profile will be the cycle date, the cycle length, and the expected cycle date. **g.** She suggested collapsing the symptoms and medications to save time scrolling down, which was already on my to-do list. **<u>Tasks to be achieved next:</u>** • Create a Trello board with all requirements that need implementing in the third increment.
Third increment	
14/02/2021	**<u>Project-related research/work:</u>** • I created a Trello board for the third increment's activities:  • I started implementing the **<u>improvements required by my customer:</u>** • I added a notes text box to the symptoms and medication where the user can select the symptom or medication and write their notes directly on them. When the user presses the save button, this note will be displayed on the user's profile alongside the symptom or medication. • I removed the post section from the user's profile as the notes section will replace this. • I improved the layout of the user profile page to adapt to the new changes.

	• Replaced the register button with the profile button when the user is logged in. • Started writing my dissertation. I wrote my functional and non-functional requirements. • I added JavaScript alerts to certain pages to improve the user experience.
Week three: 15/02/2021	**Project-related research/work:** • I improved the style for different pages and added icons to enhance the user experience and attract the user more. • I looked at the FYP guide for the second deliverable and the structuring for the final deliverable to start early and give it enough time for review. • I fixed a styling issue with the medication and symptom top pictures, where the centred div would overlap on a mobile phone. • I installed a calendar in the web application, but still need to display the user's symptoms on the calendar.
17/02/2021	**Lecture by Lee Griffith:** This lecture was about experimental projects, however, there was a few tips and ideas I found useful for any project: • The research process: understand the problem and research the lecture to see what has already been actioned for this problem to identify the gaps. • You should be critical about work reliability and concerns. • The conclusion should be linked to the original hypotheses and objectives. **Seminar:** Types of diagrams recommended: • Entity Relationship Diagram (ER). • Mockup. • Class diagram. **Project-related research/work:** • I tried displaying user symptoms on the calendar. • I tried to implement the required changes for adding a cycle. **Issues:** **1. Calendar:** • I managed to format the data pulled from the database using JSON encode but I am still unable to display the symptoms on the calendar.

	• A conflict between the calendar links and the header links is making the navbar fill the whole page. • The calendar is not mobile responsive. **2. <u>Adding the Cycle:</u>** • I had a go at implementing the logic that calculates the cycle length depending on the user's cycle date. I have used DATEDiff() with an inner join to find the difference between the last cycle date in the user's record and the new cycle date, but I am still getting 0 lengths.
19/02/2021	**<u>Project-related research/work:</u>** • I collapsed all sections on the user's profile to save time scrolling down. If users need to view their symptoms, they need to expand the section by clicking on it. The customer recommended this.
23/02/2021	**<u>Project-related research/work:</u>** • I created "Add Symptom and Add Medication" pages that the admin can use to add symptoms or medications using the web interface. The reason for this is to make the support easier and protect the code, so the admin does not need to interact with the code. Only the admin can see and access these pages. • I managed to calculate the cycle length for every time a user adds a new cycle date.
25/02/2021	**<u>Project-related research/work:</u>** • I found a way to display user symptoms on the calendar. • I managed to display different icons on the calendar according to the symptom intensity. • I created a toolbar for each event on the calendar, so when the user hovers over an event, a toolbar with all symptom information will appear. • I enabled the changing of event colours according to the intensity "mild = yellow, moderate = orange and severe = red." • I made the events on the calendar clickable. When the user clicks on any event, a day view will open, showing any symptom that happened on this specific day. **<u>Usability testing:</u>** • I recruited three women for usability testing. Users were asked to explore the web application and figure out how to use it. The reason for this is to test how easy or complicated it is to use this web application. • Users found it easy to use and liked the colours and design.

	• Users suggested using positive imagery across the web application to provide positivity for the user. They also suggested making a tips bar that reminds the user of some healthy tips.
26/02/2021	**Project-related research/work:** • I added an alert message that appears when the user adds a symptom or medication to notify the user that the medication was added successfully. The reason for this is to improve the user experience. • I made the medication questionnaire and the symptom questionnaire clear when the user presses the submit button. The reason for this is to improve the user's experience, so that the user is aware that the form was submitted. **Customer demo request:** • I emailed the customer and requested a feedback session to demo the latest changes.
27/02/2021	**Functional testing:** • I did full system functional testing, and **found the following issues:** a. Making the medication questionnaire and symptom questionnaire clear after submitting caused a problem when inserting data into the database. b. I found an issue with the cycle form, so when the user adds the cycle twice, it works fine. It calculates the cycle length and the next expected cycle date. However, when the user adds the third cycle, if the cycle doesn't match the next expected cycle date, then the code calculates the cycle length from the "previous, previous" cycle date to the new cycle date, which is wrong. **Fixes:** • I was able to **fix the cycle date issue** and tested it many times. • I made the calendar mobile responsive. • **I fixed the conflict between the calendar and the navigation bar**, where the navbar filled half the page. The reason for this was a conflict between two bootstraps libraries.
01/03/2021	**Project-related research/work:** • I added bleeding to the cycle to help the user keep track of how heavy or light the flow is. • It fixed a styling issue on the index page, where one of the divs in the index page conflicted with another div that has the same class. • I added a delete button to the cycle date to give the user the option to delete any data that was added by mistake.

	Customer Demo: The demo went very well. The customer was satisfied with the improvements made after the second demo. She was happy with the new functionalities added (cycle length and the calendar). When I asked her if she wanted any further improvements or anything done differently, she commented, "you left me nothing to say; everything is nice and well thought of".
Fourth increment	
02/03/2021	**Project-related research/work:**  • Created a Trello board for every increment's activities. • Implemented the logic for uploading and deleting a user profile picture. **Improving Performance:** • When testing the web application, I noticed that the images are taking a while to load. To handle this issue, I added Expires headers that avoid unnecessary HTTP requests on subsequent page views and improve the performance and user experience. • I compressed and resized all images on the web application • I minimised the CSS file size using an online tool CSS Minifier, which helped reduce the file size by removing white spaces. • I added Gzip to improve the web performance as Gzip reduces traffic between the web server and the browser.
03/03/2021	**Project-related research/work:** • I added a delete account option to the user profile to allow the user to delete their account if not needed anymore.

	Usability: • I added a confirmation alert to each delete button (delete account, delete symptom, etc.) to ask the user whether they wish to continue, or if they wish to cancel. The reason for this is to protect the user against accidental deletion.
06/03/2021	**Project-related research/work:** • I added an information and tips tab to each symptom. The reason for this is to add a learnability feature and improve user experience. However, this feature will not be completed as the time scope will not allow for researching and adding reliable information to each symptom. • Created an update password function and added this to the user profile to allow the user to update their password.
08/03/2021	**Security:** • I implemented Tokens and added tokens to all forms to protect against Cross-Site Request Forgery.
09/03/2021	**Project-related research/work:** • I added more icons to each page where appropriate to improve user experience. • Added a tip bar to the left of each page to remind the user of some essential tips like "eat healthily".
10/03/2021	**Dr Julian Bass lecture:** Dr Bass provided the following advice: • Follow the final year project guide when drafting your dissertation. • He outlined the recommended structure for the dissertation. For example, he suggested adding increment explanations for each section in the dissertation, including the testing completed for each increment. • He gave examples of dissertation structures. • He spoke about the writing process and gave advice such as, never submit the first draft and do editing, spell checking, and proofreading, before you submit. • Recommended top-down writing processes, where you write down the heading, subheading, and then bullet points that describe these subheadings. • He spoke about writing styles and gave advice (use paragraphs). Each paragraph should contain a topic sentence, explanatory sentence, and summary sentence, use active voice, and remove needless words. **Seminar:**

	I did a demo in the weekly seminar; the feedback was positive. However, I had the following comments for improvements: • The colour contrast between the orange and yellow on the calendar is only a slight difference. Make sure to make each one distinct. • The same issue on the symptoms page, the colour contrast between the intensity radio buttons is not ideal. **Usability:** • I created a "How to Use" page. This page contains instructions for using this web application.
11/03/2021	**Project-related research/work:** • I redesigned the index page to make it more attractive and useful. **Usability:** • I added an explanation for each feature to the index page to introduce my application to the visitors and make it easier to understand.
12/03/2021	**Customer demo:** • I requested an appointment with the customer to demo the final product. **Usability:** • I added a bottom border for the opening page on the navbar.
13/03/2021	**Usability:** • I made the alert box change colours according to the message content, so it will turn red if the message is a "fail" message. • I moved the add cycle table from the profile page to a new page titled Add Cycle and added a new tab to the navbar for this page to make it easier for the user to find.
15/03/2021	**Testing:** • I created an online survey for user testing. This survey is to evaluate the web application from the user's perspective. I included questions that evaluate performance, ease of use, compatibility, responsiveness, and functionality. (https://s.surveyplanet.com/eavZSRNFR). **Usability:**

	• When the user presses the add medication or symptom button, the user will get forwarded to the login page if the user is not logged in. **Customer demo/increment 4:** The customer was happy with the final product and did not request any further improvements.
16/03/2021	**Project-related research/work:** • I shared the survey with the website link on a WhatsApp group and asked for user testing. • I restructured and improved upon my dissertation.
17/03/2021	**Lecture by Dr Murray:** This lecture's focus was on the final deliverable. It was very beneficial as it explained and answered my questions about each section in the deliverable, like the requirements definition and design and specification, etc. This lecture will be used as a guide when writing my dissertation. **Improvements according to user's feedback:** • I added an introduction about menopause to the index page. • I have corrected spelling mistakes found on the index page.
18/03/2021	**Project-related work:** • I created an instruction sheet for user testing. This sheet contains an overview of the web application and all of the different tasks a user can perform.

Menopause Symptoms Tracker

Safaa Alazzam

This is a study about Menopause Symptoms Tracker intended for women aged between 45-55. My goal is to make the web application appealing, intuitive and user friendly. Your participation will help me achieve this goal.

This paper contains tasks a typical user might do, such as creating an account and taking the menopause symptoms questionnaire. You may do all the tasks in the sheet or any list of tasks of your choice. Please complete the online survey and include tested tasks in the related section after finishing testing.

All information collected is for testing purposes and will be used to improve the web application. I will publish the results from this in my reports, but all such reports will be confidential and will not include your name.

No	Task
1	Create an account.
2	Login to your account.
3	Add menopause symptoms to your profile.
4	Add menopause medications to your profile.
5	Add your cycle to your profile.
6	Check your symptoms and cycle on the calendar.
7	Delete symptom(s) from your profile.
8	Delete medication(s) from your profile.
9	Delete cycle(s) from your profile.
10	Reset your password.
11	Upload a profile picture.
12	Delete profile picture.
13	Delete account.

Dissertation:

- I reflected on all objectives that I have achieved so far.

22/03/2021

Project-related work:

- I validated all HTML files using the W3C service.
- I validated the CSS file using the W3C service.

23/03/2021

Security headers:

- I added x-content-type-options to protect the web application against MIME Sniffing vulnerability.
- I added x-frame-options header to protect the web application against a clickjacking attack.
- I added x-xss-protection to protect the web application against an xss attack.
- I added Content-Security-Policy(CSP)/ frame-ancestor to protect the web application against XSS and clickjacking attacks.

24/ 03/2021

Testing:

	• I did full system functionality testing. All functions were fully functional • I used RGBlind – Google extension to test the web application for colour-blind people. The test shows that this web application is accessible for colour-blind people. • I performed browser and platform independence testing. I used different devices for this test (MacBook, iPhone, iPad, Android, and desktop)
25/03/2021	**Testing:** • I used the Google developer online tool (pageSpeed Insight) to test the page load speed. • I tested the web application against different attacks (XSS attack, SQL injection, CSRF and URL XSS attack).
27/03/2021	**Responsiveness issue:** • I found a responsiveness issue when using an iPhone 11, where symptom and medication cards do not break (one card in each row), and four cards get squashed in one row. To fix this, I used the bootstrap grid system instead of using columns and rows.
26/03/2021	**Dissertation**
14/04/2021	**Seminar:** • My supervisors covered the importance of different testing types and clarified what is required for security testing. Lee has demonstrated an XSS attack on one of the demoed websites. • Lee explained that it is not enough to do client-side protection against security attacks; it is more important to do server-side protection.
21/04/2021	**Performance:** • For optimising the page load time, I moved the JS code to the footer. The reason for this is that JS gets executed by the browser upon loading. So, putting JavaScript at the top will make the browser execute the JavaScript before loading the rest of the page. Therefore, moving JS to the bottom will make the browser quickly render the page as it makes JavaScript defer its execution to a later stage, hence improving the page load time. **Seminar:** • The main focus this week was on testing, mainly security and user testing. For usability testing, a minimum of five users is recommended to test the website.

	• For security testing, we need to focus on the most popular security attacks (SQL injections, XSS attack and CSRF).
21/04/2021- 30/04/2021	Dissertation writing

19.4 Appendix E, Project Proposal:

Aim:

The project aims are to build a web application that helps women who are going through the menopause, track menopause symptoms and maybe control them by providing tips based on scientific research.

Background:

Menopause is the time that marks the end of women's menstrual cycles, it is a natural biological process, but it causes several physical and emotional symptoms, such as hot flushes, anxiety, unsettled sleeping routine, and it can lower your energy[1].

My Supervisor suggested an online menopause symptom tracker. This project was proposed by a customer who is going through the menopause and experiencing symptoms. The main idea of the project is to help women who are going through menopause, track these symptoms and maybe control the symptoms by providing some health tips.

When I spoke to the customer about their requirements, the thing that inspired me to do this project was that there is currently no web application that helps women track menopause symptoms. There is an app that helps to track these symptoms, however the drawback of an app is they are designed for a specific platform, such as iOS or Android and they can only be used by installing them on devises that support these platforms such as Apple and Samsung phones. Therefore mobile apps aren't always available for all users. A web application will be available and can be used on any browser.

Who will it benefit?

It will help women who are going through menopause. It will track their symptoms and maybe control the symptoms by providing health tips based on scientific research.

Motivation:

The project idea attracted me, as I am interested in health and wellbeing. I read research on health related topics in order for me to adopt a healthy life style. Performing this project will help me in too many different ways. It will enrich my knowledge with regard to the latest research on the menopause. Importantly it will help me as a woman when I also go through the menopause. It will also develop my technical skills, e.g. planning skills, as this is important to successfully deliver the project, it will also develop my coding skills and problem solving skills.

Objectives:

- **Objective 1:** To research Menopause and its symptoms and get better understanding about menopause in general.
- **Objective 2:** To research similar products related to menopause, in order to improve on the on products currently available.
- **Objective 3:** To research suitable programming languages and suitable equipment/software that can help me to develop my web application.
- **Objective 4:** To design a user-friendly interface, while focusing on usability.
- **Objective 5:** To create a quality database for the project.
- **Objective 6:** To develop a user profile system that allows users to register, login and edit and update their personal details.
- **Objective 7:** To create a symptom questionnaire, where the user can choose their symptoms for saving under their user profile for future reference.
- **Objective 8:** To create medication questionnaire, where users can add their medication, again to be saved to their profile.
- **Objective 9:** To Create a Search engine for quick access to advice on symptoms and medications in order for users to read about them.
- **Objective 10:** To perform testing on the usability in order to check the product is compatible with different web browsers. Also, to perform security testing, testing will be part of each development phases(interface, database, symptoms and medical questionnaire etc..".
- **Objective 11:** To write my dissertation.

Optional Objectives:

- **Objective 12:** To create a tips generator that is based on the user's individual profile and lifestyle, some tips will be autogenerated when the user takes the questionnaire.
- **Objective 13:** To create a reference section by adding tabs that contain articles with helpful and relevant information. This will also be linked to the search engine.

Methodology:

The project will be created using Agile methodology. The main reason for this is the incremental process used in the Agile methodology, which will help to get the maximum productivity and the minimum risk when building the project.

Agile will also ensure a high-quality product, as the testing is part of the development cycle and will help to track any issues and fix them.

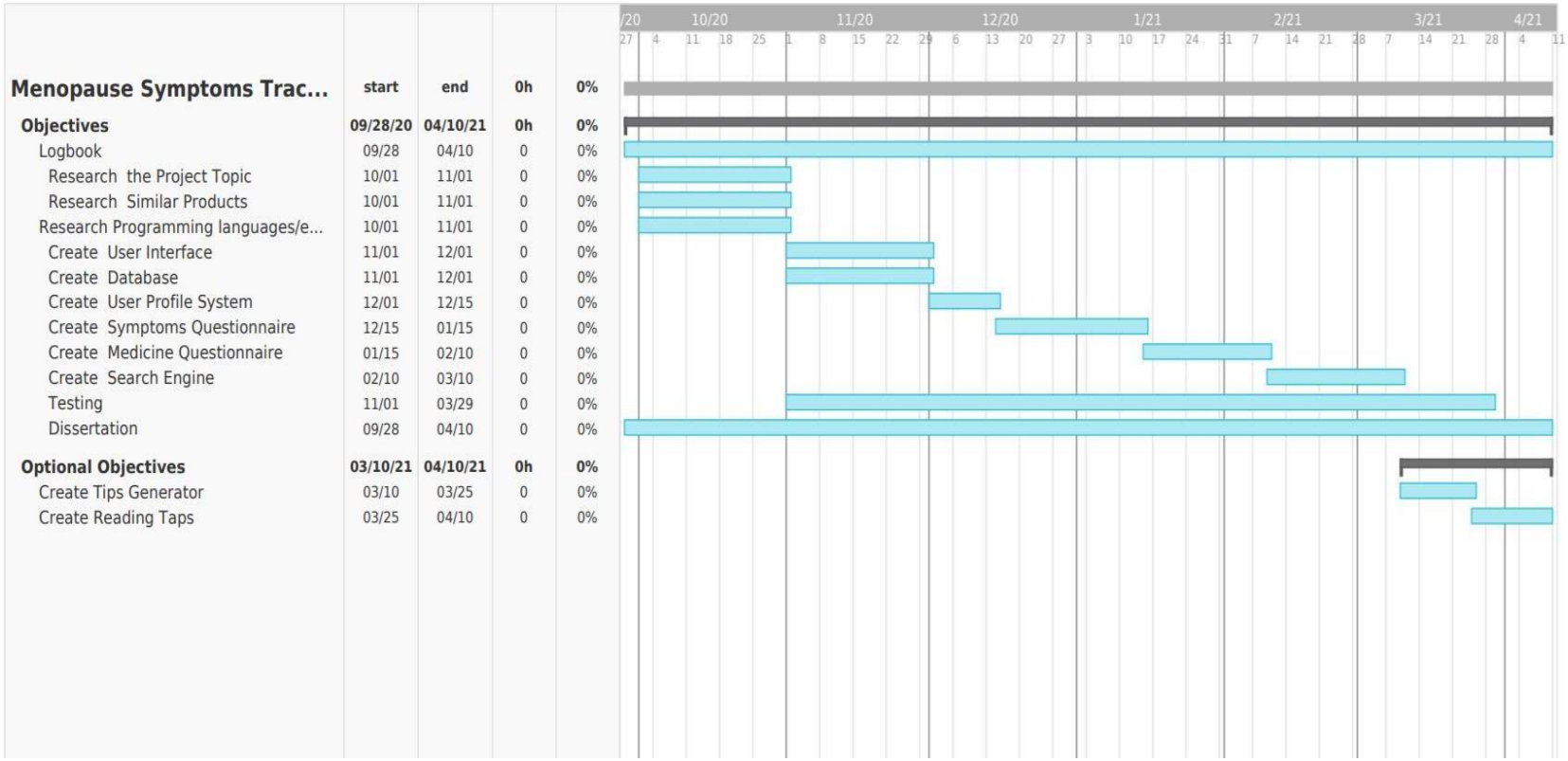
The flexibility of this methodology allows the project to cope with any changes the customer may ask for. Hence a customer may change the requirement or ask for improvement at any point making this methodology ideal for my project. It also guarantees a good quality web application.

The implementation for my project is based on delivering the project in small parts and not the whole project at once, which therefore makes Agile the best methodology to use.

Software, Equipment and Facilities:

I will use HTML, CSS, JavaScript for the front end development, I have not yet decided whether to use PHP or C# for the backend development, therefore I will do research to help me decide.
I will also research different databases/software to use to develop my web application according to the programming languages I will be using.
I will be using Microsoft Word and excel to write my report and create any tables or charts if needed.
TeamGantt is the tool I used to create the Gantt chart it is free and easy to use and it will help me to track the project progress throughout the development process.
In addition to that, I will be using Google Drive to write and share my logbook with my supervisor.

Time Plan/Gantt Chart:



Menopause Symptoms Trac...	start	end	0h	0%
Objectives	**09/28/20**	**04/10/21**	**0h**	**0%**
Logbook	09/28	04/10	0	0%
Research the Project Topic	10/01	11/01	0	0%
Research Similar Products	10/01	11/01	0	0%
Research Programming languages/e...	10/01	11/01	0	0%
Create User Interface	11/01	12/01	0	0%
Create Database	11/01	12/01	0	0%
Create User Profile System	12/01	12/15	0	0%
Create Symptoms Questionnaire	12/15	01/15	0	0%
Create Medicine Questionnaire	01/15	02/10	0	0%
Create Search Engine	02/10	03/10	0	0%
Testing	11/01	03/29	0	0%
Dissertation	09/28	04/10	0	0%
Optional Objectives	**03/10/21**	**04/10/21**	**0h**	**0%**
Create Tips Generator	03/10	03/25	0	0%
Create Reading Taps	03/25	04/10	0	0%

References:

[1] https://www.mayoclinic.org/diseases-conditions/menopause/symptoms-causes/syc-20353397