



AF - DATE CONTROL
APPLICATION FOR RETAILERS STOCK

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

BY
ANDREAS FAHEY
G00346830

MAY 9, 2020
Advised by Mr. Mark Campbell
DEPARTMENT OF COMPUTER SCIENCE AND APPLIED PHYSICS
GALWAY-MAYO INSTITUTE OF TECHNOLOGY (GMIT)

Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 3 |
| 2 | Methodology | 9 |
| 2.0.1 | Software Development v/s Research Methodology | 9 |
| 2.0.2 | Agile / Incremental and iterative approach to development | 10 |
| 2.0.3 | Application Testing | 11 |
| 2.0.4 | GitHub and Development Tools | 12 |
| 3 | Technology Review | 13 |
| 3.0.1 | The How and Why | 13 |
| 3.0.2 | Beneficial and Sufficient | 14 |
| 3.0.3 | Minor Survey | 18 |
| 3.0.4 | Planning The Project | 19 |
| 3.0.5 | Technologies | 20 |
| 3.0.6 | Issues | 23 |
| 3.0.7 | Technology References | 26 |
| 4 | System Design | 27 |
| 4.0.1 | How This Idea Was Designed | 27 |
| 4.0.2 | Application Sketches and Diagrams | 28 |
| 4.0.3 | Application Design and Why | 30 |
| 4.0.4 | Self-Learned Extras | 32 |
| 5 | System Evaluation | 33 |
| 5.0.1 | Objectives Set Out | 33 |
| 5.0.2 | Objectives Met or Not Met | 34 |
| 5.0.3 | Application Testing Results | 35 |
| 5.0.4 | Survey Results | 37 |
| 5.0.5 | Limitations | 38 |
| 6 | Conclusion | 39 |
| 6.0.1 | Outcomes of the Project | 40 |
| 6.0.2 | Personal | 41 |

CONTENTS

| | |
|---|-----------|
| 7 References & Appendices | 43 |
| 7.0.1 Technologies Used References: | 43 |
| 7.0.2 Dissertation Images References: | 43 |
| 7.0.3 Running the Application | 44 |

List of Figures

| | |
|---|----|
| 1.1 Application Dashboard | 3 |
| 1.2 Various Software Languages to choose from. | 4 |
| 1.3 Database Option: Firebase. | 5 |
| 1.4 Database Option: MongoDB. | 5 |
| 1.5 Database Option: Microsoft Azure. | 5 |
| 1.6 Database Option: Amazon Web Service (AWS). | 5 |
| 1.7 Chosen Technology for Date Control Application, Ionic Firebase. | 6 |
| 1.8 Best Before Date On Product Example. | 7 |
| 1.9 GitHub Containing the Software Application for the Project. | 8 |
| | |
| 3.1 AF Date Control Logo | 13 |
| 3.2 Quotation From: https://www.brainyquote.com/ | 13 |
| 3.3 CBE Provides Shop Databases and Tills | 15 |
| 3.4 CBE's System in the workplace 1: | 15 |
| 3.5 CBE's System in the workplace 2: | 16 |
| 3.6 CBE's System in the workplace 3: | 16 |
| 3.7 CBE's System in the workplace 4: | 17 |
| 3.8 CBE's System in the workplace 5: | 17 |
| 3.9 Short Survey for Colleagues at work. | 18 |
| 3.10 Developed the code in Visual Studio Code. | 21 |
| 3.11 Programming Language of choice for SD. | 21 |
| 3.12 Cloud Database of My choosing for Data Storage. | 22 |
| 3.13 Example of Firebase Configuration: | 22 |
| 3.14 All Project Items are on GitHub and can be cloned. | 23 |
| 3.15 This project dissertation was edited on Overleaf in LaTeX. | 23 |
| 3.16 In Every Project or Idea Issues arise. | 23 |
| | |
| 4.1 Design Sketch 1 | 28 |
| 4.2 Design Sketch 2 | 28 |
| 4.3 Design Sketch 3 | 29 |
| 4.4 Design Sketch 4 | 29 |
| 4.5 Design Sketch 5 | 29 |
| 4.6 Example of HACCP Sheet in the workplace | 31 |

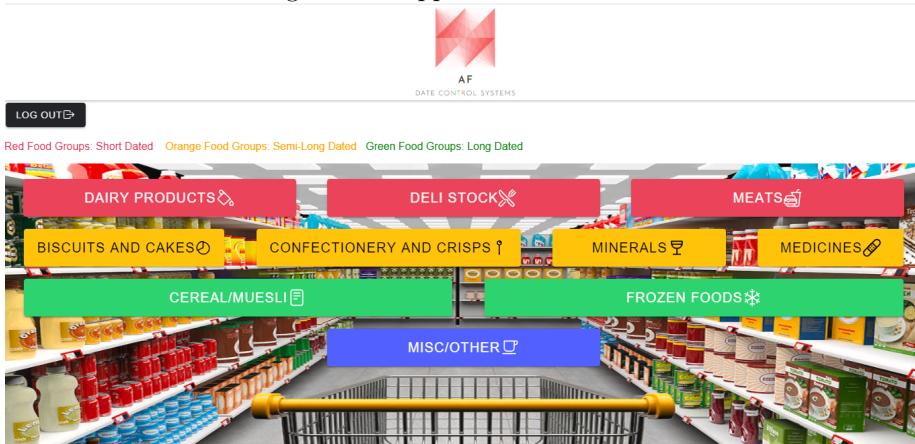
LIST OF FIGURES 1

| | |
|---|----|
| 5.1 Application Testing Result Page 1 | 36 |
| 5.2 Application Testing Result Page 2 | 36 |
| 5.3 Survey Results | 37 |
| 6.1 Application Main Page | 39 |

Chapter 1

Introduction

Figure 1.1: Application Dashboard



The Final Year Project was a great opportunity for me 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 deciding what to develop for the final year project, I needed to split it up into many different aspects. The idea, the reasoning and why it would be beneficial for human use and also economically sufficient for the target audience. A decision on technology to use needed to be made also, what programming language to use, pros and cons, what database storage to use to store data applicable to what I was going to develop.

Figure 1.2: 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 weekly life. My part time job as a Sales Assistant had a massive influence in making a decision on what type of project to do. I looked into the everyday operation of the shop, after working there for just under five years the experience was there in knowing the day to day operations of the store. I looked at different ways I could make the staff's job easier and at the same time, save the shop money by creating this application. Google Scholar was used 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 aimed 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, it needed to suit the system design and development of the application. A decision on a database needed to be made for data storage that I was familiar with and what made sense in terms of the functionality of the application. What code editor to use to code the application. There were so many available but ultimately it was decided on to choose the one that suited me and the project combined. As mentioned above 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 were done during the tenure of this course. The decision had to make sense for me and for the application itself, what elements of each would suit the progress of the software development.

Figure 1.3: Database Option: Firebase.



Figure 1.4: Database Option: MongoDB.



Figure 1.5: Database Option: Microsoft Azure.



Figure 1.6: Database Option: Amazon Web Service (AWS).



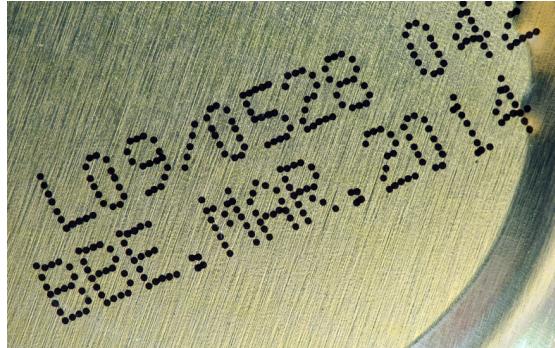
The objective was to create something that would help tackle an issue within the workplace, for fellow staff members, the management team and saving time and money for the shop. One element that is being done but not everything caught is the attention of the eye. That is Sufficient Date Checking. This is obviously observed by the retail staff who work on the shop floor, who go around and physically 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 barely being checked I feel 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. Foods are not the only danger of going out of date. Medicines and health and beauty products also have a sell by date. The likes of Panadol and Calpol have sell by dates on their products that proves foods aren't the only shop item that can go out of date. In terms of health and beauty items they are not believed to cause any harm to a customer but be almost defective or do not serve it's intended purpose.

The decision to pursue this project was based on the links to college life and work experience together as one. When picking the technologies to create this application every aspect was looked at for each technology however after much thought and looking at the pros and cons for each, the decision was made to develop this project inevitably in Ionic Firebase. I had past experience for both and being honest had the best experience with both, I like the way they connect and the smoothness of Ionic when coding and running. This was not the initial choice. Initially I began to develop this application as an Angular Firebase project which didn't turn out as intended in the early stages of development which triggered a change of mind to change to an Ionic Firebase application.

Figure 1.7: Chosen Technology for Date Control Application, Ionic Firebase.



Figure 1.8: Best Before Date On Product Example.



This dissertation 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 used in this project such as GitHub and Visual Studio Code.
- The Technology Review, discussing the how and why the decision to create this application was made, why this is needed to help the workplace, is the project idea beneficial and sufficient, what a survey does to help with a project, the planning of the project basically the developer diary, technologies used in the project even extra ones if any, the references used in helping with the development of the software for the application, the issues and issues that arose during the software development, and the extras learned along the way.
- The System Design, how the application was designed and why, styling and HTML etc., design sketches for the application, what I wanted my application to do in terms of tackling the issue and any other extras added to the design element for example, making it easy for staff to use rather than making it complicated.
- The System Evaluation, the objectives and goals set out, were they achieved ?, the application testing results shown in a testing excel sheet, results of the conducted survey, and the limitations after the application was made.
- The Conclusion, where a look back at the rationale and goals of the overall project is done, highlighting the findings from the System Evaluation and discuss the opportunities and flexibility this project has made for me and for others especially the target audience, can it do more than one thing, can it benefit me for future interviews and possibly present this idea to potential investors etc.

- The References and Appendices, this will include the GitHub repository for the software development of the application for the project and the references used to help develop the application and give a brief description for each reference. It will also include how to run the application accordingly. In this case it will contain the link for the Firebase website. Along with referenced URLs and technology used. It will also contain the project screen-cast presentation including a demonstration of the application.
- The Bibliography, includes any articles, pieces or reference to a quotation from its citation. This is the information gained in the research on this particular field of product of date control in retail. Citations although little are spread out throughout the dissertation.

Figure 1.9: GitHub Containing the Software Application for the Project.



This is the link to the GitHub Repository:

<https://github.com/AndreasFahey/AppliedProject-DateControl>

Here you will find all the project content both in software development, dissertation and any extras linked with the project. You will also see issues raised during the project and if they were resolved. Also the commits and what was done for each commit will also be available to see the timeline in which things were done 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, Power Point presentation, application testing results on a excel document and a screenshot of the results of the survey conducted put into a pie chart.

Chapter 2

Methodology

As mentioned in the Introduction, my weekly life was looked at as inspiration in deciding what type of application to make for the final year project. The day to day operations of the shop were looked upon to see could anything be done to save time, money and address an existing issue. The 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. This was a key part of my Methodology.

2.0.1 Software Development v/s Research Methodology

As decided to pursue a Stock Date Control application, research was needed to see if there was anything of the sort existing in the world in shops or warehouses. This was crucial 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'd be able to see how if an existing application exists works and how it is used within the workplace. If it didn't exist this 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 the overall feeling is that an application to make date checking more sufficient will help suppress this potential hazard.

Before the software development of this project began, extensive research was

done in shop databases and looked at the aspects and gathered inspiration from the shop and their database for stock control. This helped with the design and functionality of the application. If an offer was made of this service to CBE for example it needed to be in a certain 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 in which I work in.

After the past experiences of using the Ionic Framework and Firebase Cloud Storage Database the feeling was 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 a survey was conducted 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". A refresher was needed 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, project supervisor and the members of staff in the workplace. Meetings with the project supervisor took place 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 research was done in 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 a system

where date control existed in a manner in which can 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 were done for how i wanted the application to look like. This application needed to be easy to use and understand for the worker, not make it fancy and complicated. I knew when sketching that implementation of 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. 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 the decision process took place on the software development process. A choice was needed in terms of 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 software development was ready to begin. This was around early February. This may be later than some, however assurances were needed 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 the project supervisor my goals were shared 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. 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 the software development did not start until satisfaction with the plan, objectives and goals were 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 once the application was operational. The tests are as follows:

- Running The application: This is all or nothing. In this case I ran 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: Here a new feature was 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 note that this will be a prototype to demonstrate to shops and companies linked to shop inventory control to show the idea in real time.

2.0.4 GitHub and Development Tools

To develop this project a GitHub Repository was this was cloned to my computer desktop. The folder was then opened in the command prompt window to install the relevant libraries, modules and add-ons for the Ionic Firebase application. 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 .'. There are a range of different code editors to do this project but Visual Studio Code was the preferred choice due to the past experience using it during the 4 years of the course. Not to mention Firebase was the choice of database to store Authentication data and product data. Overleaf was also used to write this dissertation in LaTeX. In later development I needed to make this application a Firebase website for easy access for the user. Firebase initialization was needed to deploy the application for Firebase to then host the Ionic 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



3.0.1 The How and Why

Figure 3.2: Quotation From: <https://www.brainyquote.com/>

“I am just a child who has never grown up. I still keep asking these 'how' and 'why' questions. Occasionally, I find an answer.

[Stephen Hawking](#)

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 be done to try and improve with what was learned in college for four years, in this case I was able to highlight one area of the shop that could be integrated into the final year project and that is to develop an application to ease the burden of Date Checking for 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 can hopefully 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 where I currently work in part time and the feeling is that 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 its sell by date to the deli or reduce it. This isn't going to solve the issue entirely but to help it as much as it can.

3.0.2 Beneficial and Sufficient

Before pursuing a Date Control Application for Retail, it needed more clarity in terms of it being beneficial to staff members and superiors in the workplace. A minor survey was conducted enclosed within the workplace to get some feedback for this potential idea. The results of this survey are in the System Evaluation section. 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 ? very much so. 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 hopefully 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 the 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 knowing that they don't offer the idea that I am trying to implement. This can prove in being very beneficial and sufficient to them in saving them time and money and providing an extra service to their new and existing 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 the workplace 1:



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



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

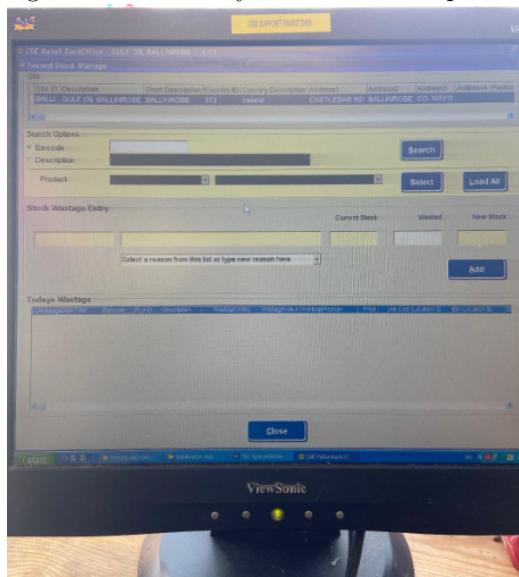


Figure 3.7: CBE's System in the workplace 4:

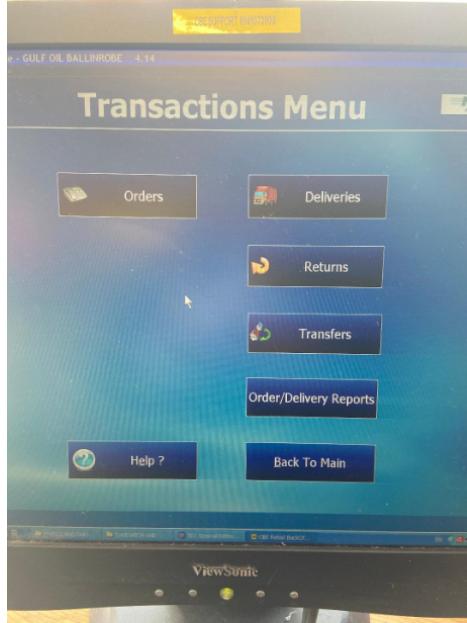


Figure 3.8: CBE's System in the workplace 5:

| CBE Retail BackOffice - GULF OIL BALLINROBE - 4.14 | | | | | | | | | |
|--|---------------------|-------------|----------------|-------------------------------------|------|--------------------------------------|-------------------------------------|---------------------------------------|--------------------------------------|
| Returns | | | | | | | | | |
| Return ID | Return Date | Supplier ID | Supplier Name | Authenticated | Note | Print | Edit | Delete | Print |
| RTN60047418 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input checked="" type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047419 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047420 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047421 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047422 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047423 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047424 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047425 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047426 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047427 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047428 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047429 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047430 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047431 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047432 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047433 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047434 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047435 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047436 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047437 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047438 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047439 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047440 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047441 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047442 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047443 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047444 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047445 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047446 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047447 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047448 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047449 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047450 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047451 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047452 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047453 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047454 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047455 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047456 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047457 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047458 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047459 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047460 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047461 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047462 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047463 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047464 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047465 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047466 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047467 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047468 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047469 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047470 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047471 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047472 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047473 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047474 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047475 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047476 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047477 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047478 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047479 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047480 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047481 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047482 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047483 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047484 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047485 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047486 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047487 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047488 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047489 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047490 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047491 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047492 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047493 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047494 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047495 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047496 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047497 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047498 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047499 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047500 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047501 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047502 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input type="checkbox"/> | | <input type="button" value="Print"/> | <input type="button" value="Edit"/> | <input type="button" value="Delete"/> | <input type="button" value="Print"/> |
| RTN60047503 | 24/04/2020 19:11:00 | EM | EASONS MENZIES | <input | | | | | |

As you can see in the images above, this is an example taken from the shops CBE database. 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 the implementation and presence of Date Control 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. This application helps address this existing issue and prevents customer harm and helps the retailers save money and being able to act quickly. To conclude this application is beneficial and sufficient and based on the survey results, 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, a short survey was conducted, as you can see 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. |
| <input type="checkbox"/> | <input type="checkbox"/> |

If you answered NO, please state why:

Signed: _____

This is a second opinion that will influence 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. This application needed to be 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. Opinions came from fellow students and the project 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 dissertation.

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 it was agreed upon to meet with the designated supervisor once a week. I am in full support of the provision of supervisors for the Applied Project and Minor Dissertation as it benefited hugely in the planning of this project.

For the first couple of weeks of meetings with the supervisor I had a few different ideas. One of them was a Date Control Application which was eventually decided upon. The other two was to make a more sufficient and more operational version of the group project done 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 it was decided to take up this project as the final year project. When this was decided a decision needed to be made on what technology that was going to be used and the research to find out has this type of application 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. Discussions of the prospect of introducing this idea to CBE took place once near completion as 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.

Contact was made with colleagues and superiors at the 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. A minor survey was conducted within the workplace and the results were then put into a pie chart which you will see in the System Evaluation section of this write up.

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

I wanted to implement some elements to the application that may not be present in a CBE add on application or store application. User Authentication was one element that 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 implementation of 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. The decision was made to switch to Ionic Firebase. There are various similarities between Angular and Ionic but I felt more comfortable with Ionic than Angular and not to mention liking the end product of an Ionic application rather than Angular. Thankfully the plan changed at the early stage of development.

3.0.5 Technologies

The Technologies used to develop the idea were as follows:

- Visual Studio Code - The Editor of choice for coding the project.
Whenever we received a project from a lecturer, the initial thought was would it be possible to develop this project in Visual Studio Code. Out of all the editors used throughout the four years of study this stands out as the favourite. It is so easy to use and having using it for past projects and the Ionic Firebase project from third year no editor came to mind but Visual Studio Code. The file views and the smoothness of the editor when developing a program is very likeable. To

Figure 3.10: Developed the code in Visual Studio Code.



develop this project I'd open a command prompt inside the project repository directory and type "code ." and it would open up the project in Visual Studio Code. This can be done with any project. It is the more favoured editor among fellow students.

Figure 3.11: Programming Language of choice for SD.



Ionic - The programming language in which the project was coded. 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. Initially I decided to go with using Angular as my programming language for the final year project, however it was giving various issues and I didn't like the way it was turning out so a change of mind was made 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 with getting the project 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 the decision was made to switch and the fact that it suits what I in-visioned when sketching the pages 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 the second year of study in GMIT I encountered the Angular Framework, and in third year encountered the Ionic Framework. When coming up with the idea of creating my Date Control application the choice was to pick a language I liked and enjoyed coding. In third year for the group project myself and another student created a cinema booking website using Ionic Firebase. From then I wanted to use Firebase for its easy implementation into the Ionic Framework for an application. As always wanting to learn something new, although similar Ionic and Angular are different, as mentioned above initially started the project in Angular and then switched to Ionic. This was done as I did not feel as comfortable with Angular Firebase as I did with Ionic Firebase. I'm glad the switch was made 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 used for this application to store User Authentication details and store the product entry data for crud functionality. Note for private and security purposes 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 the software development to connect the Firebase database project made on Firebase implementation of a unique Firebase configuration values to the 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:

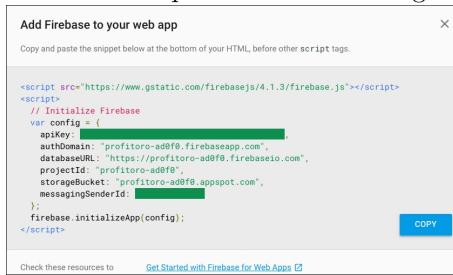


Figure 3.14: All Project Items are on GitHub and can be cloned.



- GitHub - Used to publish the 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 3.15: This project dissertation was edited on Overleaf in LaTeX.



- Overleaf - Used overleaf as a Latex editor for this project dissertation. Used this template provided to us from our year head. Only came across Overleaf with LaTeX in the first semester of final year where much like this section we needed to create a Literature review. This benefited in terms of writing this dissertation.

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 pursuing the Date Control Application in Angular Firebase. Having done Ionic Firebase in Third Year for the group project the sense of a challenge was there in trying out Angular with Firebase. Having set up the authentication with Angular Firebase, the way it was looking and what it was going to look like when implementing the CRUD functionality to the application was not what the vision looked like. In the end it was the correct decision in the long run. I referenced the third year project a lot during the making of this application as it too was Ionic Firebase. In terms of experience this worked in my favour.

The realisation hit that pursuing this project in Ionic would be the best option. The switch was made which you can see in the early commits of the software development of the project. The switch was made of course for the reasons mentioned, however the switch also came due to the fact of being familiar with Ionic Firebase having completing a project in it before. The overall look of Ionic intrigued me. This did not hinder to much in the completion of this application. When the switch was done it 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 the switch was the correct decision.

The Next issue that arose was the authentication "reset/forgot" password. After looking at many different tutorials online I was unable to get this function to work. The code is still in the project directory but has to be commented out due to "ionic build" errors when trying to make the project a Firebase hosted website. Due to the fact if CBE were to implement this application into their systems they may not have the idea of a user authentication system within it, as this is a prototype it does not hinder the overall reasoning for this application. A password reset email can be sent via the Firebase console to the user upon request. This issue is highlighted in the issues section of the GitHub Repository for this project.

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. Unfortunately this feature was not implemented. Various different ways were tried to implement it such as a query in the get product details function and also the fetch product details functionality that shows the product details on

the page. Attempts were also made to alter the Firebase database to show this by trying to implement rules to do so. I was unable to make this feature work, however the idea was there and may be implemented if taken up by the likes of CBE who may take a different approach in showing data in this format. This issue is highlighted in the issues section of the GitHub Repository for this project.

A Small bug started to arise when signing into an account also. Where a window pop up gives an error message along the lines of "null is not an object". This issue is also highlighted on GitHub. This does not hinder a sign in, as if you click the log in button again it will sign you in.

Thankfully no major issues arose that were expected to arise, for example when making this application a Firebase hosted website the fear was present of when trying to do this will result in the application breaking completely. Since this was at a late stage it was a very fragile time in the software development phase.

3.0.7 Technology References

<https://developer.okta.com>
<https://ionicframework.com/docs/theming/colors>
<https://ionicframework.com/docs/building/running>
https://www.tutorialspoint.com/ionic/ionic_colors.htm
<https://ionicons.com/>
<https://www.youtube.com/watch?v=M-nTpVIyGw0>
<https://devdactic.com/host-ionic-website-firebase/>
<https://forum.ionicframework.com/t/how-to-add-styles-to-ion-button-inner-text/148987>
<https://ionicframework.com/docs/native/firebase-authentication>
<https://www.freakyjolly.com/ionic-firebase-crud-operations/#.XrKlWqhKjIU>
<https://github.com/AndreasFahey/ajproject>

Chapter 4

System Design

4.0.1 How This Idea Was Designed

I developed this application using my knowledge of Ionic and Firebase with past projects and labs conducted in the environment of GMIT. Not to mention also having the aid of online resources for different functionality and design to help with the project. The Ionic Framework helped with designing the project while past projects on GitHub and a mixture of online resources and video tutorials aided in the functionality of the application. The applications functionality was developed through a back end and front end using the unique Firebase Configuration.

The back end handling the Firebase Database stuff, in this case the 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 or 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.

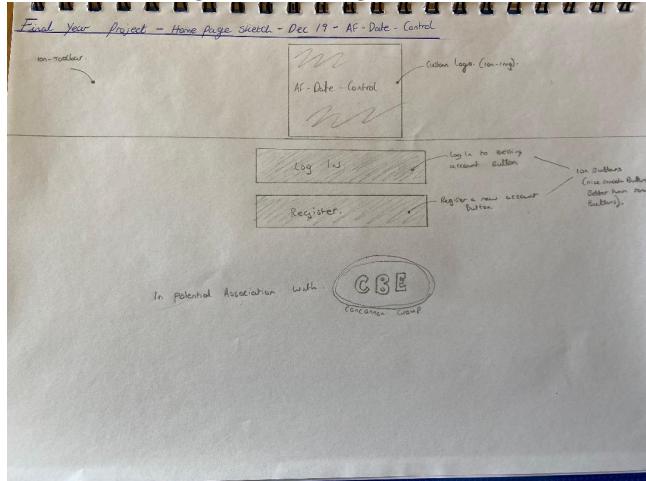
The front end is what the user of the application sees, so the design of the application, all the food groups, staff log in, staff log out, staff register and so on, here you can see the work of the back end, you can see the data read in from the Firebase Database showing the data read in by the user. 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 Application Sketches and Diagrams

These sketches below were drawn before the software development started in which were brought to meetings with the project supervisor.

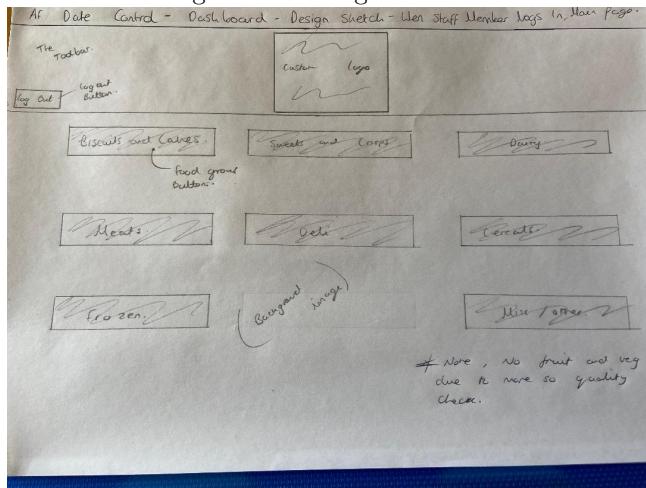
As you can see in the sketch below, this is a sketch of the home page when the application is ran. This is the first page the user is presented with.

Figure 4.1: Design Sketch 1



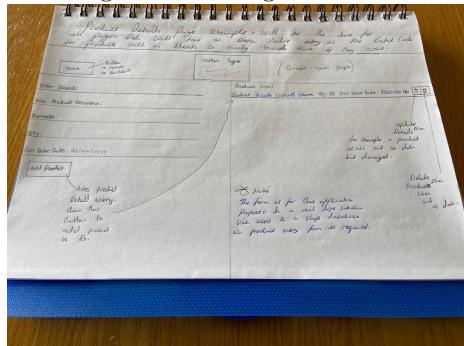
Here is a design sketch of the dashboard when the user signs in to their account:

Figure 4.2: Design Sketch 2



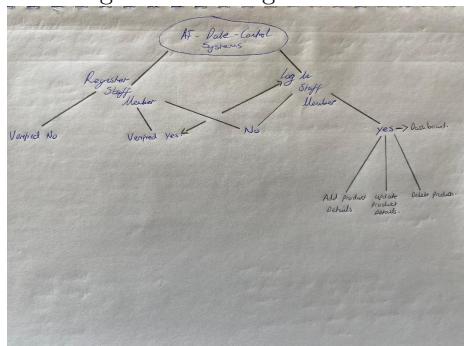
Sketch of the product inventory page, add product form and product details.

Figure 4.3: Design Sketch 3



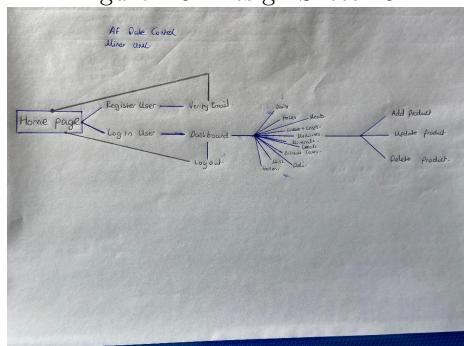
Below is a sketch of a functionality tree of the application

Figure 4.4: Design Sketch 4



Finally a miniature UML diagram sketch of the application.

Figure 4.5: Design Sketch 5



4.0.3 Application Design and Why

For this Project Prototype Ionic Design Framework was used such as Ion Buttons, Ion Content and Ion Rows. Personally I love the look and smooth functionality of the output of Ionic Tags in HTML of the applications developed before. This was one of the main reasons for the switch to Ionic from Angular as mentioned in the above Technical Review of the project.

The design of this project needed to be aesthetically pleasing for the user/staff member. It needed to show 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 the project supervisor, however the end result wasn't what was 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 the fruit and vegetables section was left out, 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 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.

Features were added to this application for prototype purposes only as mentioned numerous times throughout this dissertation. The purpose is to show CBE that time and money could be saved 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 was 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 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 promising aspect of this application, 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 the workplace

| Fridge Date Check Record | | | | | | | |
|------------------------------|--|-------------------------------------|--------------------|-----------|--------------|---------------------|-----------|
| Today's Date | Product Name & Size e.g. 300g X-Bread Oranges | Product Location e.g. Daily Wall | Date to be removed | Signature | Date Removed | No of Units Removed | Signature |
| Week Commencing: Mon 27.4.90 | | | | | | | |
| 27.4. | Carr Grahams | D wall | 28.4 | Y.F. | | | |
| 27.4. | Grahams for salad | D wall | 27.4 | Y.F. | | | |
| 27.4. | Pauls Raspberry yogurt | D wall | 28.4 | Y.F. | | | |
| 27.4. | Steak Hamburger yogurt | D wall | 27.4 | Y.F. | | | |
| 27.4. | Mango Choc late Flwr | D wall | 29.4 | Y.F. | | | |
| 28/05 | Muller Corner Bacon & Cabbage | D wall | 01/04 | N.D. | 02/04 | 5 | Wade Doun |
| 01/05 | Tomato & Basil soup | D wall | 03/04 | N.D. | 02/04 | 5 | " |
| 02/05 | Kelly's Brie Sandwich | D wall | 02/04 | N.D. | 02/04 | 1 | " |
| 02/05 | Peanut butter Biscuits | D wall | 03/04 | N.D. | 02/04 | 2 | " |
| 02/05 | Special Kitchen Wings | D wall | 02/04 | N.D. | 02/04 | 7 | " |
| 03/05 | Special Kitchen Wings | D wall | 03/04 | N.D. | 03/04 | 4 | " |
| 04/05 | | | | | | | |
| 05/05 | | | | | | | |
| 06/05 | | | | | | | |
| 07/05 | | | | | | | |
| 08/05 | | | | | | | |
| 09/05 | | | | | | | |
| 10/05 | | | | | | | |
| 11/05 | | | | | | | |
| 12/05 | | | | | | | |
| 13/05 | | | | | | | |
| 14/05 | | | | | | | |
| 15/05 | | | | | | | |
| 16/05 | | | | | | | |
| 17/05 | | | | | | | |
| 18/05 | | | | | | | |
| 19/05 | | | | | | | |
| 20/05 | | | | | | | |
| 21/05 | | | | | | | |
| 22/05 | | | | | | | |
| 23/05 | | | | | | | |
| 24/05 | | | | | | | |
| 25/05 | | | | | | | |
| 26/05 | | | | | | | |
| 27/05 | | | | | | | |
| 28/05 | | | | | | | |
| 29/05 | | | | | | | |
| 30/05 | | | | | | | |
| 31/05 | | | | | | | |
| 01/06 | | | | | | | |
| 02/06 | | | | | | | |
| 03/06 | | | | | | | |
| 04/06 | | | | | | | |
| 05/06 | | | | | | | |
| 06/06 | | | | | | | |
| 07/06 | | | | | | | |
| 08/06 | | | | | | | |
| 09/06 | | | | | | | |
| 10/06 | | | | | | | |
| 11/06 | | | | | | | |
| 12/06 | | | | | | | |
| 13/06 | | | | | | | |
| 14/06 | | | | | | | |
| 15/06 | | | | | | | |
| 16/06 | | | | | | | |
| 17/06 | | | | | | | |
| 18/06 | | | | | | | |
| 19/06 | | | | | | | |
| 20/06 | | | | | | | |
| 21/06 | | | | | | | |
| 22/06 | | | | | | | |
| 23/06 | | | | | | | |
| 24/06 | | | | | | | |
| 25/06 | | | | | | | |
| 26/06 | | | | | | | |
| 27/06 | | | | | | | |
| 28/06 | | | | | | | |
| 29/06 | | | | | | | |
| 30/06 | | | | | | | |
| 31/06 | | | | | | | |
| 01/07 | | | | | | | |
| 02/07 | | | | | | | |
| 03/07 | | | | | | | |
| 04/07 | | | | | | | |
| 05/07 | | | | | | | |
| 06/07 | | | | | | | |
| 07/07 | | | | | | | |
| 08/07 | | | | | | | |
| 09/07 | | | | | | | |
| 10/07 | | | | | | | |
| 11/07 | | | | | | | |
| 12/07 | | | | | | | |
| 13/07 | | | | | | | |
| 14/07 | | | | | | | |
| 15/07 | | | | | | | |
| 16/07 | | | | | | | |
| 17/07 | | | | | | | |
| 18/07 | | | | | | | |
| 19/07 | | | | | | | |
| 20/07 | | | | | | | |
| 21/07 | | | | | | | |
| 22/07 | | | | | | | |
| 23/07 | | | | | | | |
| 24/07 | | | | | | | |
| 25/07 | | | | | | | |
| 26/07 | | | | | | | |
| 27/07 | | | | | | | |
| 28/07 | | | | | | | |
| 29/07 | | | | | | | |
| 30/07 | | | | | | | |
| 31/07 | | | | | | | |
| 01/08 | | | | | | | |
| 02/08 | | | | | | | |
| 03/08 | | | | | | | |
| 04/08 | | | | | | | |
| 05/08 | | | | | | | |
| 06/08 | | | | | | | |
| 07/08 | | | | | | | |
| 08/08 | | | | | | | |
| 09/08 | | | | | | | |
| 10/08 | | | | | | | |
| 11/08 | | | | | | | |
| 12/08 | | | | | | | |
| 13/08 | | | | | | | |
| 14/08 | | | | | | | |
| 15/08 | | | | | | | |
| 16/08 | | | | | | | |
| 17/08 | | | | | | | |
| 18/08 | | | | | | | |
| 19/08 | | | | | | | |
| 20/08 | | | | | | | |
| 21/08 | | | | | | | |
| 22/08 | | | | | | | |
| 23/08 | | | | | | | |
| 24/08 | | | | | | | |
| 25/08 | | | | | | | |
| 26/08 | | | | | | | |
| 27/08 | | | | | | | |
| 28/08 | | | | | | | |
| 29/08 | | | | | | | |
| 30/08 | | | | | | | |
| 31/08 | | | | | | | |
| 01/09 | | | | | | | |
| 02/09 | | | | | | | |
| 03/09 | | | | | | | |
| 04/09 | | | | | | | |
| 05/09 | | | | | | | |
| 06/09 | | | | | | | |
| 07/09 | | | | | | | |
| 08/09 | | | | | | | |
| 09/09 | | | | | | | |
| 10/09 | | | | | | | |
| 11/09 | | | | | | | |
| 12/09 | | | | | | | |
| 13/09 | | | | | | | |
| 14/09 | | | | | | | |
| 15/09 | | | | | | | |
| 16/09 | | | | | | | |
| 17/09 | | | | | | | |
| 18/09 | | | | | | | |
| 19/09 | | | | | | | |
| 20/09 | | | | | | | |
| 21/09 | | | | | | | |
| 22/09 | | | | | | | |
| 23/09 | | | | | | | |
| 24/09 | | | | | | | |
| 25/09 | | | | | | | |
| 26/09 | | | | | | | |
| 27/09 | | | | | | | |
| 28/09 | | | | | | | |
| 29/09 | | | | | | | |
| 30/09 | | | | | | | |
| 31/09 | | | | | | | |
| 01/10 | | | | | | | |
| 02/10 | | | | | | | |
| 03/10 | | | | | | | |
| 04/10 | | | | | | | |
| 05/10 | | | | | | | |
| 06/10 | | | | | | | |
| 07/10 | | | | | | | |
| 08/10 | | | | | | | |
| 09/10 | | | | | | | |
| 10/10 | | | | | | | |
| 11/10 | | | | | | | |
| 12/10 | | | | | | | |
| 13/10 | | | | | | | |
| 14/10 | | | | | | | |
| 15/10 | | | | | | | |
| 16/10 | | | | | | | |
| 17/10 | | | | | | | |
| 18/10 | | | | | | | |
| 19/10 | | | | | | | |
| 20/10 | | | | | | | |
| 21/10 | | | | | | | |
| 22/10 | | | | | | | |
| 23/10 | | | | | | | |
| 24/10 | | | | | | | |
| 25/10 | | | | | | | |
| 26/10 | | | | | | | |
| 27/10 | | | | | | | |
| 28/10 | | | | | | | |
| 29/10 | | | | | | | |
| 30/10 | | | | | | | |
| 31/10 | | | | | | | |
| 01/11 | | | | | | | |
| 02/11 | | | | | | | |
| 03/11 | | | | | | | |
| 04/11 | | | | | | | |
| 05/11 | | | | | | | |
| 06/11 | | | | | | | |
| 07/11 | | | | | | | |
| 08/11 | | | | | | | |
| 09/11 | | | | | | | |
| 10/11 | | | | | | | |
| 11/11 | | | | | | | |
| 12/11 | | | | | | | |
| 13/11 | | | | | | | |
| 14/11 | | | | | | | |
| 15/11 | | | | | | | |
| 16/11 | | | | | | | |
| 17/11 | | | | | | | |
| 18/11 | | | | | | | |
| 19/11 | | | | | | | |
| 20/11 | | | | | | | |
| 21/11 | | | | | | | |
| 22/11 | | | | | | | |
| 23/11 | | | | | | | |
| 24/11 | | | | | | | |
| 25/11 | | | | | | | |
| 26/11 | | | | | | | |
| 27/11 | | | | | | | |
| 28/11 | | | | | | | |
| 29/11 | | | | | | | |
| 30/11 | | | | | | | |
| 31/11 | | | | | | | |
| 01/12 | | | | | | | |
| 02/12 | | | | | | | |
| 03/12 | | | | | | | |
| 04/12 | | | | | | | |
| 05/12 | | | | | | | |
| 06/12 | | | | | | | |
| 07/12 | | | | | | | |
| 08/12 | | | | | | | |
| 09/12 | | | | | | | |
| 10/12 | | | | | | | |
| 11/12 | | | | | | | |
| 12/12 | | | | | | | |
| 13/12 | | | | | | | |
| 14/12 | | | | | | | |
| 15/12 | | | | | | | |
| 16/12 | | | | | | | |
| 17/12 | | | | | | | |
| 18/12 | | | | | | | |
| 19/12 | | | | | | | |
| 20/12 | | | | | | | |
| 21/12 | | | | | | | |
| 22/12 | | | | | | | |
| 23/12 | | | | | | | |
| 24/12 | | | | | | | |
| 25/12 | | | | | | | |
| 26/12 | | | | | | | |
| 27/12 | | | | | | | |
| 28/12 | | | | | | | |
| 29/12 | | | | | | | |
| 30/12 | | | | | | | |
| 31/12 | | | | | | | |
| 01/01 | | | | | | | |
| 02/01 | | | | | | | |
| 03/01 | | | | | | | |
| 04/01 | | | | | | | |
| 05/01 | | | | | | | |
| 06/01 | | | | | | | |
| 07/01 | | | | | | | |
| 08/01 | | | | | | | |
| 09/01 | | | | | | | |
| 10/01 | | | | | | | |
| 11/01 | | | | | | | |
| 12/01 | | | | | | | |
| 13/01 | | | | | | | |
| 14/01 | | | | | | | |
| 15/01 | | | | | | | |
| 16/01 | | | | | | | |
| 17/01 | | | | | | | |
| 18/01 | | | | | | | |
| 19/01 | | | | | | | |
| 20/01 | | | | | </ | | |

This application will help hugely in stock control and date checking sufficiency when it comes to HACCP sheets as it will give more 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 given or up taken throughout the 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. All learnt throughout the four years has culminated into this project, this was the chance to show what I have learned and what was liked and disliked. Even using particular past projects to help 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. Learning also how to make the 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 which turned out to be very satisfying. 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 fellow colleagues at work and companies that implement stock control systems to shops. The goal was to create an application that could tackle the existing issue of date checking not being as effective as it should be. 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 can look back on what was created and feel a sense of self-achievement that this is what was created and that 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.

Conducting a survey among the staff at the workplace to get their valued opinions on this idea that will heavily involve them potentially using this in the future was a goal that could be achieved. This feedback will be very relevant to me as the developer and as it is to those that will be using the application on a daily basis. As a result of this the application needed to be 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 used throughout the project. not to mention learning more about the Ionic framework and the Firebase cloud database storage. Also Furthering my knowledge in GitHub, Visual Studio Code and Overleaf LaTeX. Beyond this project the wish is to develop more Ionic applications with the Firebase cloud storage and being more knowledgeable in the framework and database will benefit beyond college and into potential employment.

5.0.2 Objectives Met or Not Met

With the objectives set out from the outset the majority if not all objectives set out were met to self satisfaction. There are some minor aspects in the application that might be added 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 was produced as it is helping an area close to life outside college 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. An application was successfully created 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. From experience that not every customer checks the date of products and not to mention being 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. 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.

A survey was conducted within the 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. The hope was to get a mixture of feedback for this which would allow me to then suss out the pros and cons of making this application and potentially using it within the workplace. All feedback was appreciated both positive and negative.

The ambition to learn more about the Ionic Framework and Firebase Cloud Database in which was met, which is pleasing as in the future the hope is to develop more projects using these technologies. More was learned 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 it was pleasing to 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. Not to mention improving 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. Also improving the 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 is very pleasing as it will benefit for future projects and tasks outside of college.

Overall the feeling is that the Objectives and Goals set out in making an application were met, 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 weekly goals and objectives were set out in development which was discussed with the project 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 application tests were conducted for the applications functionality. To test functions such as user authentication logging in, registration and logging out. Along with adding, updating and deleting food products from their designated food group.

Results shown on the next page:

Figure 5.1: Application Testing Result Page 1

| Project Name: | | AF Date Control | App Designed By: | Andreas Falley | Final Year Project | | | |
|------------------|-----------------------------|---|--|-------------------------------------|---|---|--------|--|
| Module Name: | | Applied Project & Minor Dissertation | Software Start Date: | 12/02/2020 | Software Test | | | |
| Release Version: | | Ionic 5 | App Developed By: | Andreas Falley | | | | |
| Cloud Database: | | Firebase | Software Tested: | 20/04/2020 | | | | |
| 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 staff sign in. 2. Enter received email and password of account. 3. Press Log In button. | Log In User Authentication | The application should successfully log me in with 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 amazVerified is null but if I try again it signs me in. I believe this is a bug with the server. 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 in required details. 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. Sign in to 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

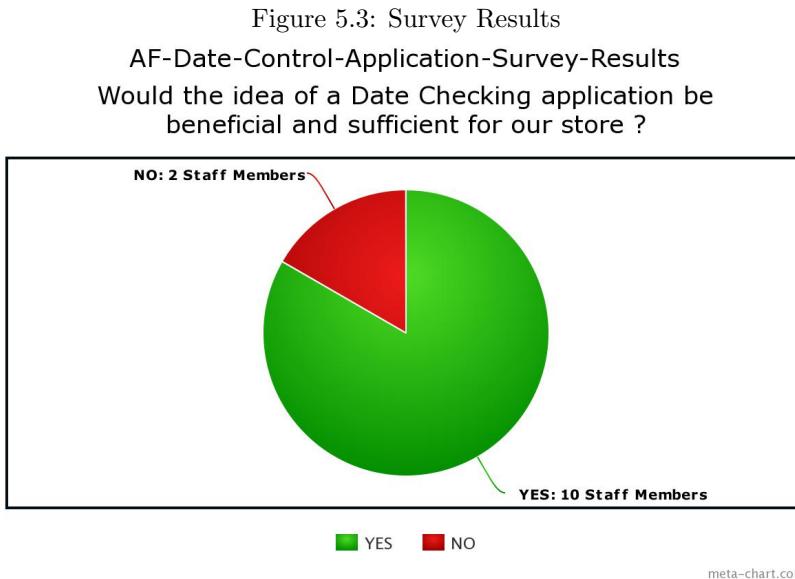
| | | | | | | | | |
|------|----------------------------|--|--|---|---|---|------|---|
| 00-5 | Forgot Password | Try and reset password via being sent an email link. | 1. Click Forgot Password button on log in page. 2. Enter email address of account for password reset. | Forgot Password User Authentication | User should receive an email with a link for password reset. | Function Does Not work for some reason. Console says email does not exist or has been deleted from db. | Fail | I had this issue near the start of development and came to it later. I had to do some digging, wasnt able to fix the problem. Issue is highlighted on Github and is now 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 login page of application. | Wasn't able to successfully log out of the application. It is brought back to the 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 product to. Each food group is unique. 3. Enter in product details and press add button once the form is filled. | Add Product Crud Functionality | The details entered by the staff member should appear 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 Detail | This 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 4. 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 selecting the item in 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 action was taken by the staff member and that item is no longer available for customer purchase. |

- Noticed when logging in a potential bug has been noted which is highlighted on the GitHub Repository where a window popup shows a an email verified null error. When canceled and clicked 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 it was unattainable 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 the 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.

- These application tests also give a sense of the know how to an application. An instruction manual if you will. Shows a tester or user how to do certain things such as register an account or update a food product for example. It of course is good in showing what does work and what doesn't when presenting this to someone. Maybe they could fix an issue or a failed test ? These application tests can be useful in more than one sense.

5.0.4 Survey Results



Above shows the results of the survey 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". Feedback is appreciated and the reasoning was acknowledged. 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 knowing that 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 mentioned previously this reduces the time spent date checking while making it more sufficient in the grand scheme of things.

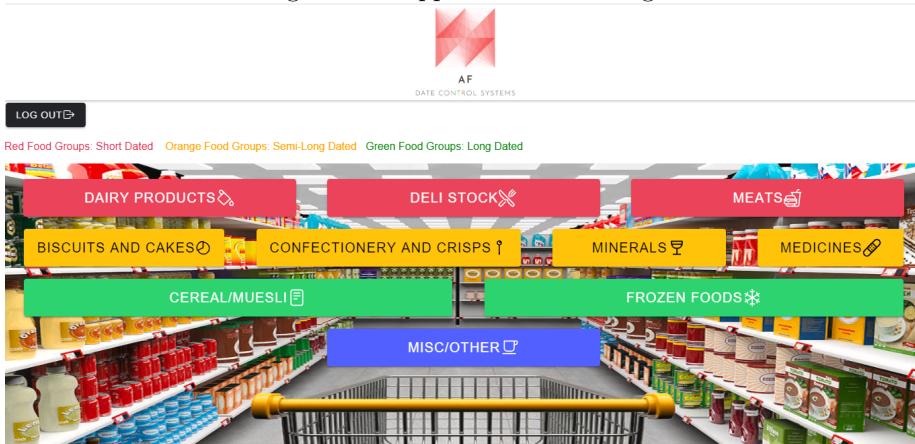
5.0.5 Limitations

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 a product entry form was added to show what it would look like in real time in a shop. Was also 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. Discussions took place about 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 these aspects could be added 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, 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 personally would have liked to have had these characteristics in the application.

Chapter 6

Conclusion

Figure 6.1: Application Main Page



To conclude, from the outset the overall rationale and goals set out were to make an application that along with second opinions from those I work with to create and develop a software application intended to tackle an exiting issue within the workplace that being date checking sufficiency, save staff members time in their already busy routine and save the shop money in terms of getting to a product in time to take action and for tactical ordering in the future. Not only does this application target supermarkets in terms of implementation, but also targets companies such as CBE mentioned throughout this dissertation.

Food wastage and Stock Control is proven to be an issue globally according to the research. The purpose of this application is to help suppress this issue. With the measures currently in place of date checking physically with the human eye, this is not a sufficiently sustainable method as the human eye cannot see everything. This application shows the products that are close to their sell by dates or past them. This allows for staff members to log in to this application and identify the exact products that are close or past their sell by date, eliminating the danger of a customer potentially buying and consuming an out of date food item. This application proves to also reduce that potentially dangerous risk as well. Not all customers look at the best before date, imagine an elderly customer picks this item up and consumes it without knowing, this can be very harmful. This application intercepts this scenario very swiftly which is a crucial factor.

Not every single objective that I wanted to meet were met in the development of this application. However the main objectives set out from the start were met and for that it is very satisfying to see the outcome which could be very successful. It is providing a helpful service to a place where I have worked part time in for five years. The flexibility and versatility of this application is very beneficial. Not only can it be for its intended purpose but it can also aid the weekly reports side of things such as staff HACCP forms where the staff member records items taken off the shelf due to damage or in this case their sell by date. The application can easily be altered this way due to the very flexible Ionic framework and Firebase cloud storage being able to tweak certain aspects to match the need at the time.

Using Ionic Firebase and changing my mind from Angular Firebase was the right technology decision not only on a personal note for the development but the overall look and functionality of the application. The application needed to be easy for the staff member to use and understand. It also needed to be aesthetically pleasing to look at but at the same time not look too complex for usage. I believe in this case this has been produced, as you can see in the dashboard of the application screenshot above the food groups divided into color coded sections, Red for short dated products for example. Making it easy to use and understand for the staff member.

6.0.1 Outcomes of the Project

- Gained more knowledge and understanding about the technologies used from the start to finish of this projects development and delivery. A lot more was learnt about the Ionic Framework in terms of its functionality and capabilities. The understanding of the Firebase Cloud Database has been enhanced as a result of producing this project. For example making the Ionic application a Firebase hosted website which then gave me a sense of accomplishment after typing in the URL of the application and it showing up rather than doing an "ionic serve" which runs the application on the local host. Not to mention en-

hancing the skill in usage of GitHub looking at insights and highlighting issues, Visual Studio Code in showing that if i need to commit changes to GitHub or install a certain package required for the application functionality and Overleaf LaTeX newly learnt framework in which my experience using it in other projects helped me in writing this dissertation.

- Also improving on meeting weekly goals and objectives with the weekly meetings with the project supervisor who was a great help throughout the development of this project in listening to me as a student and giving valuable advice for certain things. The project supervisor provided feedback every week in which I would always take on board be it positive or negative or to change something to something else.
- Another outcome being producing an application to help with an existing issue linked to life outside the college environment. That of course being in the workplace. The thought of producing an application to help save staff members time, gave me enough encouragement to produce this application to make for a happier place to work for all. Not to mention saving the shop money in terms of allowing management to take action in time and to reduce risk of customer consumption as well.
- Minor outcomes such as conducting surveys and application tests was also an important outcome from the project. Conducting a survey and receiving feedback is highly important in the development of an application as it gives you a rough indication of if an application is indeed necessary. Also conducting an application test to show the users or viewers what works and what doesn't and a small step by step snippet of how to use each function. Application testing for past projects was a huge help in making and doing these tests. These were done specifically to give the viewer and user more insight into the project/application.
- A sense of self accomplishment was one of if not the main outcome of doing this project. Seeing this application in action and a sense of "a proud moment" when demonstrating this application to friends, family and work colleagues and saying I created this. This is the favoured outcome in which will never be forgotten.

6.0.2 Personal

Overall as a final year student I find myself extremely satisfied with what was developed for the final year project. When finishing and presenting this unique feeling of self accomplishment arrived. Bringing my college experience and work experience together to create this unforgettable application. AF-Date-Control-Systems an application that was created to solve an issue within retail relating to date checking and food wastage. That is what was created, a prototype application potentially for use in the workplace or even beyond the workplace such as other shops or CBE.

This project may also aid in potential employment in the future with CBE in which contact was made via email but understandably during these unusual times yet to hear back from CBE, however remaining optimistic that maybe I'll be allowed to demonstrate this application to CBE or even meet with someone from CBE to explain how this application can be implemented into their systems and how it can save them time and money providing this new and effective service to their customers. Every moment of doing this project was enjoyable as it links to life outside college in which I enjoy to discuss my part time job with others and use the knowledge gained from GMIT for the past four years to show what was learned and remembering this project for life. Also due to the fact that this has not yet been implemented into retail as of yet, the sense of a "first" to come up with this idea is some what incredible. There is a essence of excitement to get the feedback from those who may have the capabilities to implement this application such as CBE to see if this can be possible and presenting an idea to them before employment would benefit in the long run. I am pleased to say this project can go many places if implemented and explained correctly, and the fact I have created this opportunity is most satisfying to read and to hear. Fin.

Chapter 7

References & Appendices

7.0.1 Technologies Used References:

<https://www.overleaf.com>
<https://github.com/>
<https://code.visualstudio.com/>
<https://ionicframework.com>
<https://firebase.google.com/>
<https://www.meta-chart.com/>
<https://www.freelogodesign.org/>
- Microsoft Office - Power Point
- Microsoft Office - Excel
- Microsoft Teams - Meetings and Presentation

7.0.2 Dissertation Images References:

https://logos-download.com/12885-amazon-web-services-aws-logo-download.html/amazon_web_services_logo_aws
<https://www.neotalogic.com/wp-content/uploads/2019/04/microsoft-azure.png>
<https://www.vmcn.ca/f/files/via/images/best-before.jpg;w=960>
<https://www.rai.ie/wp-content/uploads/2015/02/CBE-Logo-250x250.jpg>
<https://firebase.google.com/downloads/brand-guidelines/PNG/logo-standard.png>
<https://i.pinimg.com/600x315/2c/b6/70/2cb670b6ddd8922a1c1b2fee4f6f758c.jpg>
https://upload.wikimedia.org/wikipedia/commons/thumb/d/d1/Ionic_Logo.svg/1200px-Ionic_Logo.svg.png
https://ionicframework.com/blog/wp-content/uploads/2018/06.firebaseio_firestore_ionic.png
https://miro.medium.com/max/10000/1*T64qcW7_VJGfXJSUc6QIKA.png
<https://www.filepicker.io/api/file/CbujYaRfSGikHwnfeG8v>

https://miro.medium.com/max/3336/1*YMFKP8e6kR9cbM3IKXBtLw.png
https://blog.launchdarkly.com/wp-content/uploads/2018/10/visualstudio_code-card.png
<https://www.brainyquote.com/>
<https://pngimage.net/wp-content/uploads/2018/06/problems-png-2.png>

Screenshots:

- Mace Ballinrobe - CBE System
- AF-Date-Control - Dashboard

7.0.3 Running the Application

Copy and Paste the following URL into a web browser:

<https://datecontroldatabase.web.app>

Please register an account and verify the email address. Not verifying will deny you access to the applications dashboard where the main functionality is. When signed in i encourage you to try out the application for yourself.

For more information or a more in depth look at the source code and other aspects of this project i would suggest cloning the project GitHub Repository for viewing within a code editor. This can be done by entering the following command into a command prompt:

- git clone <https://github.com/AndreasFahey/AppliedProject-DateControl>

Here is the GitHub Repository Link:

<https://github.com/AndreasFahey/AppliedProject-DateControl>

Bibliography

- [1] Sandra Lebersorger and Felicitas Schneider. Food loss rates at the food retail, influencing factors and reasons as a basis for waste prevention measures. *Waste management*, 34(11):1911–1919, 2014.
- [2] Shigeru Nakano. Food information management system, August 22 2006. US Patent 7,096,221.
- [3] Jenny Gustavsson, Christel Cederberg, Ulf Sonesson, Robert Van Otterdijk, and Alexandre Meybeck. Global food losses and food waste, 2011.
- [4] Graham Riches. *Food banks and the welfare crisis*. James Lorimer & Company, 1986.
- [5] Fu Cheng and Fu Cheng. *Build Mobile Apps with Ionic 4 and Firebase*. Springer, 2018.