AF - DATE CONTROL
APPLICATION FOR RETAILERS STOCK

Final Year Project
B.Sc.(Hons) in Software Development

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Chapter 1

Introduction

The Final Year Project, a chance for myself to culminate what i have learned in the four years of study in the field of software development to produce the project of my choosing. When choosing what i wanted to develop for my final year project, i had to split it up in to many different aspects. The idea, the reasoning and why it would be beneficial for human use and also economically sufficient for the target audience. I also needed to choose a technology to use, what programming language will i use, pros and cons, what database storage will i use to store data applicable to what i will develop.

Figure 1.1: Various Software Languages to choose from.

When deciding on what type of project and application to pursue, i wanted to integrate it into something involved in my weekly life. My part time job as a Sales Assistant benefited me in making a decision on what type of project to do. I looked into the everyday functionality of the shop and after working there for just under 5 years i was very experienced in knowing the day to day operations of the store. I looked at different ways i can make the staffs job easier and at the same time, save the shop money by creating this application. I also used Google Scholars to gather more information on this problem in retail and will be referencing the citations throughout the dissertation. Here is a article citation that gave information about the amount of food loss in the industry and the problem i wish to solve with this application is to reduce this number by getting to a product in time to use elsewhere in the store such as the deli or even reduce the item. [1]

When deciding on a technology to use, i wanted to use what suited me for the system design and development stage. I wanted to choose a database for data storage that i was familiar with and what made my life easier. What IDE will i use to code my project. There were so many available but ultimately i chose the one that suited me and the project combined. I also needed to pick a database service to work of, Amazon Web Service (AWS), Firebase, MongoDB and Microsoft Azure all come to mind as during this course i encountered all of these some for assignments and some for personal projects which i have done during the tenure of this course. I had a decision to make, the decision had to make sense for me and for the project itself, what elements of each would benefit me and the functionality of the software development.

Figure 1.2: Database Option: Firebase.

Figure 1.3: Database Option: MongoDB.

Figure 1.4: Database Option: Microsoft Azure.

Figure 1.5: Database Option: Amazon Web Service (AWS).

I wanted to create something that would help my workplace, my fellow staff members and of course my management team and saving time and money for the shop I've been working in for five years. I noticed one element that is being done but not everything catches the eye. Date Control. This is obviously observed by the retail staff who work on the shop floor, who go around and check the products best before date. This is obviously done in a manual manner and due to uncontrollable human error of missing a product and not to mention the stock room barley being checked I've come up with the idea of producing a application/program that allows the staff member to look at this application to see every product for each section of the shop such as biscuits and cakes section, dairy, meats and so on and being able to identify which items to take off the shelf and either scan them for returns, reduce the items or waste them, depending on the type of product and the safety of selling that particular product.

I decided to pursue this project as i feel it links my college life and work experience together as one. When picking my technologies to produce this project i looked at every aspect of each technology however after much thought and looking at the pros and cons for each, i decided to develop this project inevitably in ionic Firebase. I had past experience for both and being honest had the best experience of both, i like the way it both connect and the smoothness of ionic when coding and running. This was not my initial pick, which i will mention later on in this dissertation.

Figure 1.6: Chosen Technology for Date Control Application, Ionic Firebase.

Figure 1.7: Best Before Date Example Fig.

In this dissertation i will be covering every aspect of this project including the following:

- The Methodology of the project, the software development and research side of the project, the type of approach made to development, the testing of the project, the development tools and the usage of GitHub.

- The Technology Review, why i pursued this project, why did i want to help my workplace, is my project idea beneficial and sufficient, surveys conducted, the planning of the project basically my developer diary, technologies used in the project even extra ones if any, the references used in helping me develop the software application, the issues and limitations encountered during the software development and any other elements i didn't mention.

- The System Design, how i designed it, styling and HTML etc., the design sketches i did for the application, what i wanted my program to look like and why i designed it like i did, and of course any extras i learned when developing the design of the application.

- The System Evaluation, the objectives and goals set out, were they achievable ?, the software testing results shown in a testing excel sheet, results of the conducted surveys, testing conducted by my fellow staff members, and the limitations i had for this project.

- The Conclusion, where i will look back at the rationale and goals of the overall project, i will highlight my findings from my system evaluation and discuss the opportunities and flexibility this project has made for me and others especially the target audience, can it do more than one thing, can it benefit me for future interviews and could i possibly present this idea to potential investors etc.

- The References and Appendices, here i will include my GitHub repository for the software development of the application for the project and the references i used to help me develop the application and give a brief description for each reference. It will also include how to run the application accordingly.

- The Bibliography, here i will include in articles, pieces or reference to a quotation from it's citation. This is the information i gained in my research on this particular product of date control in retail.

Figure 1.8: GitHub Containing the Software Application for the Project.

The GitHub Repository i used to commit and push my software development accordingly is: https://github.com/AndreasFahey/AppliedProject-DateControl

Here you will find all my work both in researching and development of the project and how to download and run the application. You will also see issues raised during the project and if they were resolved. Also the commits and what i done for each commit will also be available to see the timeline in which i did things in the software development side of the project. This full dissertation will also be available on the GitHub repository as part of the download of the project along with a screen cast, PowerPoint and software testing results on a excel document.

Chapter 2

Methodology

As mentioned in the introduction above, i looked at my weekly life as inspiration in deciding what type of application i will be making for my final year project. I looked at my place of work in retail in which i have five years experience. I looked at the day to day operations of the shop to see could i find anything that would save time and money. My idea of a Date Control System saves time for staff when looking for items on the shop floor, they could just look at this application that would be linked to the shops stock database to show when products are close, on or past their sell by date, giving staff members the edge in finding all they need, whereas if it's done manually in person a staff member may miss something, putting a customer at risk of buying an out of date product. This idea also saves the shop money as in the sense it gives staff members time to possibly take the product off the shelf and reduce it so the shop could make some money on the item instead of just wasting it or getting very little in credit from the supplier.

2.0.1 Software Development v/s Research Methodology

2.0.2 Agile / Incremental and iterative approach to development

2.0.3 Validating & Testing

2.0.4 GitHub and Dev Tools

To develop this project i created a repository on GitHub and cloned the repository to my computer desktop. I then opened the folder in the command prompt window and installed the relevant libraries, modules and add-ons for the ionic firebase application i planned to create. When the relevant npm(angular cmd command) installs were completed i then needed to open the IDE for the software development. After creating the ionic project i went into the project directory and opened the project in Visual Studio Code using the command

'code .'. I could of used a range of different IDEs to do my project but Visual Studio Code was my preference due to my experience using it during the 4 years of the course and because its my go to editor. Not to mention Firebase was my choice of database to store Authentication data and product data.

Chapter 3

Technology Review

3.0.1 The How and Why

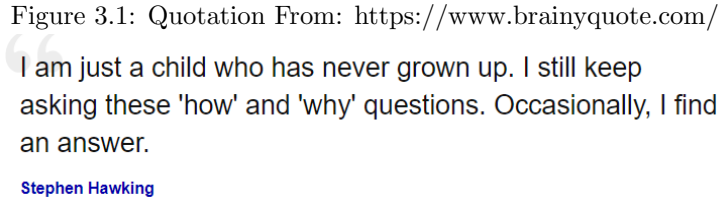


Figure 3.1: Quotation From: https://www.brainyquote.com/

With new ideas comes an influx of questions, the main two being the how and the why. How this idea came about ? this idea came about after five years of working part-time in retail. Looking at the day to day operations of the shop and what can i try and improve with what i have learned in college for four years, in this case i highlighted one area of the shop that i could integrate into my final year project and that is to develop an application to ease the burden of Date Checking for my fellow staff members. The human eye cannot spot everything, this would save time and money for the staff and shop as a whole respectively. The good thing also about this idea is the fact that it can be very flexible and can be made into various different types of applications with minor tweaks. This is a major characteristic that companies and retailers demand, versatility. It can help in many different ways.

So why this particular application and why would it be purposeful in the industry of retail. This interesting piece [2] provides incentive information about the global food wastage problem, this application will address this issue not just locally but globally. This piece proves it is an issue worldwide and with this application i hope that it can be a massive help in reducing this worrying statistic and flatten the curve of this problem as food wastage is still on the rise. This will help staff in finding the products before they go out of date and take

action. Be it reducing that particular item or using that product for something in the shop, for example identifying a packet of sausages or rashers and putting giving them to the deli staff to cook and sell in the hot deli. This is a norm in the shop i currently work in part time and i feel this is making a difference however more can be done like always. Of course you are not going to be able to give every product close to it's sell by date to the deli or reduce it. This isn't going to solve the issue entirely but help it as much as it can.

3.0.2 Beneficial and Sufficient

Before pursuing a Date Control Application for Retail i wanted to know would it be beneficial to staff members and superiors in the workplace. I conducted a minor survey enclosed within my workplace to get some feedback for this potential idea. Which i will show the results in the Surveys section below. I personally believe this application idea will be very beneficial and sufficient for retailers across the country and even beyond and the good thing about this application is that it is not intense or in anyway complicated it is basic and easy to use for the staff member or user. It is not made to look exquisite it is made to solve or help an global issue in food wastage and to save shops time and money.

Outside of retail can this be beneficial and sufficient to other industries or organisations ? I very much think so. I feel it can be beneficial to the likes of charities and food banks. Items that may not be eligible for returns for credits can be donated to food banks or charities or even compost companies. [3] Here is an interesting read on food banks and the welfare crisis in which it looks at the benefits of food banks for society. This is one of the many reasons why food wastage is a global issue that i hope this basic but sufficient application can address and aid in diluting these issues.

Figure 3.2: CBE Provides Shop Databases and Tills

The purpose of this application other than helping the retailers directly is offering this idea or application to my local retail database and till provider known as CBE. They control the inventory of the shops and provide the retailers with modern day tills all across connacht. Having five years experience with their system i know that they don't offer the idea that i am trying to implement. I can see this being very beneficial and suffiecnet to them in saving them time and money and providing an extra service to their loyal customers.

Here are some images on the permission of my superiors of the CBE Database system of where the stock is recorded as waste or returns:

Figure 3.3: CBE's System in my workplace 1:

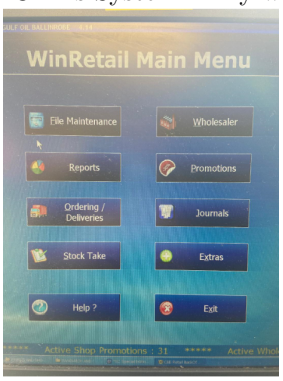


Figure 3.4: CBE's System in my workplace 2:

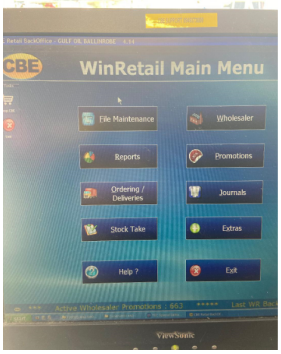


Figure 3.5: CBE's System in my workplace 3:

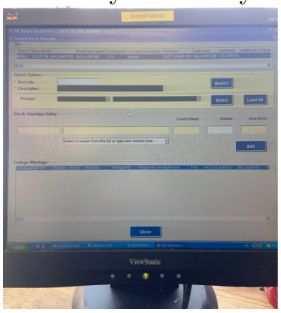


Figure 3.6: CBE's System in my workplace 4:

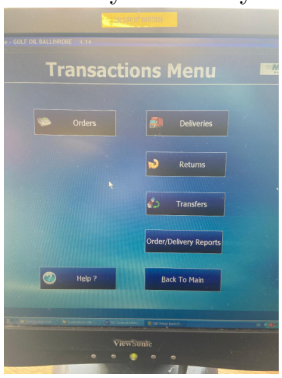
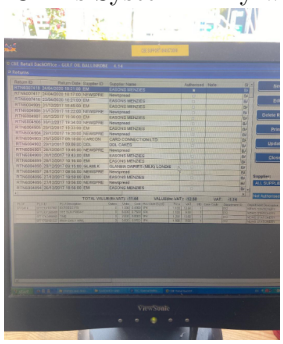


Figure 3.7: CBE's System in my workplace 5:



As you can see in the images above, this is an example taken from the shop i work in. The system provided by CBE that gives reports, wastage, returns details and so on. You can also enter in the delivery dockets here to keep track of your stock but what i am trying to implement is not here. As humans we are expected to find the products that are close or past their sell by date, customers may have a better eye than us and find products that we missed and purchase them deeming them ineffective or dangerous for consumption. My application helps address this existing issue and prevents customer harm and helps the retailers save money and being able to act quickly. To conclude i do believe this application is beneficial and sufficient and based on the survey results my fellow staff members and superiors also think so.

3.0.3 Surveys & Results

3.0.4 Planning Project

3.0.5 Technologies

The Technologies i used to develop my idea were as follows:

Figure 3.8: Developed the code in Visual Studio Code.

- Visual Studio Code - The IDE of my choice for coding the project.

Figure 3.9: Programming Language of My choosing for SD.

Ionic - The programming language in which i coded my project. For the four years of software development course in GMIT i studied various different languages such as Java, C++, C, C Sharp, Python, Ruby and many more. I initially decided to got with using Angular as my programming language for my final year project, however it was giving me various issues and i didn't like the way it was turning out so i decided to code this project using the ionic programming language framework. [4] Here is an in depth description of building an Ionic Firebase application that i came across in third year that helped me and my project partner in getting started.

Ionic enables you to develop applications using web technologies and languages like HTML, CSS, JavaScript, Angular, and TypeScript. Consider Ionic as a front-end software development kit (SDK) for creating a blend of applications. Ionic provides a collection of components that imitate the native look, feel and functionality of each platform, mainly known for mobile applications but also considered for web applications also, the flexibility of Ionic Framework is why i made the decision to switch and the fact that in my opinion it suits what i in-visioned when sketching the pages i wanted and how they look for the user. Examples of these components include buttons, tabs, menus, lists, cards,

modals, and so on. However for colors it is not so broad, but they suited what i was trying to implement. At the end of the day this application was not created to look pretty it was created to solve a problem in the work place, a Date Control Problem.

Out of the four years of studying software development, Ionic and Angular stood out. In my second year of study in GMIT i encountered the Angular Framework, and in third year i encountered the Ionic Framework. When coming up with the idea of creating my Date Control application i wanted to use a language i liked and enjoyed doing. In third year for the group project myself and another student created a cinema booking website using Ionic Firebase. From then i knew i wanted to use Firebase for its easy implementation into the Ionic Framework for an application. As i always want to learn something new, although similar Ionic and Angular are different, as mentioned above i initially started the project in Angular and then switched to Ionic. I did this as i did not feel as comfortable with Angular Firebase as i did with Ionic Firebase. I'm glad i made the switch for a number of reasons including software development, overall design and it's link to the Firebase DB Cloud.

Figure 3.10: Cloud Database of My choosing for Data Storage.

- Firebase - The Cloud Database i used to store User Authentication details and store the product entry data for crud functionality. Note for private and security purposes i the admin of the Firebase database cannot see what the users passwords are, firebase hash them in which i or anyone else does not know.

Figure 3.11: All Project Items are on GitHub and can be cloned.

- GitHub - I used to publish my project on the internet for the thesis and for people to then test themselves. GitHub gives a brief description of the project as a whole and explains to the person wishing to test how to run or try out the application.

Figure 3.12: This project dissertation was edited on Overleaf in LaTex.

- Overleaf - I am using overleaf as a Latex editor for this project dissertation. I used this template provided to us from our year head.

3.0.6 Issues

Figure 3.13: In Every Project or Idea Issues arise.

In every project or idea issues can very easily arise. During the software development you may encounter issues such as compile errors, server errors, and maybe some code implemented that worked on older versions of software, for example, some functions or declarations that work on Ionic 2 wont work on Ionic 5 and so on. HTML issues such as buttons not working, pages not showing due to an error in the code and so on. Issues can very easily arise in any software projects, in fact make that any project whatsoever. In this section i will be discussing the issues that arose for me during the software development part of the project.

The first issue arose when i decided to pursue the Date Control Application in Angular Firebase. Having done Ionic Firebase in Third Year for the group project i wanted to challenge myself in trying out Angular with Firebase. Having set up the authentication with Angular Firebase i didn't like the way it was looking and what it was going to look like when implementing the CRUD functionality to the application.

I then realised that i wanted to pursue this project in Ionic. I made the switch which you can see in the early commits of the software development of the project. I made the switch of course for the reasons mentioned, however i also switched due to the fact i was familiar with Ionic Firebase having completing a

project in it before. I liked the look overall of Ionic. This did not hinder me to much in the completion of this application. At that stage i was at the stage of testing the waters, what will and won't work and how it will look in the end. This wasn't a major issue and i was glad i made the switch.

The Next issue that arose was the authentication "reset/forgot" password.

Another issue that stood out was the sorting issue. I wanted to sort the data read into the Firebase Cloud Database to be loaded into the food groups pages with the best before date closest to the current date to be at the top of the list.

3.0.7 Project References

Chapter 4

System Design

4.0.1 The How

I developed this application using my knowledge of Ionic and Firebase with past projects and labs conducted in the environment of GMIT. I also had the aid of online resources for different functionality and design of the project. The Ionic Framework helped me with designing the project while past projects on my GitHub and a mixture of online resources and video tutorials aided me in the functionality of the project. My Applications functionality was developed through a back end and front end.

The back end handling the Firebase Database stuff, in this case my authentication and crud functionality was handled here working in the background of the application. It stores the users on the Firebase website after a registration is made. Staff cannot access the applications main frame until they have verified their email, which may be in their junk/spam folder of there preffered email. It stores the data read in by the staff member, in this case the product details, note this form was implemented for prototype purposes.

The front end is what the user of the application sees, so the design of the application, all the food groups, staff log in, staff log out, staff register and so on, here you can see the work of the back end, you can see the data read in from the Firebase Database showing the data read in by the user. I must mention that the form in this application is for prototype reasons which i have mentioned above, in the application i envision potentially co-insiding with the retail till and shop stock database company CBE it will only show the products as the delivery dockets are read into CBE's system.

4.0.2 Sketches and Diagrams

4.0.3 Application Design and Why

For this Project Prototype i used Ionic Design Framework. Personally i love the look and smooth functionality of the Ionic Tags in HTML of the applications i have made and developed before. This was one of the main reasons i switched to ionic from angular as mentioned in the above Technical Review of the project.

I wanted the design of this project to be aesthetically pleasing for the user/staff member. I wanted them to know what the application revolved around, with a nice retail type background and color coded buttons for each high and low risk of passing its sell by date. I tried to implement images as buttons for the food groups as recommended by my project supervisor, however the end result wasn't what i envisioned from the outset. This application is for staff, not just anyone, they want quick viewing and easy to identify buttons for each divided food group. You will notice when testing this application that i left out the fruit and vegetables section, as mentioned above, fruit and vegetables vary, the majority do not have sell by dates, this is examined by the selling factor of the particular fruit. Would you buy it, if no it is wasted otherwise it stays where it is. I have included a misc section for the fruit and vegetables products that have sell by dates but also for product groups not mentioned such as baby food and formulas and health and beauty products which you might find surprising to have a sell by date.

I added features to this application for prototype purposes only as mentioned numerous times throughout this dissertation. The purpose is to show CBE that i could save them time and money in solving a problem within the workplace of retail in stock controlling. If they were to implement this idea, in which i have contacted an employee of CBE who i first conversed with at the careers fair in GMIT last winter to hopefully present this application and even let them test the application if they so wish. In the actual application if they were to implement this would possibly see changes to the application i developed and remove prototype functions such as user authentication for staff, the form for entering in the product details and maybe change the food groups and types and even how they show the data stored in the cloud, which in their case would be the specific database for that particular shop.

The good thing about this application i must say, is it's flexibility, it can be used in various different ways, for example it can be used to keep track and compare with the HACCP sheets we have to fill in every time an item is taken off the shelf, or even be transformed in to an application that allows the user to record what is no longer on sale or in back stock to be ordered, the manager will then see this and order what is needed saving him/her time and the shop money in the process.

4.0.4 Self-Learned Extras

In every project i was given or i uptake throughout my four years of study in GMIT i learned something new in every project. Something new about each programming language, the different functions of cloud databases and local databases. I feel all i have learnt throughout the four years has culminated into this project, this was the chance to show what i learnt and what i liked and disliked. I even used particular past projects to help me with this final year project. I learned more about Firebase and Ionic while doing this project.

Chapter 5

System Evaluation

5.0.1 Objectives Set Out

5.0.2 Testing Results

5.0.3 Survey Results

5.0.4 Work Colleagues Testing

5.0.5 Objectives Met or Not Met

5.0.6 Limitations

Chapter 6

Conclusion

Chapter 7

References & Appendices

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