Table of Contents

1. Project Overview

1.1. Background

Revenue for the eyewear market in Ireland during 2021 was €360m and between the 2021-2025 the market is projected to increase by 4.45% annually (*Statista, 2021*). I believe there is still opportunity in the eyewear space as the market is increasing at a steady rate each year.

1.2. Objective

The objective of this project to build an e-commerce web application for SimpleFocals prescription eyewear retailers. The web application is the entry point that will allow consumers to easily login to SimpleFocals system, browse range of prescription eyewear, upload their prescription, order and pay for glasses. The specific target market for SimpleFocals are people who wear (myopic) prescription glasses but want a cheaper alternative to most other eyewear retailers (online or physical stores). Popular retailers in the Irish eyewear sector, visionexpress.ie and specsavers.ie, offer the Irish customer a wide variety of products and services ranging from eye tests to buying and servicing prescription glasses. Although they offer excellent products and services this comes at some relative expense to the Irish customer. A basic set of plastic frames from visionexpress.ie costs in the range of € 25 - € 30 in price(*fig1.1*) at the lowest end.

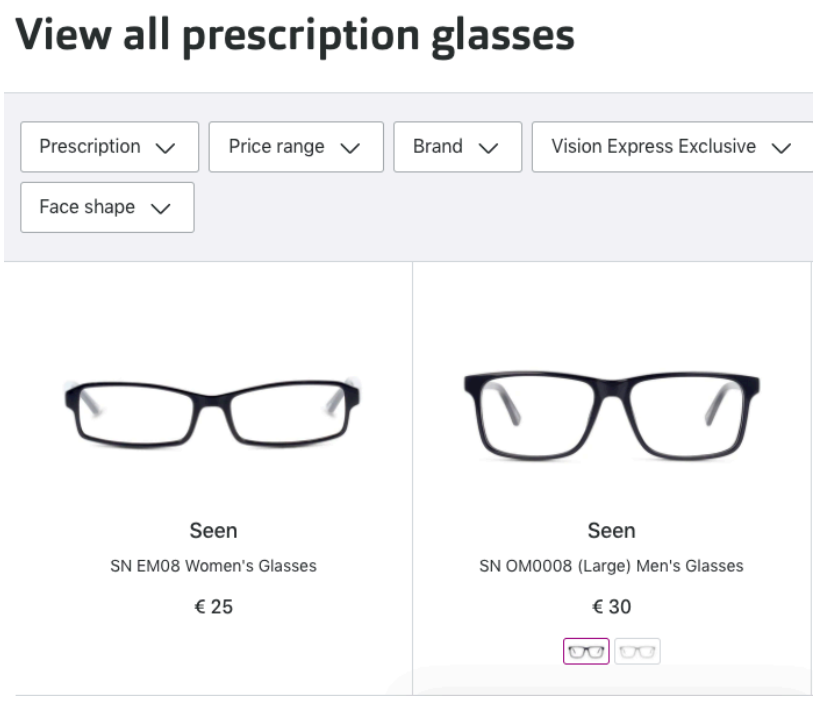

fig1.1: visionexpress's basic frames

SimpleFocals brand free prescription frames is looking to offer the Irish customer a cheaper alternative to the current options that are available. SimpleFocals pricing from € 10 - € 25 for each pair of glasses is competitively positioned when compared to other outlets.

1.3. The Sale of Spectacles in Ireland

Research of irishstatutebook.ie for legislation of the sale and distribution of spectacles(*Iris Oifigiúil, 2015*) article 8 states: "*No **dispensing optician** or optometrist shall sell or offer for sale any spectacles **except on a prescription issued** following an examination by a registered medical practitioner or by an optometrist*". SimpleFocals web application will be built fully compliant with Irish law. If any sale of spectacles is to occur, the customer must produce a valid prescription in order to complete the purchase. Although by the competition of this project the web application will not be commercially ready, it will allow the customer to upload their prescription.

2. Project expected deliverables

In the completion of this project a number deliverables are to be submitted.

2.1. Documents

The documents required for this project are outlined in the table below(*fig2.1*). The project is currently at the half way point and all the documents are expected to be delivered in accordance with the given deadlines.

Document	Description	Date Due	Submitted
Project Proposal	A document that outlines the project idea.	11th June	Yes
Ethics Approval Form	A series of questions which aim to help identity if the project is "high risk" and requires for review by ethics committee.	11th June	Yes
Project Requirement Specification	A document that describes what the application will do and how it is expected to perform.	25th June	Yes
Interim Report	A report on the current status of the project.	10th July	Yes
Project Analysis & Design Documentation	A document that outlines the system design and architecture of the application.	9th July	No
Project Final Report	A document that describes all facets of the completed project.	14th August	No

Declaration Cover Sheet	A document that confirms that this project is all my own work.	14th August	No
Project Code	The application code.	14th August	No
Video of Final Project	A quick video presentation showing all the features of the completed application.	14th August	No

fig2.1: Table showing the documentation deliverables

2.2. Application Functionality

In the completion of this project the web application is expected to facilitate the user in a number of functions. Each of these functions will be developed as components that will combine together to make the complete system. The system will:

2.2.1. Facilitate a CMS(Content Management System) for administrative use.

The administrator will be able to add product/s to the system. Once a product is added to the system registered customers are able to view that product, add it to their cart and complete a purchase.

2.2.2. Allow the user a secure login.

A registered customer or administrator will be able to log into the system securely with their email and password. The login for the customer is to provide a personalised experience where they can, upload a prescription, add a product to their cart and also complete their purchase. The login for the administrator is to provide access to the systems CMS. I will use Spring Security for secure authentication for registered users.

2.2.3. Allow the customer to register with the system.

A customer will be able to enter their details and register with the system. Once registered with the system, they can log into the system and gain all the functions a registered customer has.

2.2.4. Facilitate a secure payment mechanism.

This allows a registered customer to secure complete the payment for goods. I will implement the Stripe payment processing API because as a trusted third party Stripe offers secure interaction with its servers while keeping customers sensitive information(card number) safe during processing.

2.2.5. Allow a registered customer to upload their prescription.

In accordance with Irish law regarding the sale of spectacles(*Iris Oifigiúil, 2015*) article 8, a valid prescription is required from the customer before the purchase of prescription glasses. The web application will have the registered customer fill in the fields for their left and right eye prescriptions. The web application will also require them to upload a valid prescription(one that was given from an optometrist) in digital format(jpeg or pdf).

2.2.6. Allow a customer to browse products.

The web application will allow a customer (registered or non-registered) to browse SimpleFocals range of prescription glasses. The customer will be able to select by gender which category of glasses they want to view. Clicking into a specific set of frames will give detailed information on the product.

2.2.7. Allow a registered customer access to a cart.

The web application will allow a registered customer the functionalities of using a cart in an e-commerce application. The registered customer will be able to view the cart, add products to the cart, remove products from the cart and move cart items to payment.

2.2.8. Facilitate a user friendly experience.

The web application will be designed with a user friendly layout developed with a mobile first approach ensuring that all user functions are accessible in from small device resolution to large screen computers.

3. Project actual targets met

3.1. Documents to date

The project is currently in the planning stage. As of the time of writing 4 documents from the table (*fig2.1*) Project Proposal, Ethics Approval Form, Project Requirement Specification and Interim Report have been submitted.

3.2. Wireframes

The project front-end is prototyped with a mobile-first approach to design. The reason why mobile first design is the best practice for prototyping websites is that a smaller screen size has limited canvas to work with(only so many elements can fit into the viewable area). This means

designers will only put the most important elements into each page while everything else can be disregarded. With a mobile-first approach to design this ensures that all the functionality of each page of the website remains consistent throughout the different devices the application is viewed on. The wireframes for SimpleFocals can be viewed in the **Requirement Specification document** that has previously been submitted.

3.3. Payment processing research

The project will implement Stripe's payment processing API in order to accept payment from customers. Stripe is a world wide leader in online payments and can accept transactions using all major credit and debit cards. The system will use Stripe's API to securely accept payment from customers and the web application will not store any of the customers sensitive data as it will be processed remotely by our trusted third party.

3.4. Developing the system architecture

The project will be developed in Java using spring boot. Spring boot was chosen to develop this application because it allows for the quick development of applications using the spring framework without having to spend time dealing with boilerplate configurations.

In the research for this project I have implemented test spring boot applications in order to give me an understanding of the project structure when developing in this environment. I have connected the application to a mysql database and performed CRUD operations by connecting REST API endpoints in a controller. I have implemented a service layer which acts as the intermediary that handles the logic between the database and the controller. The REST APIs were then tested using postman software to validate the data being passed. Then I created test a webpage using Bootstrap in combination with Thymeleaf templates to update the content dynamically in the test web application's front-end. Building the test applications gave me an understanding of how my application is going to accept input from the front-end, perform some logical operations on the data, update information in the database and return some data to the front-end. From this research I was able to develop a system architecture(*fig3.1*) for SimpleFocals.

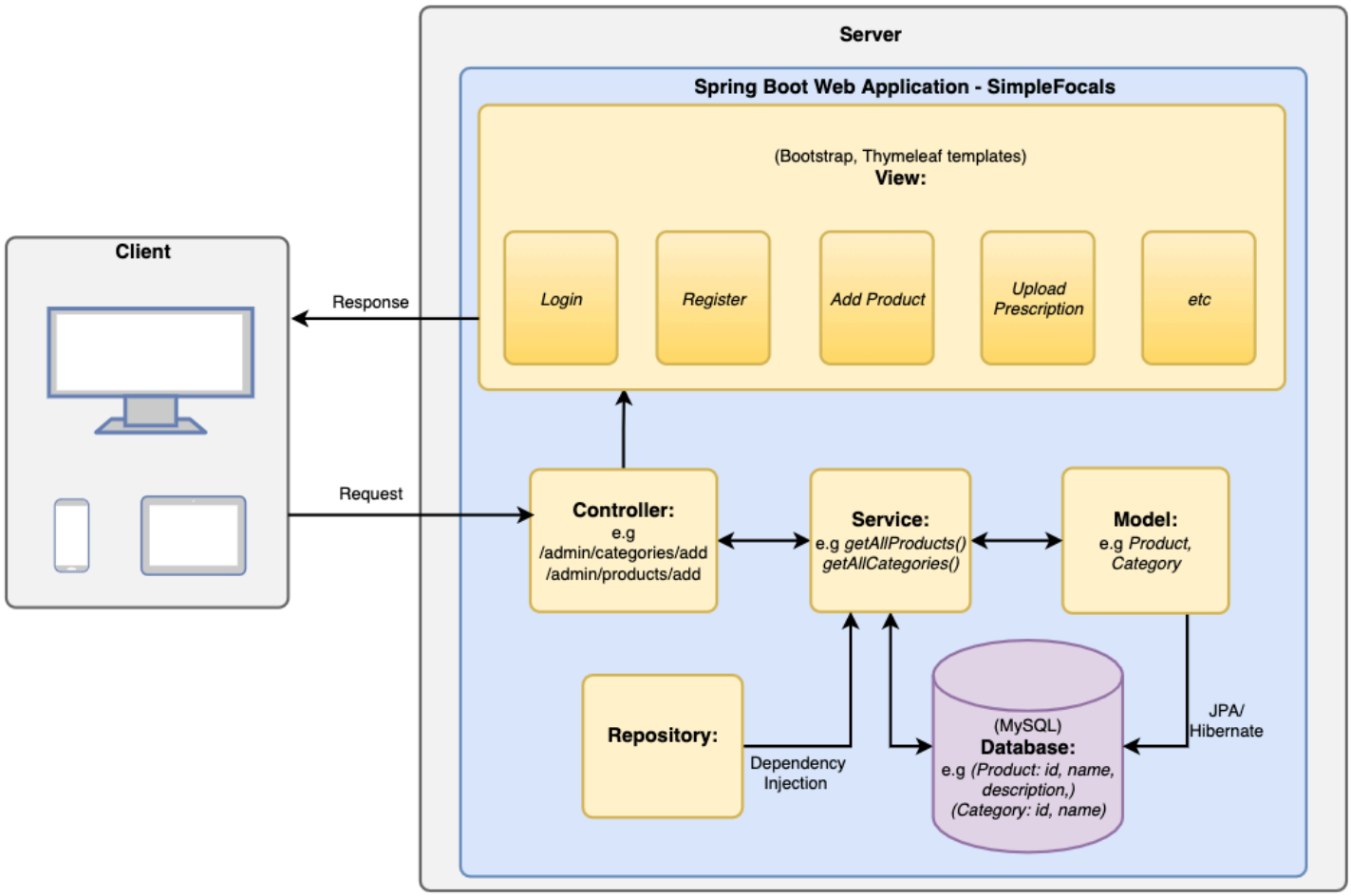

fig3.1: System architecture view of SimpleFocals web application

3.5. Current development of SimpleFocals web application

I am currently in the process of building the web application. As I have outlined in **2.2. Application Functionality** section of this document, I will develop this project in terms of components that will combine together to make the complete system. I am currently in the process of implementing the **2.2.1. Facilitate a CMS(Content Management System) for administrative use**. I have created Product and Category tables in the mysql database and have begun coding the logic that connects them to the frontend. I have developed a standard bootstrap front-end in order to test the functionality of adding a new product. When the administrator logs on to the system, they are greeted with then homepage for the CMS(*fig3.2*). If they se-

lect products they will be directed to a products page(*fig3.3*), from the products page they will be able to select add products function. Once the add products page is opened the administrator can fill in details of the product they wish to add(*fig3.4*). At the time of writing add product is not fully functional, development is on going.

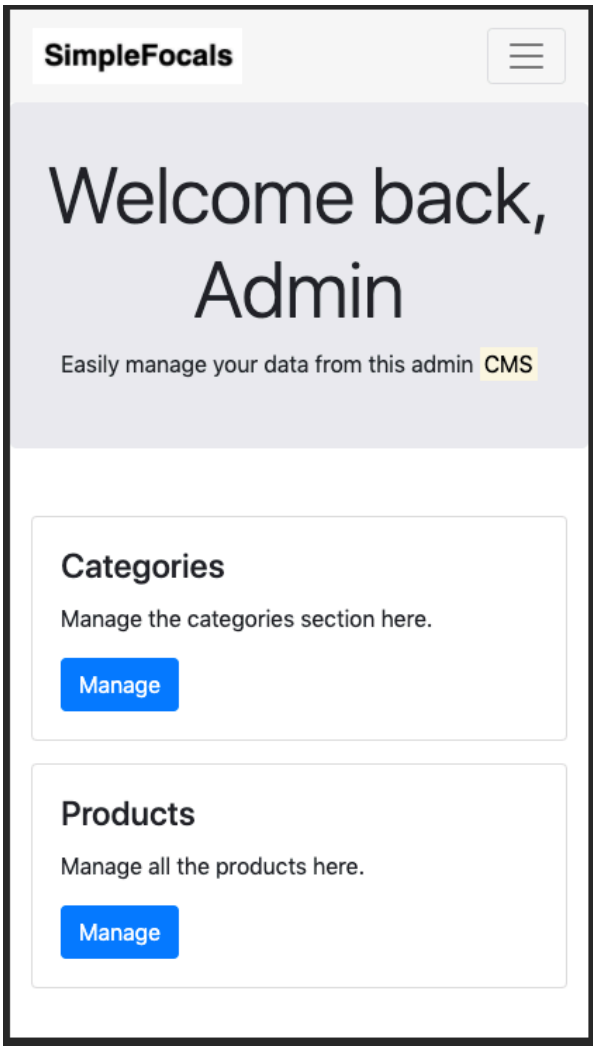

fig3.2: Homepage for administrator's CMS

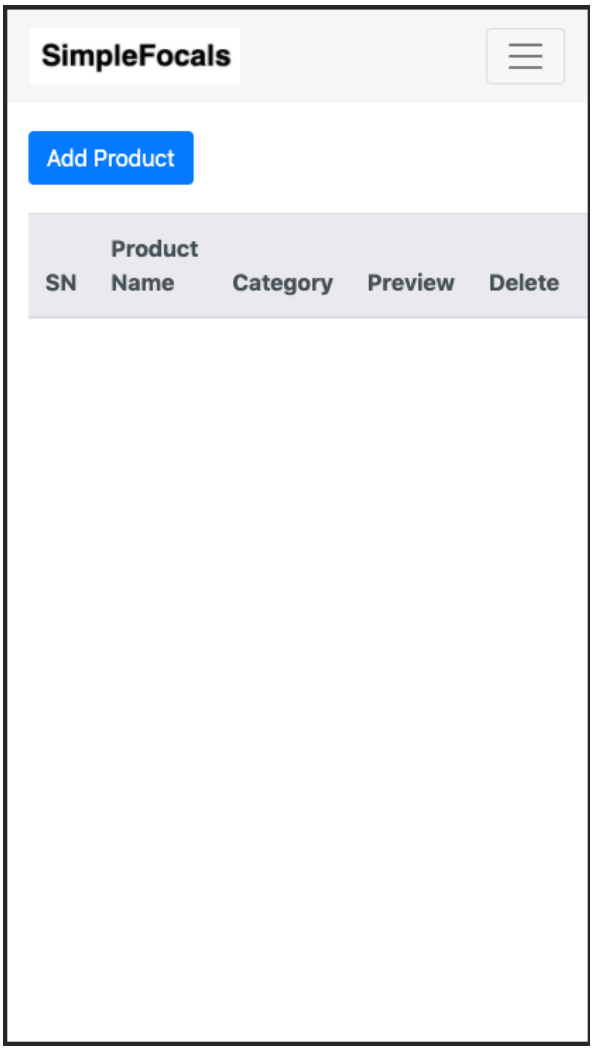

fig3.3: products page for administrator

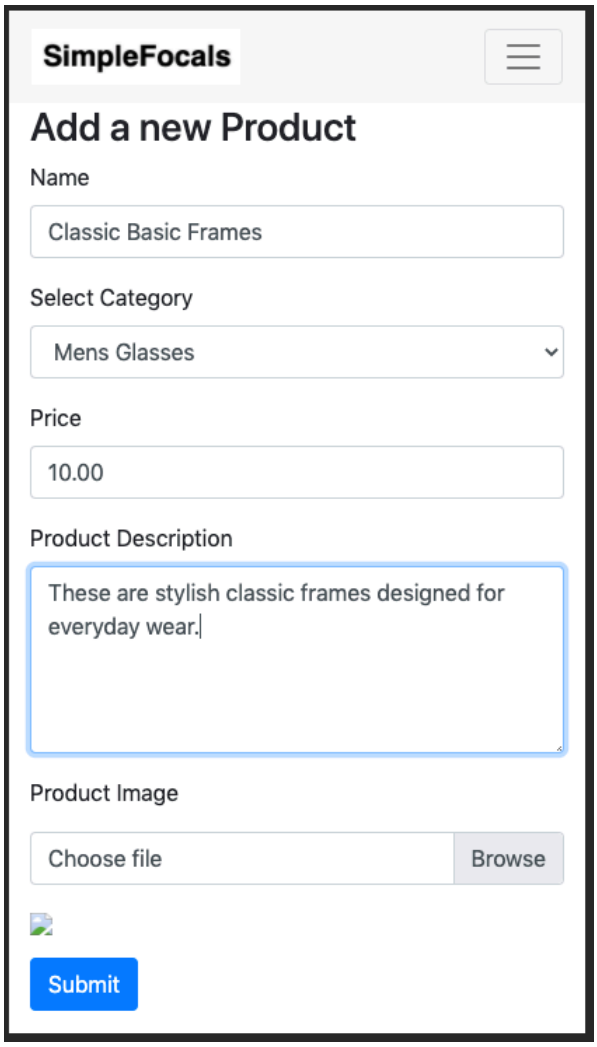

fig3.4: Add a product page for administrator

4. Deliverables to be achieved

I have updated my project plan to include the application development by components(*fig:4.1*).

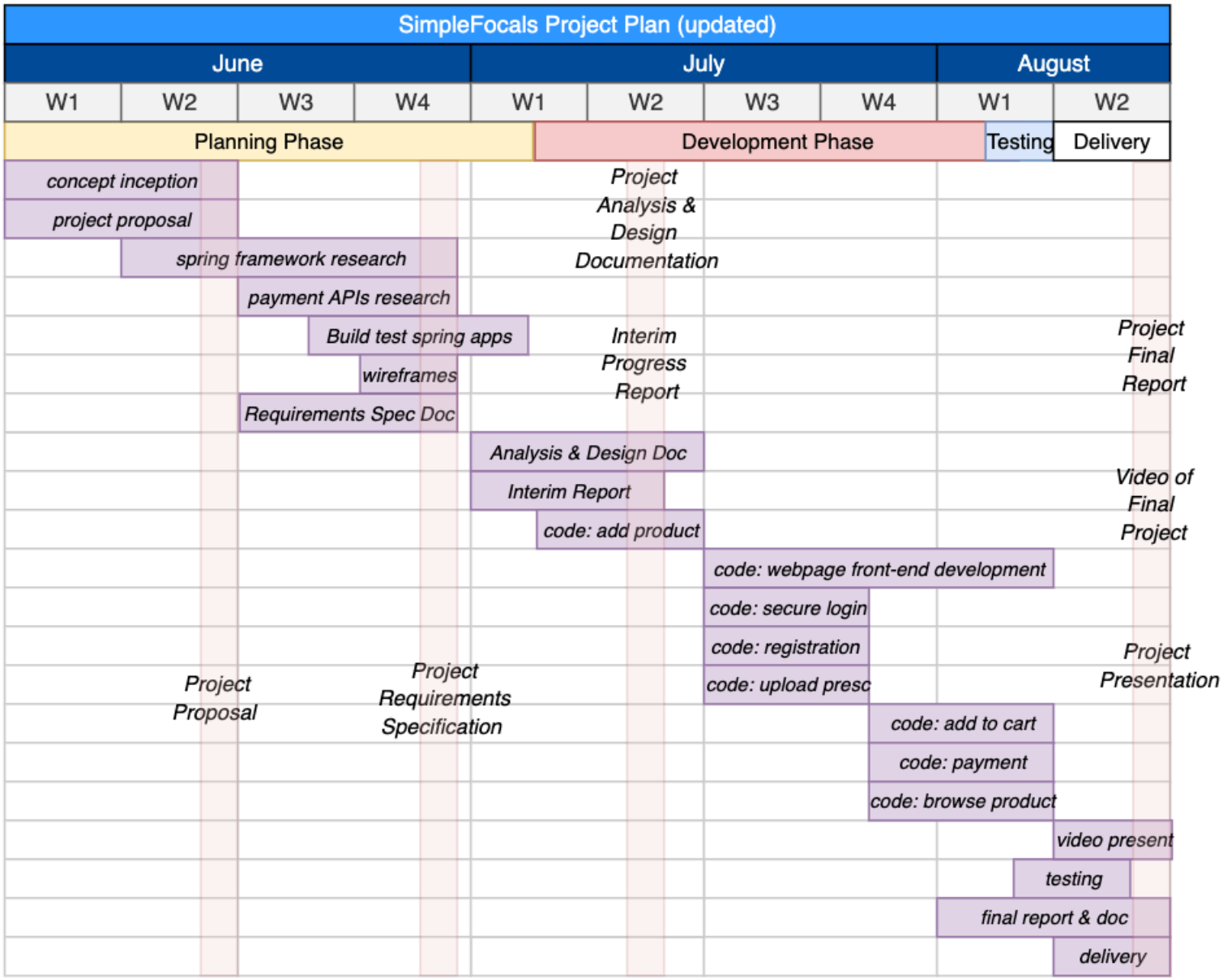

fig4.1: SimpleFocals updated project plan

4.1 Documents/Materials

In the table(*fig2.1*) there are still a number of documents and materials still yet to be submitted.

As of writing the **Project Analysis & Design Documentation**, the **Declaration Cover Sheet**,

the **Project Final Report**, the **Project Code** and the **Final Video Presentation** are yet to be

submitted. In the project plan(*fig4.1*) most of these deliverables are due in week 2 during August. The project is on course to meet these deadlines.

4.2. Application development

As previously stated I have divided up the functions of the web application into components. I will implement each of these components as outlined in the project plan(*fig4.1*). At the end of week 2 in July, in accordance to the project plan, I will submit the Analysis and Design Document and fully implemented the **2.2.1. Facilitate a CMS(Content Management System) for administrative use**. During week 3 and 4 in July I plan to implement the functionalities **2.2.2. Allow the user a secure login, 2.2.7. Allow a registered customer access to a cart** and **2.2.5 Allow a registered customer to upload their prescription.** During week 4 of July and week 1 of August I plan to implement the functionalities **2.2.7. Allow a registered customer access to a cart, 2.2.4. Facilitate a secure payment mechanism** and **2.2.6. Allow a customer to browse products.** In combination with implementing these components, I will concurrently develop the website front-end to test my components. Once I finish implementing the components I will test the web application as a whole system.

5. Main problems encountered

5.1. Understanding the internals of the framework/technologies

This is the first experience I have had working with frameworks. This project has allowed me to research the Spring framework. I have completed basic tutorials such as: setting up a basic Spring boot project, connecting a database to perform CRUD operations, connecting to the front-end using Thymeleaf. Even though these tutorials have helped, I don't think I have more than a surface understanding of the technologies involved and what is happening internally with these projects. An example of this would be with a concept of dependancy injections using annotations in Spring. The annotations are used as a form of metadata that provide information about a program. When doing the tutorials annotations were commonly used in many parts of the coding. They work and function as expected but after researching annotations for functionality past basic use-cases it is more involved internally than I can currently understand.

5.2. Time Constraints

I have experienced some problems in time management. I had to update my project plan(*fig4.1*) to arrange how I am going to compete certain tasks in a structured timeframe. With life commitments and also in conjunction with trying the prepare for interviews(the technical and non-technical aspects). It is possible I should be further along in the implementation of the web application at this stage of the software development lifecycle.

5.3. Debugging problems in the project

The development of this web application is my first development experience using the Spring framework along with integrating other technologies. Since I am new to this development environment, there is a lot of configuration and trail and error in “getting things to work”. This is probably partly related to **5.1. Understanding the internals of the framework/technologies** because even if the program doesn’t compile the console error messages are difficult to interpret. I have googled the error messages to find solutions in order to fix bugs. I have found that I have spent a lot of time troubleshooting things that should have been trivial to correct. I put this down to lack of experience in the development environment.

6. Expected Stumbling blocks

6.1. Implementation

As previous mentioned this my first experience building an application using the Spring framework. I have completed tutorials to get a hands on understanding of implementation. The tutorials were a step by step guide (essentially a “paint by numbers”) on how to achieve simple operations. It is expected I run into problems in the development phase as more complicated functionality is required to be implemented. I may encounter many stumbling blocks due to lack of understand of the framework, best practices and the technologies involved. I believe will be able to overcome this stumbling block with more experience developing in this environment.

6.2. Time constraints

As previously stated I will implement the web application in components that will combine to form a whole system. I have updated my project plan(*fig4.1*), by dividing the development of the application into components. Since this is my first time creating such an application I expect

some stumbling blocks during implementation and the development of components may take longer than the time I have allocated them in the project plan.

6.3. Presentation

I am not a confident speaker in presentations. I expect the final presentation will be a stumbling block for me. Although it is a weakness this is one aspect that I wish to improve and turn it into a strength. I think this is particularly important especially since in software development communication skills are important for working together successfully in team situations.

7. Focus on rubric

7.1. Communication

As mentioned previously I don't consider the presentation part of this project as one of my strengths but I am willing to work hard to improve in this area. I believe in preparing efficiently, making a visually engaging powerpoint presentation, structuring the presentation in a logical flow, having detailed notes on each section and working within the timeframe I am allotted, is a solid basis for giving a great presentation. Once I have this ready, I will practice many times making sure I speak in a manner that engages the listener. I will record my attempts and then listen back to myself speaking in order to see which aspects I can improve and then adjust my notes accordingly. With this foundation I will give myself a great basis to deliver a comprehensive and interesting presentation.

7.2. Writing & presentation of results

In the documentation for this project, I am aiming to write in a clear and concise manner. I aim to give examples where applicable and any assumptions that are made shall be backed up with the relevant supporting information. If there is need for information to be displayed in tables diagrams or images, these supporting materials shall be labeled and numbered in logical manner consistent throughout all the documents that are submitted. Any external referencing shall be done with Harvard Referencing Style(HRS), with details of the references included in a references/bibliography section at the end of the document.

7.3. Complexity/coding skills

I believe the implementation of this web application using frameworks and combining different technologies together is a great challenge. This project requires a lot of self study and research in order to complete to a high standard and I believe the requirements I have set out for myself are of high level of complexity especially since this is a first endeavour using these specific technologies.

7.4. Innovation

I believe the innovation in this project is the value proposition that SimpleFocals is offering. SimpleFocals wishes to offer the Irish customer a cost effective alternative to other prescription eyewear retailers in the space. SimpleFocals is intent on exploiting the lower end of the market between the € 10 - € 25 for its brand free stylish frames. This price point is unmatched by similar competitors in the space.

7.5. Technology

This project is being developed using Spring boot which is an extension of the Spring framework. At the time of writing all technologies used in the project will be their latest versions, e.g Spring boot 2.5.2 and hibernate 5.5 etc. For a more detailed breakdown of the technologies are described in **Project Analysis & Design Document.** The use of the latest versions of these technologies ensures the use of the newest features they have to offer.

7.6. Completeness

At the competition of this project, the web application will facilitate the functions that an e-commerce store. The customer will be able to view products, register an account with the system, add to basket and pay for for items. I believe this is 80% ready for commercially ready but I think more revisions should be made on the security aspects before real world deployment.

7.7. Testing/evlauation

Unit testing shall be carried out on each of the components of the system before the system will be tested as a whole using integration testing methods. As per the project plan(*fig4.1*) the complete integration testing is scheduled for week 1 in August, but the components shall be unit tested during development from week 2 in July until week 1 in August.

7.8. Project Management

The project plan(*fig4.1*) is a slightly updated version that I had planned to follow. It outlines how the project is going to be developed using a waterfall methodology from 4 weeks of the planning phase in June to 4 weeks of a development phase in July concluding with testing and delivery within 2 weeks in August. I believe I have managed the project well adhering and meeting all the specific milestones I have defined in my plan. I am clear in what is achievable in my project having defined all the requirements nessecary to complete the project. If there is any changes in the system requirements or design, I will ensure that all the documents submitted will be updated with the latest changes to the project.

8. Summary of project progression

The objective of this project to build an e-commerce web application for SimpleFocals prescription eyewear retailers. The web application is the entry point that will allow consumers to easily login to SimpleFocals system, browse range of prescription eyewear, upload their prescription, order and pay for glasses. In the completion of this project a number deliverables are to be submitted. A table(*fig2.1*) showing the documentation deliverables was outlined. Application component deliverables were outlined as follows: **Facilitate a CMS(Content Management System) for administrative use, Allow the user a secure login, Allow the customer to register with the system, Allow the user a secure login, Facilitate a secure payment mechanism, Allow customer to upload their prescription, Allow a customer access to a cart, Facilitate a user friendly experience**. The current targets I have met were submitting **Documents to date**(*fig2.1*), developing **Wireframes,** conducting **Payment processing research, Developing the system architecture** for the application and beginning the development of **Facilitate a CMS(Content Management System) for administrative use** component of the system. The deliverables that are still to be submitted are outlined in table(*fig2.1*). Most of the application implementation is about to start as the project enters the development phase. The timeline for development can be viewed on the updated project plan(*fig4.1*). Some of the problems I faced so far in this project were: having deep **Understanding of the internals of the**

framework/technologies, Time Constraints in completing sections of the project and **Debugging code in the project.** Some expected stumbling blocks are **Implementation** of the components of the system, the **Time Constraints** to finish the project and **Presentation** delivery.

Acronyms, Abbreviations and Terms:

API: Is the acronym for Application Programming Interface, which is a software intermediary that allows two applications to talk to each other.

CMS: A content management system is a computer software used to manage the creation and modification of digital content.

JPEG: JPEG stands for Joint Photographic Experts Group, which is the name of the organisation that developed the image format.

PDF: Portable Document Format, standardised as ISO 32000, is a file format devel oped by Adobe in 1993 to present documents, including text formatting and images, in a manner independent of application software, hardware, and operating systems.

REST: Representational state transfer is a software architectural style that was created to guide the design and development of the architecture for the World Wide Web.

Postman: Postman is a collaboration platform for API development.

Spring: The Spring Framework is an application framework and inversion of control container for the Java platform.

Hibernate: Hibernate ORM is an object–relational mapping tool for the Java programming language.

Thymeleaf: Thymeleaf is a Java XML/XHTML/HTML5 template engine that can work both in web and non-web environments.

CRUD: The four basic operations (create, read, update, and delete) of data storage,

References:

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[Accessed 4 July 2021].