AF - DATE CONTROL
APPLICATION FOR RETAILERS STOCK

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

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May 5, 2020

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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

As i decided on pursuing a Stock Date Control application i wanted to research if there was anything of the sort existing in the world in shops or warehouses. This was crucial in my research as if there was such a thing i could maybe implement it in my own way or of that to suit the likes of CBE's systems. This would also impact the software development side of the project as i would see how if an existing application exists works and how it is used within the workplace. If it didn't exist i knew i could implement something here that would be able to tackle an existing issue globally in terms of food wastage and customer consumption of an out of date product which can prove to be a very dangerous scenario. Not every customer checks the date on food products, it is our job to do so as shop workers and i feel an application to make date checking more sufficient will help suppress this potential hazard.

Before i started to develop the software for this project, i did extensive research in shop databases and looked at the aspects and gathered inspiration from the shop i work in and their database for stock control. This helped with the design and functionality of the application. If i were to offer this service to CBE for example i wanted to have it in a way that they could implement it into their systems for their customers easily. You will see in the technology review section some screenshots of CBE's system for the shop i work in.

After the past experiences of using the Ionic Framework and Firebase Cloud Storage Database i felt that after research into other alternatives that this was the best option for me in terms of development and easy to access for the staff member. It is all about making the application easy to use for the shop staff and not make it over complicated. This was the major characteristic in terms of the software development. If it is too complicated to use the staff member will not use it and go back to the human instinct of using the human eye to identify close or past their sell by date products. For this i conducted a survey within the shop i work in among colleagues and superiors to get feedback of potentially having this sort of application within the shop to help with date checking. Feedback from those who will be using this application in real time will be the most relevant in terms of factors to consider when potentially implementing this idea.

Research before pursuing a project idea into an application is highly recommended as it gives you insights into peoples opinions, what is needed to make this application beneficial and of course the question of "is it solving a problem". I also needed to refresh myself in terms of Ionic Firebase to be able produce this problem solving application, learning new functional elements and design elements that will make the application easy to use and understand for the shop staff. This was a crucial factor in the software development of this project. Intense research was done on all parts before starting the software development.

2.0.2 Agile / Incremental and iterative approach to development

The approach taken to develop this application was based around second opinions from fellow students, my project supervisor and the members of staff i work with. I met with my project supervisor weekly in the first semester of final year to intensely discuss this idea of a Date Control system being implemented into supermarkets and beyond.

The First Semester of final year was mainly used to conduct a broad plan of the project as a whole. Conducting short surveys within the workplace which you will see shown in the Technology Review section of this dissertation.

Firstly i researched this particular type of application, was it done before ? does it exist currently within workplaces and company systems ? I researched the topic in which i was unable to find much in terms of s system where date control

existed in a manner in which i can see be implemented with this application. This citation from Google Scholar [2] was a very interesting read on the matter however gave me no indication an application or method was in place to tackle this issue within retail.

Sketches which you will see in the System Design section of this dissertation where done for how i wanted the application to look like. I wanted this application to be easy to use and understand for the worker, not make it fancy and complicated. I knew when sketching that i had to implement some elements that may not be used by the shop such as user authentication and a product entry form which wouldn't be used by CBE as they already have the stock inventory's databases for shops which would automatically show the products upon delivery entry. I knew from the outset this would more or so be a prototype more than the real thing to present to companies such as CBE and shops such as the one i have worked in for five years.

It was over the festive period of 2019 where i needed to make a decision on the software development process. I needed to choose what technologies to use such as a programming framework of language along with a cloud database such as Firebase or MongoDB to store the user/staff data such as email and password and product entry in a crud designed way.

After extensive planning and numerous opinions and advice i was ready to start developing the software for this application in early February. This may be later than some, however i wanted assurances over a number of aspects before developing this project in which they were met along with objectives and goals to meet. With every meeting with my project supervisor i shared my goals for the following week at the end of every meeting which encouraged me to work on this project daily rather than leaving it and coming back to it. I can tell you from experience doing it in one big bang in software development is not the way. You will always miss something, even minor. That is why i would not start developing the software until i was happy with the plan and objectives and goals set out and were they attainable.

2.0.3 Application Testing

With every application comes testing. In this case i set out a list of tests to carry out on the application to carry out once the application was operational. The tests are as follows:

- Running The application: This is all or nothing. In this case i will be running an "ionic serve" to run the application before making it a firebase hosted website.

- Log/Sign In to an existing account: To be able to access the main functionality and purpose of this application a user must be able to sign in.

- Register a New User and email verification: A staff member should be able to register an account to be able operate the application as intended. An email must be verified to log in to an account. If not verified you cannot access the applications dashboard.

- Forgot Password or Password Reset: Another new feature i found. Much like verify email to be sent to a registered account a password reset email should be sent to a existing user upon request.

- Log/Sign Out of application: Should successfully log the user out and to make them enter details again if they wish to sign back in.

- The CRUD functionality: adding, updating/editing and deleting a product is the main functionality of the application. This must work to show what is its intended purpose.

The results from these tests can be found in the system evaluation section of this dissertation. Testing the application before release is almost mandatory as if there are any issues you can try mend them or highlight them in release notes if there is an issue that cannot be fixed in time that may only be minor. Please not this will be a prototype to demo to shops and companies linked to shop inventory control to show my idea in real time.

2.0.4 GitHub and Development 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 installs for ionic 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. I also used Overleaf to write this dissertation in LaTeX. In later development i needed to make this application a firebase website for easy access for the user. I had to initialise firebase and deploy my application for firebase to then host my application as a website instead of running ionic serve which may hinder the user if they were to clone the GitHub Repository and having to install all the necessary libraries for Ionic.

Chapter 3

Technology Review

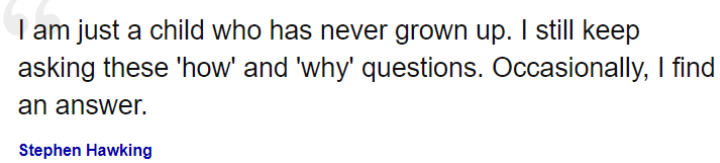
Figure 3.1: AF Date Control Logo

AF

DATE CONTROL SYSTEMS

3.0.1 The How and Why

Figure 3.2: 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 [3] 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. [4] 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 3.3: 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 3.4: CBE's System in my workplace 1:

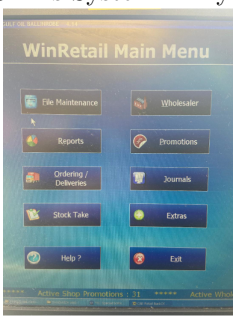


Figure 3.5: CBE's System in my workplace 2:

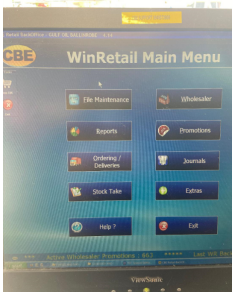


Figure 3.6: CBE's System in my workplace 3:

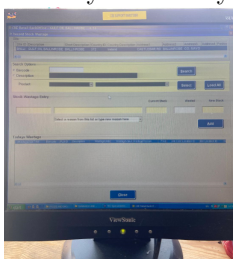


Figure 3.7: CBE's System in my workplace 4:

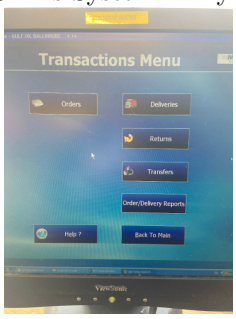
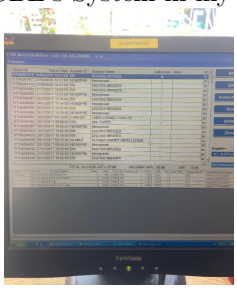


Figure 3.8: CBE's System in my workplace 5:

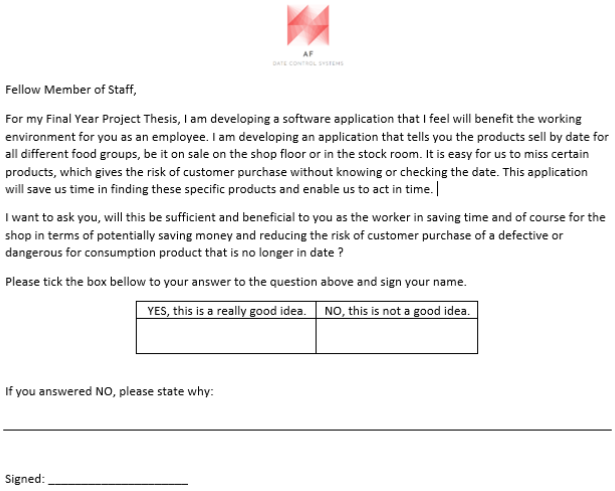


As you can see in the images above, this is an example taken from the shop i work in. The system provided by CBE that gives reports, wastage, returns details and so on. You can also enter in the delivery dockets here to keep track of your stock but what i am trying to implement is not here. As humans 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 Minor Survey

In order to prove the idea of implementing a Date Control Application into the workplace is a good idea and will benefit and not hinder staff members, i conducted a short survey, as you can see in the Fig below.

Figure 3.9: Short Survey for Colleagues at work.



Fellow Member of Staff,

For my Final Year Project Thesis, I am developing a software application that I feel will benefit the working environment for you as an employee. I am developing an application that tells you the products sell by date for all different food groups, be it on sale on the shop floor or in the stock room. It is easy for us to miss certain products, which gives the risk of customer purchase without knowing or checking the date. This application will save us time in finding these specific products and enable us to act in time.

I want to ask you, will this be sufficient and beneficial to you as the worker in saving time and of course for the shop in terms of potentially saving money and reducing the risk of customer purchase of a defective or dangerous for consumption product that is no longer in date ?

Please tick the box bellow to your answer to the question above and sign your name.

YES, this is a really good idea.	NO, this is not a good idea.

If you answered NO, please state why:

_____

Signed: _____

This more or less is a second opinion in creating this application. Hearing different opinions being positive or negative is always good. Even if a negative response is given, it will highlight the pros and cons of this application in a more controlled environment. Does that person think it will benefit them, are they a fan of technology, they may prefer physically looking themselves rather than using an application to find things even if it may take longer in which in creating this application i am trying to save my fellow staff members time with the implementation of this application into the workplace, however everyone is entitled to their opinion.

This was a major factor in the making and outcome of the application as it gave me more information on what to implement and not implement. I needed to make this application easy to use and understand and to make the application functionality not too complex, making it quick and easy to use for staff and managers. This survey helped in getting a second opinion from someone working in the same role as me. I obviously got opinions from fellow students and my supervisor which were relevant but to get feedback from those who will mainly be using this application was vital in the making of this application and to get an opinion from those who will be using it.

The results from this survey are in the system evaluation section of this disser-

tation.

3.0.4 Planning The Project

The Planning of this project took place in the first semester for final year where we were told who our project supervisors would be. Once we were told who our supervisors would be i agreed to meet with my supervisor once a week. I am in full support of the provision of supervisors for the Applied Project and Minor Dissertation as it benefited me hugely in the planning of this project.

For the first couple of weeks i came to my supervisor with a few different ideas. One of them was this Date Control Application i ended up developing. The other two was to make a more sufficient and more operational version of the group project i contributed to in third year which was an ionic firebase application and a game in C Sharp. The Date Control Application stood out from the offset and the weeks that followed. After many discussions in person and via email i decided to take up this project as my final year project. When this was decided i needed to decide what technology i was going to use and needed to find out has it been done before or similar.

After thorough research on the topic i came to the conclusion that this type of application was not done before or if it was it was done by someone as a minor or private application. I discussed the prospect of introducing this idea to CBE once near completion as i felt not only would it benefit retail it would benefit a company that provides shops with their tills and store databases of stock to potentially link my application in some form to their system to save them time and money and even gain customers through this latest potential technology.

I also got in touch with my colleagues and superiors at my workplace to get their view on the idea of using an application to help them get stock before it's sell by date and take action and catch everything in the store, be it shop floor stock or back stock where the human eye may not catch. Knowing from experience this is an existing issue, i have missed products in the shop that my colleague might find the next day. I conducted a mini survey within the workplace and put the results in a graph which you will see in the system evaluation section of this write up.

The next phase of planning was to decide on what technology i was to use to develop this program. Due to the experience of using Firebase for the first time in third year i made the easy decision to go with Firebase as a database host for my project. Having done Ionic Firebase in third year for the end of year group project there i wanted to give something else a go. So i decided to go with Angular Firebase. Lucky enough for me there is a range of different tutorials on Angular Firebase. I made this decision over the Christmas holidays where i decided on the language choice and started sketching some ideas of how i wanted the application to look and what pages/components i wanted to implement into

the project.

I wanted to implement some elements to my application that may not be present in a CBE add on application or store application. User Authentication was one element that i implemented for thesis purposes that would maybe not be on a CBE application for various reasons such as time for the staff member to register an account or sign into an account, this applications purpose is to save time for staff not hinder them. Also i wanted to implement a product details form due to the limitation of not having a shops database at my disposal, this is included in this application to indicate the purpose of the application. To show product details and when their best before date is. So in terms of a real life situation, User Authentication and a product form wouldn't need to be required for the purpose of this idea.

The plan to use Angular Firebase had to change in the early stages of software development for this project. I decided to switch to ionic firebase. There are various similarities between angular and ionic but i felt more comfortable with ionic than i did angular and not to mention i liked the end product of an ionic application rather than angular. Thankfully i changed the plan at the early stage of development.

3.0.5 Technologies

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

Figure 3.10: Developed the code in Visual Studio Code.

- Visual Studio Code - The Editor of my choice for coding the project.
Whenever we received a project from a lecturer, my initial thought was would i be able to develop this project in Visual Studio Code. Out of all the editors we used throughout the four years of study this stands out as my favourite. It is so easy to use and having using it for past projects and the Ionic Firebase project from third year i had no other editor in mind but Visual Studio Code. I like the file views and the smoothness of the editor when developing a program. To develop this project i would open a command prompt inside my project repository directory and type "code ." and it would open up my project in Visual Studio Code. I could do this with any project. I understand it is the more favoured editor among my peers.

Figure 3.11: 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. [5] 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 3.12: 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. Within visual studio code in my software development to connect my firebase database project made on firebase i had to implement unique firebase configuration values to my environments files. It should look something like this if you were to ever take up a project with firebase.

Figure 3.13: Example of Firebase Configuration:

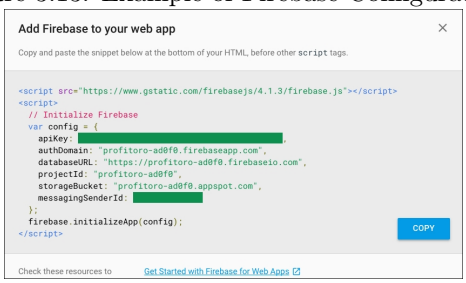


Figure 3.14: All Project Items are on GitHub and can be cloned.

- 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.

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

Figure 3.15: This project dissertation was edited on Overleaf in LaTex.

3.0.6 Issues

Figure 3.16: 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.

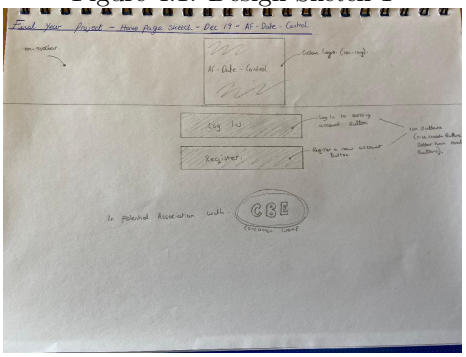
The back end handling the Firebase Database stuff, in this case my authentication and crud functionality was handled here working in the background of the application. It stores the users on the Firebase website after a registration is made. Staff cannot access the applications main frame until they have verified their email, which may be in their junk/spam folder of there preferred 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 partnering 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 as already mentioned.

4.0.2 Sketches and Diagrams

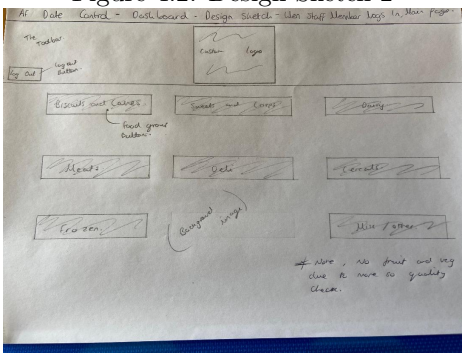
These sketches below were draw before software development started in which i brought to meetings with my project supervisor.
As you can see in the sketch below, this is a sketch of the home page when the application is ran. This is the first page the user is presented with.

Figure 4.1: Design Sketch 1



Here is a design sketch of the dashboard when the user signs in to their account:

Figure 4.2: Design Sketch 2



Sketch of the product inventory page, add product form and product details.
Below is a sketch of a functionality tree of the application
Finally a miniature UML diagram sketch of the application.

Figure 4.3: Design Sketch 3

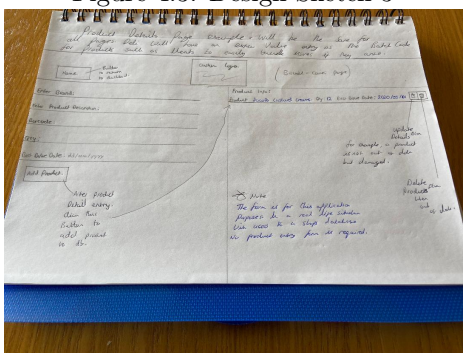


Figure 4.4: Design Sketch 4

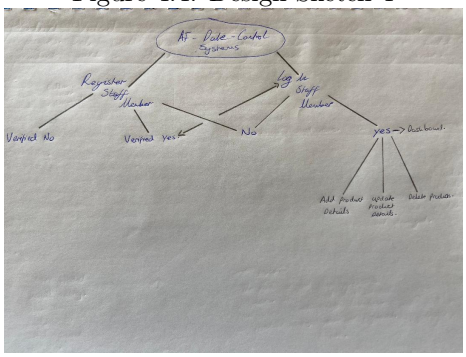
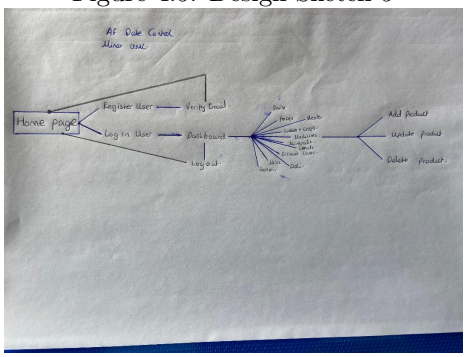


Figure 4.5: Design Sketch 5



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

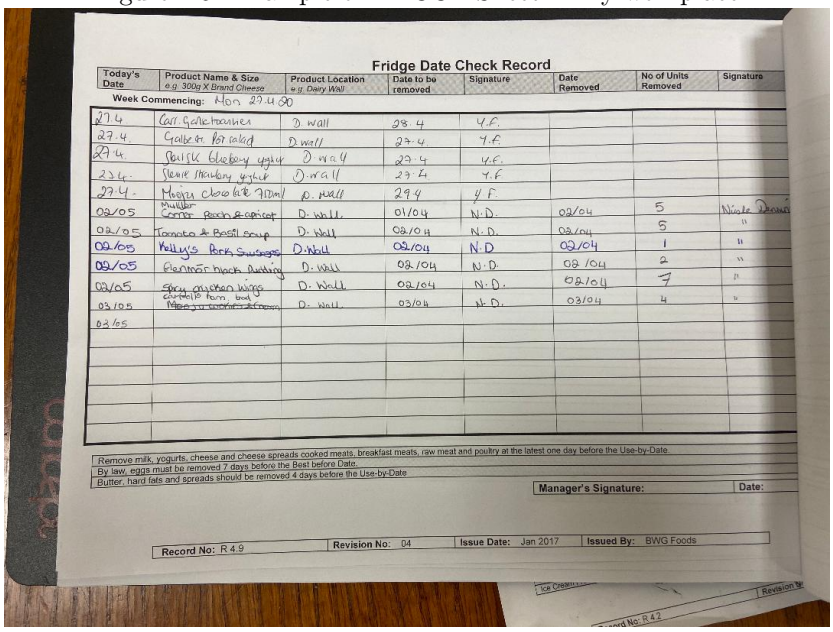
to ionic from angular as mentioned in the above Technical Review of the project.

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. The main aim of this application is to make it easy to understand and use for the staff member. Making it too complicated will result in the staff member maybe refusing to use it and go back to the habit of only physically checking by checking every item which is proven to be time consuming.

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.

Figure 4.6: Example of HACCP Sheet in my workplace



This application will help hugely in stock control and date checking sufficiency when it comes to HACCP sheets as it will give more a accurate indication of what is going off regularly to allow managers to improve tactical ordering of products. If a product continues to keep going out of date with not much sales this application and HACCP record will allow for the manager to not order as much or not order that product again.

This proves this applications flexibility and shows that it can help suppress more than one issue. It proves it can save time for the staff member and save the shop money in terms of tactical buying. Issues will always be present but its about reducing these issues in the workplace as much as possible, in which i believe this application will do so.

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. For example In terms of user authentication with ionic firebase i learnt how to implement email verification into an application where once a user registers an account they are not permitted to sign in unless their email is verified. I also learned how to make my ionic firebase application a firebase hosted website which saves so much time in terms of running the application and after making the application a website i was very satisfied with what i learnt here. This is a huge factor going forward if i were to further develop this project or any new project for that matter as i enjoy this framework.

Chapter 5

System Evaluation

5.0.1 Objectives Set Out

From the outset the main objective was to create an application worthy of being a prototype system to be able demonstrate to my fellow colleagues at work and companies that implement stock control systems to shops. I wanted to create an application that could tackle the existing issue of date checking not being as effective as it should be. I believe this application will benefit staff members in saving time and stores in saving money by being able to take action early with products close to their sell by dates and also saving money in the future looking at the popularity of the product and look at the aspect of maybe saving money by not ordering a product as it didn't sell as well as it was targeted to do so.

This project from the outset was to achieve a personal objective of making an application to be proud of. That in the future i can look back on what i created and feel a sense of self-achievement that i created that and it can solve an existing issue linked to life outside of the college environment and into a place i have worked in for over five years.

I wanted to conduct a survey among the staff at my workplace to get their valued opinions on this idea that will heavily involve them potentially using this in the future. This feedback will be very relevant to me as it is them that will be the ones using the application on a daily basis. As a result of this i wanted to make this application very easy to use and understand. Not making it complicated to use which will cause for carelessness to use it. Making it quick and easy to use for staff is a prime objective set out from the outset. Once ready the staff will be shown a demonstration of the application to get their thoughts overall.

Outside of the purposeful objectives i hoped to learn more and gain more insight into the technologies i would be using throughout the project. I hoped to have learned more about the ionic framework and the firebase cloud database storage. Along with furthering my knowledge in GitHub, Visual Studio Code and

Overleaf LaTeX. Beyond this project i wish to develop more ionic applications with the firebase cloud storage and being more knowledgeable in the framework and database will benefit me beyond college and into potential employment.

5.0.2 Objectives Met or Not Met

With the objectives set out from the outset i am happy to say the majority if not all objectives set out were met to my self satisfaction. There are some minor aspects in the application that i might add in the future to the application, however this is a prototype that is designed in a way to demonstrate to shops and companies who are linked to shops such as CBE. Overall i am pleased with what i produced as it is in my opinion helping an area close to me and knowing it will save staff the hassle of checking every product where as with this they can just see whats close or past its sell by date pinpointing what needs to be done rather than physically looking where it is possible that they might miss something which then puts the customer at risk along with the shop if something were to happen.

The main objective set out was to develop an application for to improve date checking sufficiency within the retail business and to save staff time in identifying stock close or past their sell by date. I believe i have created an application that will indeed save the shop money in terms of getting to the product in time and taking action and intercept the danger of a customer purchasing and consuming an out of date product. I can tell you from experience that not every customer checks the date of products and not to mention i have been in a scenario where a customer has actually brought up or notified me of a product passed or close to its sell by date. The regulations in the shop is to remove or reduce an item two days before its sell by date. I believe the purpose of this application improves this and will save the staff time in a busy schedule and the shop money in using the product elsewhere or enable them to make future decisions regarding a product and the number of products found.

I conducted a survey within my workplace which was one of the objectives set out, to get a sort of second opinion on the potential implementation of this application to their daily routine. This objective was met and was crucial in the planning and development of the application, taking into account mainly those who questioned the idea and if it was necessary. I was hoping for a mixture of feedback for this so i was able to then suss out the pros and cons of making this application and potentially using it within the workplace. I appreciated all feedback positive and negative.

I wanted to learn more about the Ionic Framework and Firebase Cloud Database in which i did, which i am pleased with as in the future i hope to develop more projects using these technologies. I learned more specifically about making an application a firebase hosting website which was a first and a sense of achievement that this application was now active and live for people to use instead

of running an ionic serve and installing the required libraries to do so which isn't a sufficient way of application usage and demonstration so i was glad tom learn more about this and implement this into my application. There is now a sense of easy transportation of this application rather than having to be just be on one particular device to use the application. I also improved my GitHub knowledge in terms of insights and to show issues within development. I also enhanced my use of Visual Studio Code and the use of command lines. Not to mention improving my newly learned LaTeX skills after first coming across this in the first semester of this academic year. So it is safe to say i improved my usage and skill of the technology used for development in which i am pleased with as it will benefit me for future products outside college.

Overall i feel i have met the Objectives and Goals set out in making an application not only for its intended purpose but for a sense of self-achievement for making an application to tackle a global issue when it comes to food wastage and consumption of foods that could endanger a person. During the course of development of this project i had weekly goals and objectives in development which i discussed with my supervisor in our weekly meetings. This is great in terms of getting work done in a timely manner.

5.0.3 Application Testing Results

As mentioned in the Technology Review i conducted application tests for the applications functionality. Below are the results:

Figure 5.1: Application Testing Result Page 1

G00346830	Project Name:	AF Date Control	App Designed By:	Andreas Fahey	Final Year Project
	Module Name:	Applied Project & Minor Dissertation	Software Start Date:	12/02/2020	
	Release Version:	Ionic 5	App Developed By:	Andreas Fahey	Software Test
	Cloud Database:	Firebase	Software Tested:	29/04/2020	

Test Case#	Test Title	Test Summary	Test Steps	Test Data	Expected Result	Actual Result	Status	Notes
00-1	Run Application	Does the application start up with no issues.	1. Go into project directory. 2. Type "ionic serve" into the command line. 3. Should open up a web browser.	Full Application	You should be presented with a web page opening with the home page to sign in or register.	Started Successfully	Pass	May differ if this application is made into a firebase website.
00-2	Log In To Existing Account	If I have registered and verified with email then I should be able to log in as user.	1. Select button staff sign in. 2. Enter required email and password of account. 3. Press Log In button.	Log In User Authentication	The application should successfully log me into my account and allow me to view the dashboard.	Log In successful, can see dashboard with all the food groups.	Pass	I've noticed sometimes during development that it sometimes comes up that emailVerified is null but if I try again it signs me in. I believe this is a bug with the server. But no major issue.
00-3	Register New Account	If I enter required details for staff registration, the application should tell me that a verified email has been sent to the provided email and you can only sign in once the email is verified.	1. Select Register Staff Member on home page. 2. Enter oin required details. (Email, Password) 3. Click Register 4. Check Email	Registration User Authentication	An verification email should be sent to the email address entered to register.	Verification Email received.	Pass	This verification email is sent from firebase but is customised by me.
00-4	Verify Email and Try Log In	After Verifying the email, try sign into the application.	1. Refresh Application after verifying email. 2. Select staff sign button. 3. Enter in details and press log in button.	Registration User Authentication	User should be signed in and be able to see dashboard.	New user successfully signed in and can see dashboard.	Pass	Must refresh application after verifying email to log in.

Figure 5.2: Application Testing Result Page 2

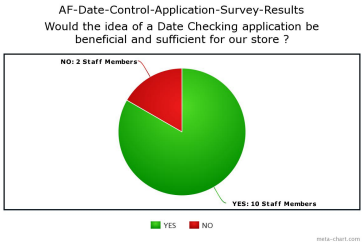
00-5	Forgot Password	Try and reset password via being sent an email link.	1. Click Forgot Password button on log in page. 2. Enter email address of account for password reset.	Forgot Password User Authentication	User should receive an email to follow link for password reset.	Function Does Not work for purpose. Console says email does not exist or has been removed from db.	Fail	I had this issue near the start of development and came back to it once I had everything else done, was'nt able to fix the problem. Issue is highlighted on Github and is now not available for the user.
00-6	Log Out of Application	When on the dashboard try log out of account.	1.. When on the dashboard click log out button to log out of account.	Log Out User Authentication	When Log Out is pressed it should sign out user and bring back to the home page of application.	User is successfully logged out of the account and is brought back to home page of application.	Pass	Works smoothly.
00-7	Add Product	The User Should Be able to add a product to the firebase database via a form entry.	1. Log in to account. 2. Select a food group to add a product to. Each food group is unique. 3. Enter in product details and click + button once the form is filled.	Add Product Crud Functionality	The details entered by the staff member should show up underneath the form to show the product was successfully added by the user.	Product added to db and shows up underneath form.	Pass	Works smoothly.
00-8	Update/Edit Product Details	The staff member should be able to edit or update the product details for example quantity, wrong spelling, wrong date etc.	1. Select a same food group as above. 2. Click Update Icon on product details you entered previously. 3. Change 1 or more details and click the tick button.	Update/Edit Product Crud Functionality	The product details should be updated for example qty was 12 and now is 9.	The product details were successfully updated.	Pass	Created a new page for update, could of also done a pop up box, but did not want to confuse myself.
00-9	Delete Product	Check and see if you are able to remove the product from the database and the page.	1. Select a same food group as above. 2. Click Delete (bin) Icon on product details you entered previously.	Delete Product Crud Functionality	When delete button is pressed after agreeing to the popup the product should be deleted	Product was successfully deleted from database and page.	Pass	The idea of deleting the product is to show that cation was taken by the staff member and that item is no longer available for customer purchase.

- Noticed when logging in i have noted a potential bug which i have highlighted on my GitHub Repository where a window popup shows a an email verified null error. When i cancel this and click log in again it allows me to log in. Note if you try log in with an unverified email it will tell you so, this is a different issue but does not hinder application functionality.

- Unfortunately i was unable to get the password recovery/reset function working as you can see in the test document screenshot above it failed. This is also a highlighted issue on my GitHub repository. The code is available but commented out as it was failing in the ionic build command for making the application a firebase website.

5.0.4 Survey Results

Figure 5.3: Survey Results



Above shows the results of the survey i conducted into a pie chart. It shows that two thought this idea was unnecessary with one reason being "Not everyone is good with technology" and the other reason being "Not necessary, if products are checked regularly there is no need for anything extra". I appreciate the feedback and acknowledge the reasoning. Yes i agree that not everyone is good with technology but i counter that with the fact that technology plays a major role in our lives on a daily basis be it using a computer and even a smart phone which is the norm for phone users nowadays. Technology is taking over so why be left behind. I also agree that if products are checked regularly that it will cover most of the products but not all in my opinion. This application shows exactly what is close or past its sell by date so the staff member can then find the product without having to check every single product. Also, from experience i know working in a shop can be very busy which gives the worker a lack of time to get things done such as date checking, as i have said many times this reduces the time spent date checking while making it more sufficient in the grand scheme of things.

5.0.5 Limitations

There were some limitations in the development of this project. The major one not being able to have access to a shop database to show a full example of the purpose of this application and show what it is intended to do. In lieu of this i added a product entry form to show what it would look like in real time in a shop. I also was unable to implement product data sort by date which will make it easier for the staff members to go to the top of the list of products where they will find products closest or past their sell by dates, but the idea was there. I also discussed the idea of highlighting a product orange if it was two days before going out of date and red if the product is passed its best before date. Maybe in the future i could try implement these aspects to the application to again make it easier for staff members to use and understand. The fact that this is a prototype allows for some stuff not to be implemented as intended as long as the idea is there. Resetting the user password functionality was another aspect i was unable to implement into this application in which i tried, the code is commented out as mentioned above it was throwing errors in the build for the firebase website. Prototypes tend to have certain limitations, however i personally would have liked to have had these characteristics in my application.

Chapter 6

Conclusion

Chapter 7

References & Appendices

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