



Coeliac Disease Symptom Tracker

Project Final Report

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Abstract

This document consists of a reflection and discussion on the final year project. Various aspects of the project will be discussed such as elements that were/were not achieved, learning outcomes and what development would take place if I had the opportunity to complete further project iterations. Also covered in this document is the testing methods that were used and a report of how much the result deviated from the initial specification and proposal. This report has been written in relation to the coeliac disease symptom tracker outlined in previous documentation.

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Introduction

This document will contain an overview of my experience building my final year project. This will include details on various aspects of the development process such as experience with new technologies, what I feel I could have improved on and how I might have made those improvements. These topics will be discussed under six headings; project description, API testing, learning process, project review and finally, acknowledgements.

The project description will contain a detailed overview of the project. Application testing will include the methods used to test the application programming interface. The learning process will cover personal and technical learning outcomes. Project review will contain information on the perceived success of the project regarding what went right, wrong or is still outstanding. The project review will also outline what aspects of the project were achieved/not achieved and the deviation of the final application from the initial proposed application.

Project Description

Coeliac Disease Overview

Coeliac disease is a condition that occurs when the ingestion of gluten causes damage to the small intestine. Gluten intolerance is an autoimmune disorder, which is where the immune system attacks healthy cells mistakenly. Coeliac disease occurs in genetically predisposed individuals in all age groups. Individuals with coeliac disease are at higher risk of obtaining various conditions in later years such as lactose intolerance, osteoporosis and infertility.

Project Overview

The application consists of a symptom tracker that is primarily targeted towards teenage coeliac disease patients. The application allows the user to log details about their symptoms such as severity, mood and the time of day where they experienced the symptoms. The application will allow the user to explore information associated with previous days. Although the application is targeted primarily at teenagers, the application is suitable for all individuals with a level of gluten intolerance. Being a coeliac is burdensome, restrictive and challenging. This application will provide information that is crucial to their continued wellbeing by allowing the individual to keep track of the symptoms that they possess and the severity of those symptoms. This application was completed as part of *Erasmus+*.

Architecture & Technologies

The application uses the following technologies:

- **Front-end** – ReactJS
- **Database** – MySQL
- **Server** – Flask

Tools used:

- Visual Studio Code
- Postman API development IDE
- PyCharm
- Github
- phpMyAdmin
- FluidUI
- XAMPP web server solution
- PythonAnywhere
- Github Pages

API Testing

The testing for the application programming interface was carried out using Postman. Postman is an API development environment. It has an easy to use interface that can construct HTTP/S requests and read their responses. I used Postman to ensure that all the API requests were working as planned before implementing the requests in the user interface. Figure 1 contains one such request.

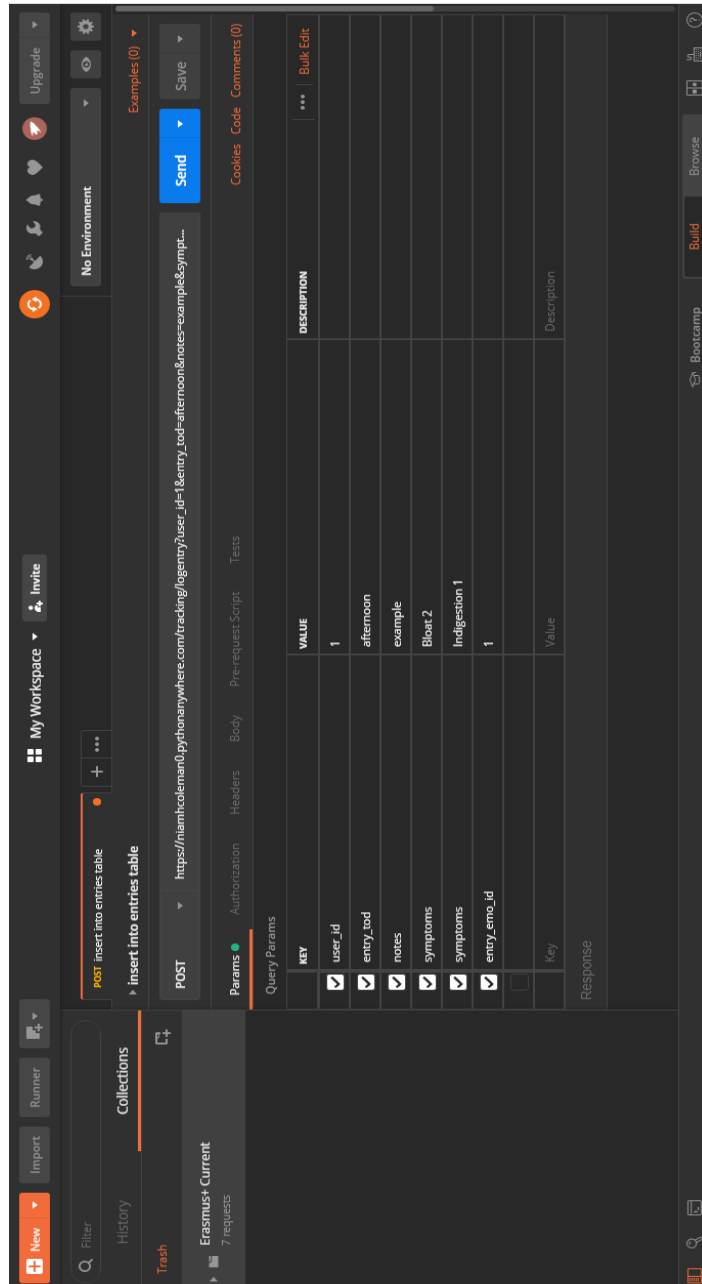


Figure 1.

Learning Process

The main outcome of the fourth-year project, in my opinion, was to expose the student to all aspects of the development of a product. The student can be a part of the project from conception to completion. My project was undertaken as part of *Erasmus+*. I chose to take part in the *Erasmus+* program as I wanted to step outside of my comfort zone and be challenged. The *Erasmus+* project added various challenging aspects to my fourth-year project such as working with students in other fields such as user interface design, game design and health science. Another challenge associated with the *Erasmus+* project was conflicting schedules. The students that were involved from other countries were working on a different academic schedule to Ireland. For example, at the point when I was midway through development, they were still working on the user interface. The changes implemented caused me to have to start UI development of the tracking function nearly from scratch in February 2019 when the user interface underwent large changes, with a knock-on effect of one of the functions of the application having to be taken out of scope. However, taking part in the *Erasmus+* project has also had numerous positive effects on my final year. I have had the opportunity to travel and meet new people, I have also had the opportunity to work with people from different disciplines. Doing the *Erasmus+* project has contributed to me realising that I may want to pursue a master's degree or consider lecturing.

Technical Achievements/Learning Outcomes

While completing my project, I gained exposure to multiple new languages and platforms. Due to the project being part of *Erasmus+*, the technologies that we had to use were provided to us at stages during the year. This was an advantage from one perspective, as the technologies were chosen by the lecturers involved in the project and as such we could be sure they were good choices. However, for me, this also meant that nearly all the technology we would use was completely new to me. This proved challenging at times. However, this also helped me to improve my ability to learn new things on my own, using the resources at my disposal.

ReactJS

ReactJS was used for the user interface of the application. I had no prior experience with ReactJS and initially found it very challenging. React utilises a component-based architecture, which meant that I couldn't just jump in and start coding. I had to plan out how I would structure my components before I started. In the end, I gained substantial experience with React due to the large changes that took place in the user interface in February 2019 after the trip to Austria. I also learned the importance of being code efficient as the code base can build up quite quickly even for a small application.

Interface Prototyping

During this project, I created user interface prototypes before I started any of the coding for the application. This was something I had never done before, but I found extremely helpful as it sped up the actual coding. Having the wireframes and prototypes to look at helped to keep the goal for the user interface clear in my mind through the entire development process. Having these prototypes was also a way for me to quickly change around the user interface and experiment with user interface design.

Python MySQL

Creating the API for the application was the part of this project that I enjoyed the most. This was because I had to work out the logic of the statements to successfully carry out requests. I had no prior experience working with APIs or Python MySQL. The API for the application was built using Flask. The most challenging part about building the API was that the decision of language wasn't finalised until later in the year. Due to this, I couldn't work on becoming familiar with the language earlier in the year.

Postman

While developing the API, I utilised a tool called Postman. Postman provides a friendly graphic user interface through which you can send requests to an API and see the response given. Using Postman sped up the development of the API exponentially as I had a quick and easy way to see errors. Postman also contributed to my understanding of JSON as I could see the layout of the response and learn from it.

JSON

JSON (JavaScript Object Notation) is used in the application as the format in which data is passed between the server and the application interface. I had never worked with JSON before and after working with it I feel that I now have a better understanding of the communication that takes place between the server and the application.

UI Design

During this project I had the opportunity to learn about user interface as there were interface design students involved in the project. I had very limited experience and knowledge about user interface design before this year and was surprised to learn that I enjoyed it a lot. I was extremely interested in the science and logic behind placement of components. This application is a web application and can therefore be viewed on any smart device. This meant that design had to be done with all platforms and devices in mind. Figure 2 (next page) illustrates this.



Figure 2.

MySQL Database

MySQL databases were the only technology with which I was previously familiar. However, I had limited experience with designing database architecture. I feel like this was one of the most valuable learning outcomes of the project for me. Working out how the database would be structured gave me a better understanding of database driven web applications that I could then take into my other subjects e.g. the secure application development module.

Deploying the UI, API and Database

When deploying the ReactJS code I chose to use Github Pages. This came after extensive research on sites where I could host a React application. The Flask API was hosted using PythonAnywhere. Although this wasn't my first time using PythonAnywhere, it was the first time I had worked with an API. It was also the first time I used PythonAnywhere to deploy and use a MySQL database.

Personal Achievements/Learning Outcomes

Coeliac Disease

To complete this project, I had to research coeliac disease. Before this project, I had very limited knowledge of the condition despite my mother being recently diagnosed. I had no idea about the extent of the long-term effects that can occur because of coeliac disease. Having this knowledge that the application I was developing could potentially improve the health of the user, I found the experience of my project extremely fulfilling.

Learning my Interests

Doing this project has exposed me to the entire lifecycle of application development in a way that I hadn't previously been. This has helped me realise which areas I am more interested in than others. For example, I really enjoyed getting the opportunity to learn more about user interface design. Through the *Erasmus+* project, I worked with interface designers to help improve the application design and usability. I know now that I would be interested in getting involved in interface design in the future.

Flexibility/Working in an Agile way

Taking part in the *Erasmus+* project meant working with many people, in Ireland and abroad. These individuals all had various schedules and areas of expertise. Working with so many people meant that I had to be flexible and open to change. An example of this would be when the project spec underwent drastic changes in February 2019 after the trip to Austria took place. The application user interface was changed significantly enough that the scope of functionality for the project had to be reduced and the user interface started again.

Working within a Team

As mentioned previously, the *Erasmus+* team consisted of a lot of people, situated internationally, from different disciplines. Working with such a large group, I had to work to improve my interpersonal communication skills. During the trip to Amsterdam, the group carried out brainstorming. This challenged me to put myself out there and interact within the group. This was made more difficult because English was not the first language of all individuals in the project. I found the experience extremely rewarding and through the experience I have become good friends with many of the project participants.

Project Review

The specification for this project has evolved over the course of the year. This has resulted in various changes to specification and scope. The following describes the functionality that was achieved against those detailed in the function specification and design documents. Also discussed are the problems encountered.

Achieved

I achieved the following features and functionality in the application:

- User interface design and navigation development.
- All functionality associated with the ‘account’ tab i.e. returning information about a specified user, allowing the user to change the password associated with the account.
- All functionality associated with the ‘tracking’ tab i.e. the user can successfully fill out the multi-step tracking form and add an entry to the database.
- All functionality associated with the ‘history’ tab i.e. the user can choose a date from the calendar displayed and get the entry information associated with the date.
- Full connection of the user interface to the API i.e. the application accesses the database via an API and not directly from the application.
- Deployment of the database and application API using PythonAnywhere and Github Pages.

Not Achieved

The following functionality was not achieved in the application:

- Log in/registration functionality.
- Insight generation i.e. providing the user with interesting information regarding the information that they have been entering. This would include information such as the most common symptom/emotion or reductions in symptom severity over time. This information would be available to the user in the format of various graph types.

Further Iterations

If there were further iterations taking place on this project I would first develop the insight generation described above as I believe that this would add the most value to the application. I would also like to implement a search feature on the symptom page so that the user does not have to search manually for a symptom from among those listed. Finally, I would like to spend more time learning about application security and apply these principles to the application while implementing a log in/out and registration feature.

Problems Encountered

Too Much Time Spent on Interface Design

As this project is part of *Erasmus+*, the technologies to be used in the project were all chosen by the project organisers. I had no prior experience with ReactJS and it took me a while to become accustomed to its component-based architecture. If a page has multiple components, the ‘state’ of these components must be pushed to the parent for use in a request to the API. I found this approach difficult to get used to initially and as such, I spent longer on user interface than I had initially planned. I also found myself getting too bogged down with design of the user interface and because of this, functionality implementation started later than I had initially planned.

Differing Timelines with Erasmus+ Project Participants

The *Erasmus+* project included participants from Austria, Spain and the Netherlands as well as Ireland. Students from the other countries were following a different academic calendar and timeline. This meant that in February, when the group was in Austria, the other students were still only in the prototyping and designing phase of their projects. I had already developed the previously designed (in Amsterdam) user interface at this point. The application underwent significant redesign which resulted in development of the user interface being set back and the scope of the project having to be reduced as a result to account for lost time. It was at this point in time that the ‘insights’ mentioned in the not achieved section of this report, was removed from scope.

Sharing a Database

For the *Erasmus+* project, all participants shared a MySQL database. Because of this, any common tables e.g. the users table, had to be discussed and defined as a group. This was challenging because participants were in different courses and as such had limited time to meet up in person. It was also challenging because if one of us needed to make changes to a table, we had to think about how these changes would affect the other developers. In the end, the deployment of the group application was postponed, and I had to take the initiative of deploying the website myself so that I had a hosted project to demonstrate.

Deviation from Initial Project Specification

User Interface

During the year, the project evolved in various ways. The most substantial way that the project changed was regarding the UI. Initially, the steps involved in tracking symptoms all featured on one screen (figure 3). However, after specification changes were put in place by the user interface designers involved with the *Erasmus+* project the tracking functionality took place using a multi-step form (figure 4).

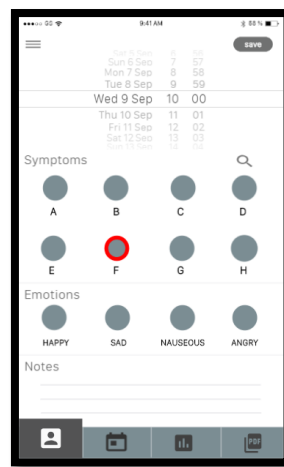


Figure 3.

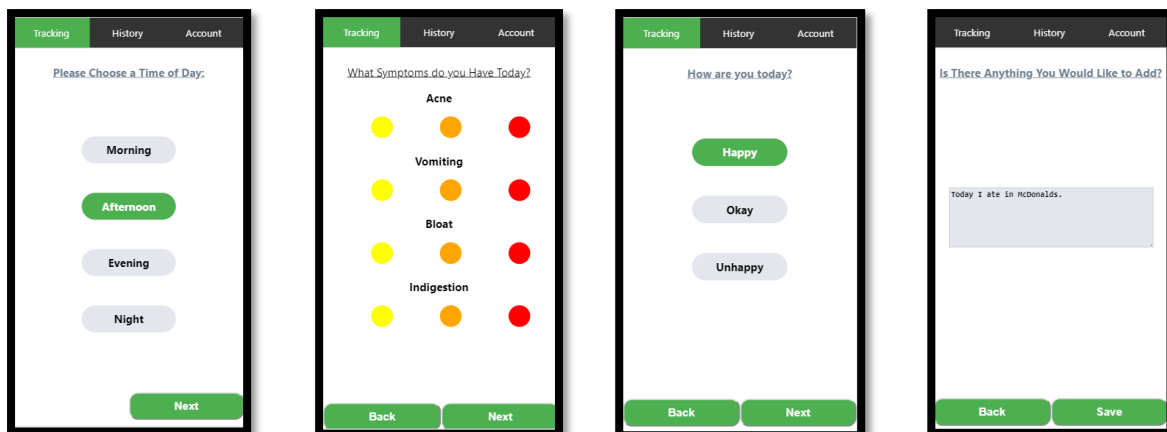


Figure 4.

Reduction of Scope

To have time to implement the changes outlined above I had to remove one of the other functions from scope. The function that was removed would have included using the information that is being provided by the user to generate insights into their symptoms. These insights would have included some of the following:

- What symptom was logged most frequently.
- What symptom(s) had seen the most improvement over the last week/month/year.
- What symptom(s) had seen the most decline over the last week/month/year.
- Assessment of whether emotion levels have been volatile or consistent over the last week/month/year.
- Whether the number of symptoms being logged has increased/decreased over time.

The user would have been presented with various options on how they would like to view this information i.e. choose the type of graph/graph colours or whether to see the information in a text-based way instead of a graphical manner.

Conclusion

I have achieved my goals regarding functionality and learning outcomes for this project. I enjoyed the challenges brought before me and the opportunity to be centrally involved in an application for the entirety of the development lifecycle. I am now much more educated and emphatic about coeliac disease and the effect that it has on the individual.

The tools used in the application were as follows:

- **Visual Studio Code** (front-end)
- **Postman API development IDE** (API development)
- **PyCharm** (API development)
- **Github** (Version control)
- **phpMyAdmin** (Database development)
- **FluidUI** (Interface Prototyping)
- **XAMPP** web server solution (Server)
- **PythonAnywhere** (API deployment)
- **Github Pages** (ReactJS deployment)

The application was primarily tested using Postman API development environment. I learned an immense amount of new information while completing this project, both personally and from a technical point of view. The functionality not achieved for this project consists of log in/registration functionality and the generation of insights based on the information logged by the user. The main challenges that I experienced consisted of:

- Spending too much time developing the user interface.
- Differing timelines with other *Erasmus+* students.
- Sharing a database.

If I had more time to complete further iterations of this project, I would like to implement the insights feature, search symptom feature and log in/ registration feature. As the project was developed throughout the year, it underwent various deviations from the initial proposal and specification. The changes consisted of an altered user interface and the consequent reduction of scope that followed.

Overall, this experience has been challenging and enjoyable for me to participate in. I also believe that there should be more applications in the future that cater to specific life-long illnesses such as coeliac disease. The application that I have created could be mirrored for any such illness by simply ensuring that the correct symptoms are shown for each illness. Participating in a project like this one, which is designed to improve the life of the user, has shown me another side of software development. In the future, I would like to be involved in an application with a similar purpose.

Acknowledgements

I would like to thank my project supervisor Dr Joseph Kehoe for his consistent help and guidance throughout the project.