FRONT COVER TO BE MADE

**Recipes For Life:**

***Bringing the tradition of cookbooks to the 21st Century***

**Kari McMahon**

**AC4001 Honours Project**

**BSc (Hons) Applied Computing**

**University of Dundee 2015**

**Supervisor: Dr Keith Edwards**

**Table Of Contents**

[1. Introduction 4](#_Toc416082191)

[2. Background 4](#_Toc416082192)

[2.1 Cookbooks As A Historical Document 4](#_Toc416082193)

[2.2 Traditional Cookbooks And Their Benefits 5](#_Toc416082194)

[2.3 Current Recipe Applications 5](#_Toc416082195)

[3. Specification 7](#_Toc416082196)

[3.1 What Is A Minimum Viable Product? 7](#_Toc416082197)

[3.2 Initial Specification 7](#_Toc416082198)

[3.3 Data Gathering 7](#_Toc416082199)

[3.5 Final Specification 8](#_Toc416082200)

[3.5 Specification Flexibility and Managing Requirements 8](#_Toc416082201)

[4. Project Management 9](#_Toc416082202)

[4.1 Methodology 9](#_Toc416082203)

[4.2 Project Deliverables 10](#_Toc416082204)

[4.3 Project Management Tools 10](#_Toc416082205)

[4.3.1 Initial Project Plan, Gantt Charts & Trello 10](#_Toc416082206)

[4.3.2 Sprint Backlogs 10](#_Toc416082207)

[4.3.3 Risk Assessment 11](#_Toc416082208)

[4.3.4 Supervisor Meetings & Minutes 11](#_Toc416082209)

[4.3.5 Log Book & Github 11](#_Toc416082210)

[4.4 Realities of the Methodology 11](#_Toc416082211)

[5. Design 12](#_Toc416082212)

[5.1 Application Operating System Selection 12](#_Toc416082213)

[5.2 Server Side Design 12](#_Toc416082214)

[5.2.1 Database Requirements & Selection 12](#_Toc416082215)

[5.2.2 Database Design 13](#_Toc416082216)

[5.2.3 Server Side Development Language Selection 13](#_Toc416082217)

[5.2.4 Server Side Development Tools 14](#_Toc416082218)

[5.3 Application Design 14](#_Toc416082219)

[5.3.1 Application Layout & Design Patterns 14](#_Toc416082220)

[5.3.2 Application Language Selection 14](#_Toc416082221)

[5.3.3 Application Development Tools 14](#_Toc416082222)

[5.4 Application & Server Communication 15](#_Toc416082223)

[5.5 Collaboration Feature 15](#_Toc416082224)

[5.6 Paper Prototypes 15](#_Toc416082225)

[5.7 Design Sketches 15](#_Toc416082226)

[5.8 Ethics 16](#_Toc416082227)

[5.9 Intended Audience & Persona’s 16](#_Toc416082228)

[5.10 Design Focus Group 16](#_Toc416082229)

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*Abstract - This project details the design and development of Recipes For Life an Android application for collaborative recipe management. For generations collaborative cookbooks and recipes have been a way for people to express themselves and share experiences and traditions with others through the alternative format of cooking. But as society increasingly moves more and more into a digital age the concept of the collaborative cookbooks could soon be lost in the onslaught of digital information if it is not brought into the 21st century. Many recipe management applications are on offer but none offer the possibility to collaborate on cookbooks and recipes with friends, family and communities - a tradition which has been ingrained in society for many generations. Therefore this project aims to fit this gap in the market and presents a solution which brings the tradition of recipe books to the 21st century through a collaborative recipe management application.*

# Introduction

A recipe book is defined as a “book of directions explaining how to prepare and cook various kinds of foods” (Merriam-Webster, 2014). Although many successful cookbooks do not just represent directions but they represent people’s experiences and their traditions which we can identify with and get excited about often through tantalising pictures, interesting descriptions and innovative ideas (Ruhlman, 2012). For generations collaborative cookbooks and recipes have been a way for people to express themselves and share experiences and traditions with others through the alternative format of cooking. But as society increasingly moves more and more into a digital age the concept of the collaborative cookbooks could soon be lost in the onslaught of digital information if it is not brought into the 21st century. Currently there is no applications on the market that offers collaborative recipe management and therefore this project presents a solution to this an Android application called Recipes For Life. This solution aims to bring the tradition of recipe books to the 21st century through collaborative recipe management. The following report outlines design and development process of the solution as well as reflecting on the successes, challenges and lessons learnt from the various aspects of the project.

# Background

Recipes and cookbooks inextricably link with fond memories. Whether it’s an individual’s memory of their favourite apple pie recipe they baked with their grandma, a delicious chocolate chip cookie recipe they picked up at a charity bake sale or their beloved secret penne arrabiata recipe. Much of society stores these memories away by placing them recipes on pieces of paper in the back of cookbooks, creating their own cookbooks and increasingly placing these recipes on technological devices. By storing these recipes it allows them to keep the recipes to look back on and alter as well as share with friends and family to develop new experiences and memories together. Although as society reach a point where many individuals are storing and sharing recipes using technology the possibility of collaborative cookbooks and recipes between groups of people could soon been lost. For generations recipe books have enabled others to view our cookbooks and alter and add new recipes but as society moves into this digital age we appear to be losing this tradition. This can be seen when browsing through the Apple and Android application stores there is a large amount of cooking and recipe management applications but none of these apps offer the possibility to collaborate on cookbooks and recipes with friends, families, clubs or even with strangers who have similar interests. The recognition of this sparked interest into the research into traditional cookbooks and the benefits they provide as well as research into the current recipe applications on offer to help understand the viability of the project being presented.

## 2.1 Cookbooks As A Historical Document

Recipes have been a part of society for thousands of years with the earliest recollection of recipes being the De Re Coquinara which dates back to the 5th century AD. Since then recipes have played a major part in society for so many years with cookbooks now being seen as informal historical documents. Many papers have explored this topic including Mitchell’s paper Cookbooks As A Social And Historical Document – A Scottish Case Study. The paper examined whether Scottish cookbooks published between 1890 and 1990 are historical markers of major events and technological advances in society. The paper found that “although cookbooks might not record events in society as historical facts nevertheless their contents are often a response to historical events.” (Mitchell, 2001). Similarly in the book Eat My Words: Reading Women’s Lives Through The Cookbooks They Wrote - the author examines cookery books from the US and UK from the 17th to mid-twentieth century. The book documents how women from “diverse backgrounds have found the homely cookbook a suitable place to record their stories and thoughts as well as their recipes.” The book aimed to tell untold stories of these women from the cookbooks. The author used the book to examine these stories to get others to consider cookbooks as worthy objects of serious textual analysis through demonstrating how the recipe books told the history of that time. As well as this the author also demonstrated how recipe books could be used to maintain a connection with the individual who wrote the book even if they were from a different century from the individual who was reading the book and this connection was formed all through the medium of cooking - “How deep are the connections between us – a 17th century mother and myself –despite the time that has elapsed.” (Theophano, 2003). These papers and books mentioned demonstrated how cookbooks can be seen as a historical documents which can tell the story of the time and be beneficial in helping others understand that time period through the analysis of these documents. It is clear that cookbooks appear to stand the test of time and that individuals can still connect with documents that are hundreds of years old. Losing cookbooks would mean losing documentation that can tell the story of a specific time period whether learning about an individual’s specific story or learning about the varying diets or food/cooking trends for cultures all around the world in that specific time period.

## 2.2 Traditional Cookbooks And Their Benefits

Recipes have been a part of society for thousands of years with the earliest recollection of recipes being the De Re Coquinara which dates back to the 5th century AD. Since then recipes have played a major part in society for so many years with cookbooks now being seen as informal historical documents. Many papers have explored this topic including Mitchell’s paper Cookbooks As A Social And Historical Document – A Scottish Case Study. The paper examined whether Scottish cookbooks published between 1890 and 1990 are historical markers of major events and technological advances in society. The paper found that “although cookbooks might not record events in society as historical facts nevertheless their contents are often a response to historical events.” (Mitchell, 2001). Similarly in the book Eat My Words: Reading Women’s Lives Through The Cookbooks They Wrote - the author examines cookery books from the US and UK from the 17th to mid-twentieth century. The book documents how women from “diverse backgrounds have found the homely cookbook a suitable place to record their stories and thoughts as well as their recipes.” The book aimed to tell untold stories of these women from the cookbooks. The author used the book to examine these stories to get others to consider cookbooks as worthy objects of serious textual analysis through demonstrating how the recipe books told the history of that time. As well as this the author also demonstrated how recipe books could be used to maintain a connection with the individual who wrote the book even if they were from a different century from the individual who was reading the book and this connection was formed all through the medium of cooking - “How deep are the connections between us – a 17th century mother and myself –despite the time that has elapsed.” (Theophano, 2003). These papers and books mentioned demonstrated how cookbooks can be seen as a historical documents which can tell the story of the time and be beneficial in helping others understand that time period through the analysis of these documents. It is clear that cookbooks appear to stand the test of time and that individuals can still connect with documents that are hundreds of years old. Losing cookbooks would mean losing documentation that can tell the story of a specific time period whether learning about an individual’s specific story or learning about the varying diets or food/cooking trends for cultures all around the world in that specific time period.

## 2.3 Current Recipe Applications

AllRecipes.com an extremely popular recipe site states that one-third of online cooks use smartphones to look up recipes. They found that 44% of cooks preferred using cooking websites over 19% who preferred to use traditional cookbooks and in the past 15 years the use of cooking websites have surged 207% (All Recipes, 2012). It is clear that technology is becoming the top cooking resource and although traditional collaborative cookbooks have been seen to have many benefits, they are beginning to be lost in the mass offerings of technological cooking resources. Especially with tablets now being used as the replacement of the traditional cookbook with AllRecipes.com in 2013 stating that social referrals from tablet devices to their website was up 787% from 2012 to 2013 as well an increase in page views on the website from tablets (All Recipes, 2013). The popularity of tablets in the kitchen can also been by the vast number of kitchen accessories on offer for tablets such tablet kitchen stands, covers to protect from spillages and styluses to use when cooking instead of touching the screen with dirty hands, an example of this can be seen in figure 1. With accessories like these making their way onto the market and the statistics seen from AllRecipes.com tablets seem the way to go when creating technology applications for the kitchen.



Figure 1: Belkin Kitchen Tablet Mount

To help the student understand if there was room in the market for the collaborative recipe application being proposed research was focussed on current popular applications available for tablets. The student explored a few apps from big name companies and a smaller indie apps this is because the student would be more likely to be competing against the available indie apps. Figure 2 outlines a few of these applications with their features and downfalls. Many of these applications are very popular with a high amount of downloads and star ratings. But all of these applications lacked a collaborative feature that enabled users to set up and maintain shared cookbooks. The research showed there is room on the market for the project and also showed that recipe apps are highly desired and used by a large amount of the population. The research also enabled the student to also see the successes of the current apps and what users currently like and didn’t like about these apps which could be possible features that would work in addition to the collaborative features of this project.

|  |  |  |  |
| --- | --- | --- | --- |
| **Application Name** | **Description** | **Features** | **Downfalls** |
| All The Cooks | A social cooking application | Enables users to find new recipes, write reviews as well as add new recipes and a few neat features like shopping lists and conversion features | No collaborative feature |
| Big Oven | A strong recipe management and discovery application. With over 8 million downloads and has won several awards. | Import recipes from websites  Take an image of a recipe and convert to a recipe. | No collaborative feature.  You have to pay for some functionalities. |
| RecetteTek | A simple recipe application that enables you to create a recipe library and manage them. | Import recipes from a website.  Free text recipe adding.  Search recipe features. | No collaborative feature.  Not very stylish. |

Figure 2: Current Applications Research

# 3. Specification

This project was the idea of the University of Dundee Applied Computing student Kari McMahon who also undertook the design and development of the project. The core aim of the project was to create a minimum viable product that enabled users to collaborate on recipes together in shared cookbooks.

Since the project was the student’s idea there was no client interaction to gain the specifications for the minimum viable product. Therefore student created the specifications based on a combination of own ideas, data gathering and research.

## 3.1 What Is A Minimum Viable Product?

*“A minimum viable product (MVP) is the the most pared down version of a product that can still be released. An MVP has three key characteristics:*

* *It has enough value that people are willing to use it or buy it initially*
* *It demonstrates enough future benefit to retain early adopters*
* *It provides a feedback loop to guide future development*

*The catch to this development technique is that it assumes that early adopters can see the vision or promise the final product and provide the valuable feedback needed to guide developers forward. “*

* (Technopedia, Unknown)

A minimum viable product (MVP) is a way for developers to create a product that is a market led and desired by consumers through accelerated learning. An MVP is producing a product that has just enough functionality to gauge whether there is a market need for this product. The challenge is that there is a significant amount of recipe applications already on the market often with a large amount of features therefore this already sets the bar quite high for market expectations. So the challenge in creating the product specification is that it should mainly be focussed on the specification of the apps core aim which is the collaborative features but also have enough specifications that add additional functionality to the app so it can be put on a level playing field with current recipe applications on the market.

## 3.2 Initial Specification

The initial requirements were an informal list of requirements. The requirements were in two categories functional and non-functional and were set out with shall, should and may. Shall meaning the requirements that should definitely be developed. Should meaning the requirements that should be developed if there is time and may meaning the requirements that may be developed if there is time. The initial requirements proved as a starting point for understanding the applications functionalities. With a list of possible application requirement functionalities gathered from research, a survey was then created to learn more about the demographics for the application and to help prioritise the functionalities and find any new functionalities based on the target markets needs and desires. An example of these initial requirements can be seen in figure 3.

The application shall enable users to create account.

The application shall work offline

Figure 3: Requirements specification example for functional and non-functional requirements

## 3.3 Data Gathering

To help better understand the target market and gather specifications for the application a survey was created placed on the website SogoSurvey.com. SogoSurvey was selected over popular survey sites like Google Forms or SurveyMonkey because it was free to use, had a good range of different question types and had useful analysis tools. The survey asked for anyone over the age of 18 who was interested in cooking and cooking with technology to fill out the survey. The survey was distributed via email, on cooking forums and through communication with those interested in the project. The aim of the survey was to understand the applications target market and gather information to help create the applications final specifications. To gain information about the specification there was a section the survey which laid out the 17 possible functionalities that had been set out in the student’s initial specification. The participants were then asked to rate these functionalities in order of usefulness and suggest any other functionalities.

The survey received 19 responses with 13 of the participants being female and 6 being male with the participant’s ages ranging from 18 – 78. Several of the participants in the survey were from a cooking background where their occupations were a pastry chef, dietician and private chef. In figure 4 a summary of some of the responses to questions in the survey can be seen.

|  |  |
| --- | --- |
| **Question Summary** | **Response Summary** |
| Percentage of participants who frequently use recipe books, apps, recipe websites | 63.69% responded to frequently by selecting 4 or 5 in the scale  1 (Not at all) – 5 (All the time) |
| Percentage of participants who use smartphones or tablets in the kitchen | 78.95% stated they used smartphones or tablets in the kitchen |
| Percentage of participants who were interested in using the project being presented | 47.4% responded yes  26.3% responded possibly  21% responded no |

Figure 4: Summary of some of the survey responses

The responses from the survey showed the participants had a clear interest in cooking using technology, the majority liked the idea of the application being presented and they were all from a wide range backgrounds which was useful for gaining a varied response. Therefore the responses relating to the rating of application features were taken into consideration when developing the final specification document. The survey responses were used in connection with the initial requirements document to develop the final specification. The data gathering was beneficial in showing that there was interest in the project being presented and it was worth pursing and having the respondents contribute towards the requirements document helped create a market led specification document. The full survey results can be found in the appendix.

## 3.5 Final Specification

The final specification was created from the data from the survey, the student’s ideas and research. The student examined the ranking of requirements via a frequency table generated by SoGoSurvey. The ranking of the requirements determined the priority in the specification document. Occasionally requirements that were not ranked highly by participants still ended up high in the final requirements document because they were essential to the creation of the application. The requirements marked with shall were the requirements essential to creating a minimum viable product. The full specification document can be found in the appendix and an example requirement can be seen in figure 5.

Figure 5: Example final requirement

**R5 Cookbook Privacy**

**Description:** The user shall be able to set cookbook to private or public

**Rationale:** This is essential as it gives users the choice of who is displayed to the public

**Risk:** High

**Priority:** High

## 3.5 Specification Flexibility and Managing Requirements

The type of formalised requirements document discussed in section 3.4 is often rigid and fixed. Since the project was the student’s idea and was not a contractual agreement with a client this enabled some flexibility in the specification document. To help create a flexibility with the specifications a technique of using a task board was used which was popularized by the Agile methodology. A task board is “a snapshot of the current sprint backlog allowing everyone to see which tasks remain to be started, which are in progress and which are done” (Bowes, 2014). The benefits of the task board is its simplicity the developer can easily move tasks around if priorities change and add/remove new tasks if the developer realises they are missing a requirement. The task board is so simple it also easily provides a snapshot of progress (Agile Alliance, n.d.). In the project the student used the task board by splitting the formal requirements into smaller requirements in a user story[[1]](#footnote-1) format and then storing them in the online task board called Trello in the same priority as listed in the document. The higher they are on the list then the higher priority they are. The tasks are then marked with a colour – red for todo, yellow for in progress and green for done. This marking helped for an easy snapshot of progress. Trello makes requirements easy to move around and helps make the project more adaptable to change.

When the final specification was set and then moved to Trello then all the requirements were managed on Trello. Using a task board helped create a project that was flexible and was led by information instead of a process where requirements were fixed and based on assumptions made at the start of the project. An example scenario was requirement R1 (Recipe management) was higher priority than R2 (Account creation). At the development stage it was clear creating an account should be developed before recipe management as users account are linked to recipes. So through having Trello the student could easily log on and move the requirements around based on this information. Also by splitting the requirements into smaller and more manageable chunks as seen in figure 6 was really useful because it made tasks easier to achieve and also helped give clarity on the priority of some requirements. For example due to time constraints it appeared creating a recipe and cookbook were important tasks to achieve than deleting a recipe in the time constraints so using Trello enabled the student to easily change these priorities. Often in development it was a clear a new requirement might need to be added which wasn’t though about at the initial requirement stage and using a task board made it simple to easily add or removed requirements based on new information.

**In the document:**

**R2. Account Creation**

**Description:** The user shall be able to create an account.

**Rationale:** This is necessary as it allows the user access to the application.

**Risk:** High

**Priority:** High

**In the task board:**

As a user I want to be able to create an account so I can log onto the app

As a user I want to be able to log in so I can use the app.

Figure 6: Example comparison of requirement and user story



Figure 7: Trello Task Board

# 4. Project Management

## 4.1 Methodology

A software development methodology is a “framework that is used to structure, plan, and control the process of developing an information system” (IT Knowledge Portal, n.d.). Recipes For Life is a large project and it was necessary to select a software development methodology that would help structure and maintain the project. There are two core software development methodologies – waterfall and agile. Waterfall is the traditional software development process, it is a linear and rigid approach that does not embrace the inevitable changes or revisions that often occur within projects (IT Knowledge Portal, n.d.). Whereas Agile is a set of development processes which are flexible to change, encourages working code over documentation and frequently take opportunities to assess the direction of the project throughout the development lifecycle (Highsmith & Cockburn, 2001). The Agile approach enables a flexible project which can be evaluated honestly and realistically through interaction and collaboration at frequent intervals. An Agile approach was most suitable for this project as requirements, design and evaluation could easily change as the project was explored in more depth and therefore a software development process that enabled flexibility was essential. The most popular Agile methodology is SCRUM which is a very customer centric approach and is based on a lot of customer and team collaboration. This project lacked an official customer and was being developed by an individual so it was necessary to find a flexible Agile development approach that was this less client and team oriented. An Agile approach that was suitable for this was the iterative development process. The iterative development process allows you to develop a system in iterative cycles. The process starts with an initial planning stage where the initial requirements and design are set. Then iterations essentially “mini-project” cycles which occur until the product is ready for the delivery. At the end of each iteration the individual or team has an opportunity to re-evaluate the project and re-organise and change aspects of the project to the fit the needs of the team, individual or client. The iterative approach is very flexible and helps creates a final product that is user centred and information led (Bittner & Spence, 2006).For the needs of the project the iterative approach was built upon to create an iterative methodology strategy appropriate for the project. The diagram in figure 9 outlines this strategy.



Figure 8: Iterative Development Process [[2]](#footnote-2)



*Figure 9: The Projects Iterative Strategy*

Figure 9: Iterative Strategy For Project

## 4.2 Project Deliverables

The main deliverables for the students project was the recipe application for Android devices, the server side SQL database and the C#/ASP.net code which inserts or retrieves a JSON of database details to sync the phone and server. Several other deliverables were to be handed in for the project:

* Requirements document
* Gantt chart
* User manual
* Proof of testing and evaluation.
* Source code for the application and server side code.
* Poster and presentation
* Log book.
* Supervisor minutes.
* Ethics documents.

As well as any other documents the student used throughout the project and felt was relevant to the hand in. These deliverables are all included in the appendix.

## 4.3 Project Management Tools

### 4.3.1 Initial Project Plan, Gantt Charts & Trello

At the beginning of the project an initial plan was developed by the student outlining an overview of the project plan for September 2014 till May 2015 this was mainly to give the supervisor a guideline of the estimated project plan. This plan was then further developed into a Gantt chart at the start of the project. Gantt charts give a graphical illustration of a schedule that helps to plan and coordinate tasks (Rouse, 2007). Gantt charts are frequently used in management and are a great way to visualise the overall project. The student choose to use a Gantt chart as it provided a snapshot of the overall project plan and easily visualise tasks and milestones for the project over a year. The student often used the Gantt chart at regular intervals to help evaluate overall project priorities and progress. Trello which was discussed in section 3.5 was used for a lower level project view as the student could see in detail whether specific requirements were in progress, achieved or still to be done. The combination of the Gantt chart and Trello meant it was easy to see project progress and re-prioritise if necessary which led to good organisation throughout the project. The initial project plan, gantt charts and a link too trello can be found in the appendix.

Gantt chart comparison image ?

### 4.3.2 Sprint Backlogs

A sprint backlog is a list of the tasks and requirements to be completed within the sprint **Invalid source specified.**. For this project sprint backlogs were used for the 2 week development sprints that occurred within the iterations. Requirements would be selected from the product backlog for a 2 week sprint and then these requirements would be split into small tasks on the sprint backlog with an estimated time to spend to achieve these tasks. Each day in the sprint the amount of hours spent on the task would be logged and monitored. The sprint backlog helped show the progress of development and helped the student analyse the amount of time being spent on requirements as the student could see on average how quickly they developed requirements. This made weekly task commitments more realistic as the student knew what they could achieve in the time frame and this helped limit the student over committing on tasks. The sprint backlog is also very flexible because if an individual underestimates what they can do in 2 weeks they can easily add new requirements. Sprint backlogs are really simple and effective way to monitor and analyse development progress by giving a snap shot of day to day progress. The sprint backlogs were created in excel and can be found in the appendix.

### 4.3.3 Risk Assessment

For a project to be successful it is essential to outline the possible risks and problems within the project at an early stage and create contingency plans for these risks. This is a common practice within the software development industry. For the project a risk assessment was created at the research and design stage of the project. It outlined the risks for the project in order of priority and contingency plans for each risk. For the top 3 risks two contingencies are listed and for the rest of the risks one contingency is listed. The prioritisation of the risk is based on a value from 1 to 10 representing the likelihood of the risk occurring and the loss if the risk did occur. These two values are multiplied together to give the severity which is used to calculate the priority. Risk assessments enable developers to think ahead about any risks that might have a serious impact on the success of the project and help create solutions to best limit them. This is essential in a large project like recipes for life where a risk like losing files at a late stage could be detrimental to the success of the project therefore it was essential to use a risk assessment throughout project and was key to the successful management of the project. The risk assessment can be found in the appendix.

### 4.3.4 Supervisor Meetings & Minutes

Supervisor meetings were scheduled once a week for the majority of the project. A supervisor meeting is a useful way to help manage the project because the student gets an outsiders perspective. Another perspective is useful when the student is struggling with challenges that are halting project progress as the different perspective often gives new suggestions and strategies that hadn’t crossed the students mind. At each meeting the student has a chance to present their work and because of this the supervisor can give advice and guidance on the student’s project or their progress. This is a great way to address any progress or project issues early on. Each meeting gives the student an opportunity to learn from the supervisor’s knowledge and experience which is a great tool to have. Minutes were kept to enable reflection on these meetings and can be found in the appendix.

### 4.3.5 Log Book & Github

A log book was maintained by the student throughout the project as an informal diary of work. The log book enables the student to write about the tasks achieved on a day to day basis as well as their rough notes, ideas or research throughout the project. The log book was a really useful and informal way to document the daily progress and vision of the project.

Github was selected by the student as the versioning control system for the project so they could manage all the files for project and store all the versions in case files need to be recovered. Github enables access to files wherever there is an internet connection, the ability to revert to old versions and the ability to store a variation files such as java files or word documents. Github was selected over other versioning control systems like Subversion or CVS because the student already had experience with Github from past projects and had a private account on Github. As well as this Github is also well supported with over 6 million people using the site (Github, n.d.) so there is a large amount of support available if any difficulties were to occur and it is available when there is no internet connection which offers flexibility therefore for these choices for file management. Although Github also acted as another informal logbook as the daily commit messages acted an informal log of day to day work and the visualisations produced on Github based on the commits which show the overall students’ progress.

## 4.4 Realities of the Methodology

The student followed the iterative strategy laid out in section 4.1 and figure 9. Although some aspects of the strategy were changed based on the project. In the strategy it was set out that user testing sessions would be done after the 2 iterations but after the first 6 week iteration there wasn’t enough functionality in the application to justify user testing to be done at that point. So in the second iteration two user testing sessions had to be done one early in the iteration and one in late into the iteration. Also in the plan it stated there would be 2x 6 week iterations but in the second iteration an extra 2 weeks was added to enable more functionality to be added to the application. Although the iterative strategy did not go exactly to plan because of its flexibility it enabled these changes to be made without causing too many problems.

# 5. Design

Before implementation could start on the project several design decisions needed to be made which are discussed in the following sections.

## 5.1 Application Operating System Selection

The application for the project was being developed predominantly for tablets as they are increasingly becoming more popular for use in the kitchen. This meant a tablet operating system needed to be selected before development. In terms of tablet operating systems there are three main options you can develop for which are Android, IOS or Hybrid / Web apps. In 2014 IDC.com stated the worldwide smartphone operating system market share for Q2 2012 was 84.7% for Android, 11.7% for IOS and others making up 3.7% of the market

share with the predominant vendors being Samsung with 24.4% market share and Apple with 11.7% market share. IDC.com stated the tablet OS market share was 53.8% Apple and Android 42.7% (IDC, 2014), (IDC, 2014), (McCracken, 2013). In terms of the two major operating system competitors it is quite a close call between them but Android comes out slightly stronger having a wider overall reach over Apple. This data was taken into consideration with the advantages and disadvantages of each operating system based on the student’s previous experience and research. These advantages and disadvantages are outlined in the figures 10 and 11.

|  |  |  |
| --- | --- | --- |
| **Android** | **IOS** | **Hybrid / Web Apps** |
| Already experienced in Android development | Large amount of resources available for help | Works on both operating experience |
| Not as many recipe applications available on android hence more market share for the application | Popular operating system | Has some experience of html/css with minor javascript experience |
| Large amount of resources available for help | Standardized marketplace | Save time as they port to multiple platforms |
| Standardized market place | Easier to build nicer UX/UI features | Merge web and native features |
| Easier to build nicer UX/UI features | Make use of own hardware and software features | Consistency between apps |
| Make use of own hardware and software features |  |  |

Table 1: Advantages of Android, IOS and Native Web Apps[[3]](#footnote-3)

|  |  |  |
| --- | --- | --- |
| **Android** | **IOS** | **Hybrid / Web Apps** |
| Only covers one OS | Only covers one OS | Little help available, it’s relatively new in comparison to Android or IOS |
|  | No experience with ios or objective C development | Complex to set up and fidgety |
|  | Need to own a mac to develop so would only be able to work from computing building | No centralized market place. |
|  |  | Often work arounds are needed when porting to different apps |
|  |  | Web apps cannot work offline |

Table 2: Disadvantages of Android, IOS and Native Web Apps[[4]](#footnote-4)

Android was the leading operating system in market share in smartphones in the last year as well as having the largest amount of advantages to the least amount of disadvantages based on the research therefore Android was a natural choice to develop for. Although hybrid/web apps were also a strong contender but the main reason for not selecting this option was the lack of support available at the moment which was a concern especially for a large project like this. The device selected for testing and presenting the application is a Samsung Galaxy Tab S4 as Samsung is the largest Android vendor according to IDC.com (IDC, 2014), so it felt best to test and develop on a Samsung device.

## 5.2 Server Side Design

### 5.2.1 Database Requirements & Selection

The application will be handling a reasonable amount of data from multiple users so a large aspect of the projects design stage was database consideration. The student was already aware that Android devices come with a SQLite database built into the phone this enables individuals to retrieve data from the database directly without having being connected to the internet which means applications can be very responsive as there is no time waiting connecting to the server and it also means applications can work offline. It was important for the student to have an application which could work offline because the users may want to retrieve recipes to look for ingredients when there are looking for ingredients in the store or may not have wifi in their kitchen. But it was also important for the student to have a database on a centralized server because users can be contributing to other cookbooks or searching for other recipes this means it’s necessary to insert and retrieve this new data from a central database that all the users can access. Therefore this meant having the database on each of the individual’s phones and a central database on the server and a sync functionality would be used between them.

Although SQLite is built into the Android device, new and upcoming NoSQL database has been developed for Android as well called Couchbase. The student explored the SQLite and Couchbase options before deciding which would be used on the device. SQLite is a lightweight, self-contained database that is memory efficient and can handle terabyte sized databases which makes it suitable to be embedded on smartphone devices (SQLite, n.d.). It is a full SQL implementation which makes it very easy to use if the developer already has experience of SQL. Whereas Couchbase is NoSQL database solution for the Android device. NoSQL databases are schema free, can handle large volumes of data, are suitable for scaling and have high availability and strong disaster recovery (MongoDB, n.d.). Couchbase at first seemed the better choice for the project because the application may need to handle a large amount of data and may need to scale in the future which couchbase offers. Couchbase also states they offer a sync functionality between the phone and the server which would be a useful tool for this application. The issue with Couchbase was it was relatively new and was lacking significantly in support and documentation in comparison to SQLite. To help make the choice the student drew out the basic database design for the project and found it was hard to visualise the projects database as a NoSQL database so taking this into consideration with the lack of support and documentation the student chose SQLite to be used on the device.

With SQLite selected to be on the device. A SQLite or SQL database needed to be chosen to be used on the central server. There wasn’t much difference between selecting a SQLite or SQL database as they are both equally suitable and it was mainly due to the student’s preference. The student selected a SQL database on the server because they have more robust and sophisticated database management tools which are free in comparison to SQLite which are very lightweight management tools unless the developer is willing to pay money for them. Another reason for this choice is SQL databases tend to be more supported for querying from server side scripts such as a C# or PHP script than SQLite.

### 5.2.2 Database Design

After the selection of the database was made an in depth database design was developed. The design of the database went through multiple iterations in the design phase. It was important that all the tables in the database had a timestamp which would be used to track the differences between the application and server databases which would allow for an accurate sync between them. In the design the recipe table is connected to quite a lot of tables because tables like preparation and ingredients involve linking tables as recipes can have more than one preparation step or ingredient. A snapshot of the database design can be seen in figure 10 and the full database design can be found in the appendix.

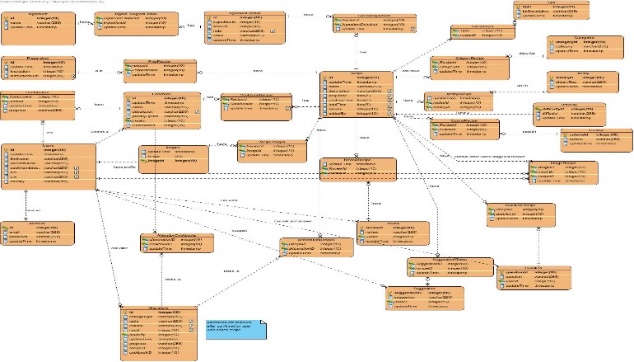


Figure 10: Database Design

### 5.2.3 Server Side Development Language Selection

On the server side it was necessary to have server side scripts that would be called by the application to insert and retrieve data from the database. The two main options for this was PHP and ASP.net/C#. PHP is a “widely used open source general purpose scripting language” (PHP, n.d.) and ASP.net is a “development framework for building web sites with html, css, javascript and server side scripting” (W3C, n.d.). Both of these languages are widely used and have strong support networks so the choice of the language predominantly came down to experience. The student was experienced in both languages but had used PHP with Android syncing in the past and found it straightforward so therefore felt it was suitable to use again.

### 5.2.4 Server Side Development Tools

The development tools to be used for managing the server side application was Microsoft SQL Server Management Studio as the database was a MSSQL database which was provided by the School Of Computing for use in the project. Therefore Microsoft SQL Server Management Studio was chosen as the tool to manage the database as it is recommended to use with this database, it is free for students and it’s a premiere Microsoft product so has a lot of support and documentation and is easy to set up. To write and manage the PHP scripts notepad++ was selected as its lightweight, fast and a simple tool which has a lot of code editing features built in that seemed suitable for managing the PHP scripts (Web master Format, 2009).

## 5.3 Application Design

### 5.3.1 Application Layout & Design Patterns

The application will be designed with a Model-View-Controller design pattern as the application is heavily database orientated and the MVC pattern enables separation of the business logic and view. The benefits this pattern brings is that it limits code duplication and enforces code re-use making code more flexible and easy to test functionality independently (Kotek, 2002). The application will have classes split into the packages model, view and controllers (beans). Figure 11 demonstrates the model view controller design pattern.



Figure 11: MVC Design Pattern

The application will have a model package which contains classes that purely send and retrieve data from the database. The controller will be information beans which will store information that is being sent too or retrieved from the database. The view will have all the classes (activities) which the user will interact with and retrieve the data from user input which will be stored in the controller. The model view controller pattern creates a strong separation of business logic and view. This pattern is demonstrated in the UML class diagram created for the application which is seen in figure 12 and in the appendix. This class diagram represents the classes that will be thought to be used during the implementation at the design stage.

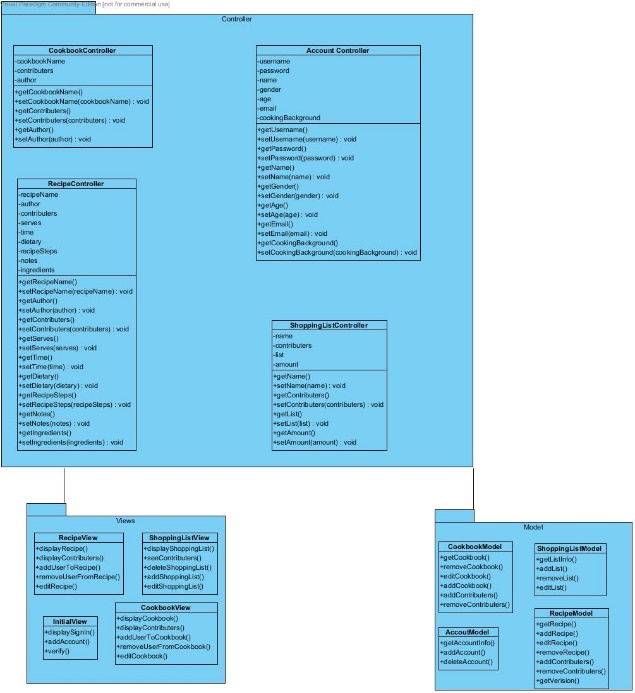


Figure 12: UML Class Diagram

### 5.3.2 Application Language Selection

Java is an object oriented programming language which is platform ubiquitous and has a vast array of 3rd libraries available for use (IBM, n.d.). Java has been around since 1995 and therefore a significant amount of developers work with java and a huge amount of documentation is available (Oracle, n.d.). Google selected Java as the language to be used to develop Android applications and therefore Java is the language that must be used to develop the application. To write unit tests for the application Junit was selected as the android test suites are based on Junit (Android, n.d.). Junit is a unit testing framework for the Java Programming Language (JUnit, n.d.), its links with the android test suites makes it easy to test and write tests for Android applications.

### 5.3.3 Application Development Tools

There are two IDE’s available for Android development – Eclipse and Android Studio. Android Studio is an intellji editor that is set to replace Eclipse at some point in the future but is still in its beta stages at the application design stage (Android, n.d.). Eclipse is the original Android IDE of choice, there is a lot of support for issues in eclipse and it is stable but the Eclipse editor is also bulky and can be very slow when doing development work. The deciding factor between Eclipse and Android studio was stability and support. Eclipse was more reliable for support and stability. The student also had Eclipse set up and was experienced using it, so this also affected the choice of the IDE.

In Android you can run the application virtually using an emulator. The emulator selection for the project is Genymotion. Genymotion is an android emulator which is trusted by 1500000 developers (Genymotion, n.d.). This is the alternative in comparison to the Android emulators provided and from past experience of using both there is a significant difference in speed with Genymotion being a lot faster.

## 5.4 Application & Server Communication

As already discussed the application should be able work online and offline. Therefore a sync functionality is needed between a centralized database on the server and a database on the phone. To show how the sync should work a diagram is displayed in figure 13.



Figure 13: Application & Server Database Communication

This system involves having a database on the server and a sqlite database on the phone. Each table in the database stores a timestamp and differences between the timestamps on the server and phone are used to find rows that need to be sent or retrieved between the database and the device when internet is available. These rows are often sent through a data exchange format between a server side application and the device. To make the syncing possible it was important to select a data exchange format that would be easy to use within the application and server side code.

The two main choices for data exchange format were XML and JSON. XML is a markup language for documents containing structured information such as text or images with some information about the role this data plays like header or paragraph (Walsh, n.d.). JSON is a lightweight data interchange format that easy for humans but is also easy for machines to parse and generate (JSON.org, n.d.). The choice selected was JSON as it is readable and in both PHP and Java is really simple to create and parse JSON code therefore it seemed more straightforward to use JSON than XML.

## 5.5 Collaboration Feature

An important aspect of the application is the ability to create collaboration in the application therefore the student thought about this in depth at the design stage. The collaboration feature will work by the user being able to add individuals by their email to a cookbook. Once this choice is made the user who has been added will receive the cookbook on their shelf and they will be able to add, delete and edit to the cookbook to help create collaboration.

At the design stage the student explored the collaboration feature also involving some form of versioning control for recipes, cloning of recipes so if the user wants to change a recipe drastically instead of editing it they can clone it and adding reviews or tips to a recipe for small changes instead of editing a recipe. The student also explored the idea of users being able to ask to join cookbooks. But these possible additional features depended on development capabilities and time constraints at the implementation stage.

Refactoring & Testing Strategy ? Does it need discussed ?

## 5.6 Paper Prototypes

Paper prototypes are a simple and efficient way to explore ideas at the design stage. The student used paper prototypes when trying to develop a design for the application. It enabled the student to visualise the application without spending too much time on the finer details (Medero, 2007). The paper prototypes went through several iterations as often when the student was sketching aspects out she realised she missed a step and needed to re-develop the design. The paper prototypes were a cheap and quick way to explore design ideas and were beneficial in the design of the application.

Image of prototypes need to be scanned.

## 5.7 Design Sketches

Once the finalised design sketches were created on paper these designs were then moved onto Axure. Axure helps create a more polished design sketch by exploring widgets, placeholders and font styles (Axure, n.d.). This makes it very to create a sketch that looks very much like an actual application. Using Axure makes it very easy to visual the application and seeing the design in this way helps pull out additional ideas and possible challenges. Axure was useful because you could load the design and easily make changes to the application based on feedback or requirement changes which is great when developing a user centred design.

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Figure 14: Design Sketches

In the design the student really wanted to create an application that had a unique style and did not look like a generic android application. She wanted to represent cookbooks as users would see them on a day to day basis. The student did this by having shelves which the cookbooks sit on like the user would have at home. The cookbook would be made to look like a cookbook by having the image the user selected as a square shape like a book with a text overlay at the top of the image to make it appear as though it’s the books title. These cookbooks would then sit on the shelf.

The application design is very icon centric to help create a system that has a match to the real world by using icons that are familiar to the user. The colour scheme for the application is bright pink and white because it creates a good contrast, helps catch attention and aesthetically pleasing.

## 5.8 Ethics

The application is user centred so it necessary to be able to design and implement the application based on user feedback and to do this an ethics form has to be submitted. An ethics form outlines the various techniques involving users that will be used to aid the creation of a user centred application. The techniques chosen for this project were an anonymous survey, interviews/focus groups, user testing and evaluation. An anonymous survey was used to gather information about the target market and help gather/prioritise requirements for the application, interviews/focus groups were used to gain opinions on design sketches and the application idea, user testing to understand how usable and easy to understand the application is and an evaluation against a popular recipe app to see if it could compete on the market. Ethics enables the student to undertaken user studies in the correct manner. Ethics for the project was approved in October 2014 this meant the project could have users involved throughout which would aid the development of a user centred application.

## 5.9 Intended Audience & Persona’s

The intended audience for the application is any individual with an interest in cooking and particularly those with an interest in using technology with cooking. The participant group aims for the studies involving users were individuals from the ages of 18-60 who have an interest in cooking. It was hoped the participant group would have an equal gender split. At the design stage very basic personas were created to represent the different demographic groups the application could have to help others understand the intended audience of the application. These personas can be found in the appendix.

Update Persona’s

## 5.10 Design Focus Group

A focus group was undertaken at the design stage of the application to help create a user centred application. The focus group had 6 participants, 4 female and 2 male between the ages 18 and 60. The focus group was very informal with the design sketches that were created on Axure and the project idea being presented to the group and their feedback was noted down. The overall comments were that the application was clear, consistent, interesting and colourful with some minor changes to be made such as areas where the pink font was used as headers was sometimes hard to read and issues with some of the icons such as the ones to change font size was hard to understand. This feedback was then taken into consideration in the implementation stage.

1. User Story - A user story is a tool used in Agile development to capture a description of a software feature from an end-user perspective. (TechTarget, n.d.) [↑](#footnote-ref-1)
2. (Agile Development Tools, n.d.) [↑](#footnote-ref-2)
3. (Budiu, n.d.)**,** (Gorbsky, 2013)**,** (McCracken, 2013) [↑](#footnote-ref-3)
4. (Budiu, n.d.)**,** (Gorbsky, 2013)**,** (McCracken, 2013) [↑](#footnote-ref-4)