

Institiúid Teicneolaíochta Cheatharlach



At the Heart of South Leinster

# LifeReceitas

## 4<sup>th</sup> Year Project Research Manual

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# Abstract

The purpose of this document is to outline the early research necessary for the development of LifeReceitas, the food recipe web app. The app will work as a social media for people who like to cook and share their recipes with others. In this research, I will talk about things like User Interface, Database, Server, Development Frameworks and many other topics.

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# Introduction

This document will provide an overview of the research conducted for this project.

The aim of this project is to develop a multi-platform social media like application to allow people to discover food recipes of all types, from different nationalities and cultures.

To begin, the research will describe the proposed application, and review existing apps in order to evaluate the functionality they offer. The research will then go through what a Progressive Web Application (PWA) is and why it is the ideal solution for this project in detail, it will also outline the benefits and issues of developing an app as a PWA.

The last section of this research will look at technologies to consider for Progressive Web Application development. The first section will discuss all the programming languages needed in order to develop a PWA, languages such as HTML, CSS, JavaScript, JSON, SQL and noSQL. The second part of this section will outline all the frameworks that can be used to develop this application. Frameworks such as Bootstrap, NodeJs, React and GitHub. The third part of this section will discuss in detail Google's FireBase database, which is going to be used to store all the data for the application. The Fourth and final part of this section will outline all the development environments that can be used to develop the proposed application. The development environments are Visual Studio Code, WebStorm and Atom.

# Description of the Application

When thinking of healthy eating many people are unaware of what it is about.

So what is healthy eating? In plain and simple English healthy eating is eating a diverse range of meals to ensure that your body receives the nutrients it requires to function properly. Eating the right foods will ensure that your body is getting the right amounts of healthy calories needed. When eating and drinking more or less than what your body requires daily will result in gain or loss of weight.

There are many benefits to a healthy and balanced diet. It will help prevent many chronic diseases such as heart problems, diabetes and cancer.

Many people when starting this healthy eating journey get lost because they don't know where to start. In the app, people will find a way to start their journey no matter their cooking skill level.

With all that in mind, when thinking about a topic for my project it was easy to make a decision on this topic of health because healthy eating has been part of my life for about 6 years now and when looking at the app market I could never find the perfect app because there was always some feature missing.

So with this project, I plan to better implement all the features already existing in other apps and add all the features the other apps don't have.

Some proposed features for the application are:

- o User can create an account to access more functionalities in the app
- o Category search
- o Cookbook where recipes can be found
- o Add or save new recipes to the personal cookbook
- o Rate and comment on recipes
- o Message other users
- o User can share new recipes with other users

The proposed application has a significant number of potential users as everyday people are changing their eating habits and searching for healthier options. The goal is for everyone, regardless of their cooking skills, to be able to utilize the app independently.

# Existing Applications.

Several current apps were evaluated throughout the project's research period. The functionality given by the apps to the user, the user interface, and the platforms on which the application was available were the primary emphasis of this part of the research. Google, the Google Play Store, and Apple's App Store were used to locate these programs. Despite the fact that numerous applications were investigated, only the most significant are included in this report.

## Paprika Recipe Manager

This app is available on all platforms. It allows users to save dish recipes with a simple tap. When Paprika Recipe Manager is installed on multiple devices your data will be synced. The app also allows you to add new dishes and add images and rate other recipes within the app. "Paprika doesn't just help out with recipes; it also gives you the tools to plan meals, create organized shopping lists, start a timer, and convert measurements".(MUO, Paprika Recipe Manager, 2021).

Figures 1 and 2 below show how a user can edit an existing recipe.

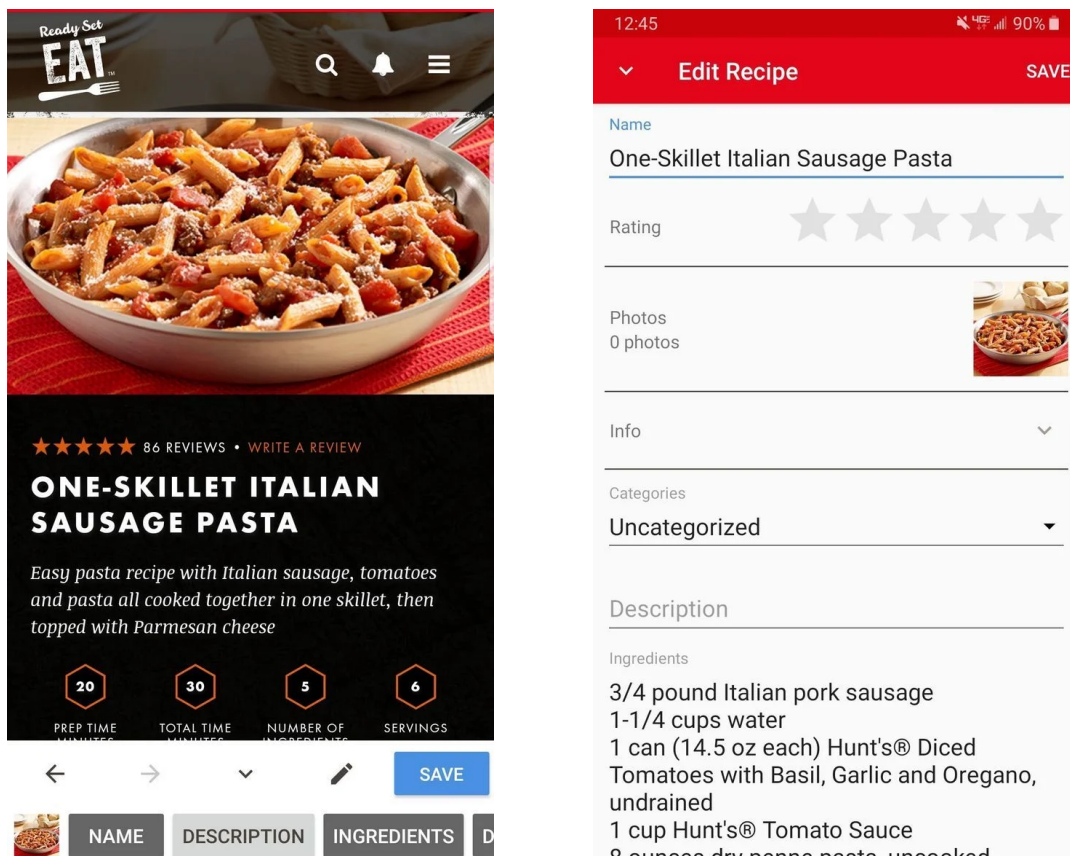


Fig. 1 & 2 : (MUO, 2021)

Although Paprika is available on all platforms, it is only free for android devices. This aspect of the application, causes its popularity to drop due to the fact that in today's date most applications are free and no user wants to pay for apps.

## BigOven

“With BigOven, you can take your recipes anywhere, make grocery lists and easily share your favourite creations with your friends, family or even your future self when you need them.” (About BigOven, 2021). Their aim is to inspire and organize home chefs in the kitchen and on the move. BigOven, one of the mobile cooking leaders with over 13 million downloads, helps home chefs prepare tastier meals. BigOven allows users to add their own recipes, explore 500,000+ recipes, reuse leftovers, make a shared grocery list, use RecipeScan to transcribe your new recipes, save recipes from sites you like with Recipe Clipper, follow friends and favourites, rate and review recipes, and more.

BigOven is freely available on Android, IOS and a website. This aspect makes the app much more appealing to the public. Also, its ability to search for a recipe based on leftover ingredients makes the app stand out from all the apps available in the app stores. BigOven will inspire some ideas for this project and thorough use of this application will be made in order to find out more about it.

Figures 3 and 4 below show the function on the app that allows the user to search for leftover ingredients and discover new recipes.

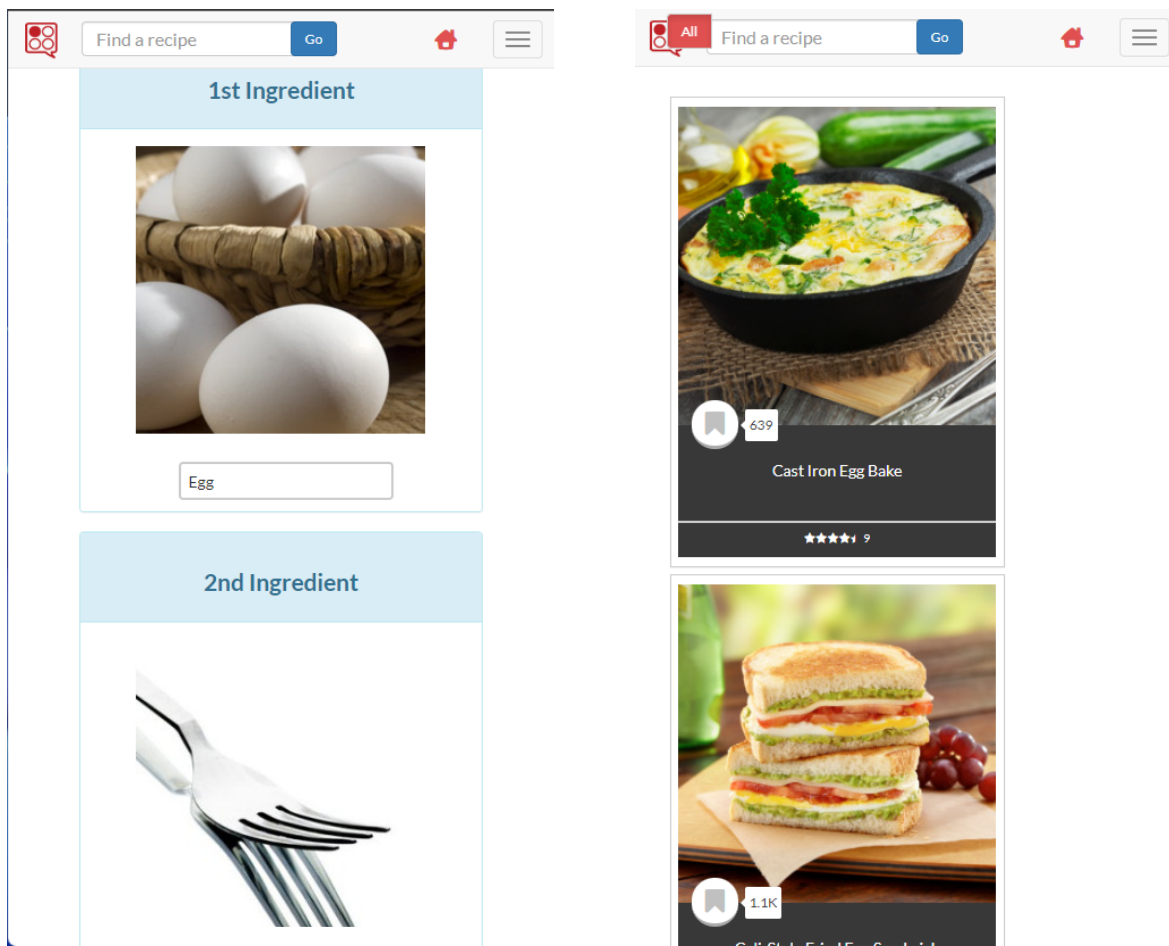


Fig. 3 & 4: (BigOven, 2021)

## Yummly

Yummly makes it simple to locate a delicious dish. It's both an app and a desktop website, which makes switching between phone and computer even easier. Yummly learns users' preferences after only a few searches and begins offering dishes. Yummly can filter out recipes that contain ingredients the user wishes to avoid whether he or she has a food allergy or particular dietary requirements. This is especially useful if users are searching for a vegetarian or vegan app to help with meal planning.

Figure 5 on the side shows how users can set their diet preferences. This feature of the app is a key component of a user's dietary requirement. Its learning algorithm also makes the app more unique, setting this application apart from all the others. Yummly is also free on all platforms.

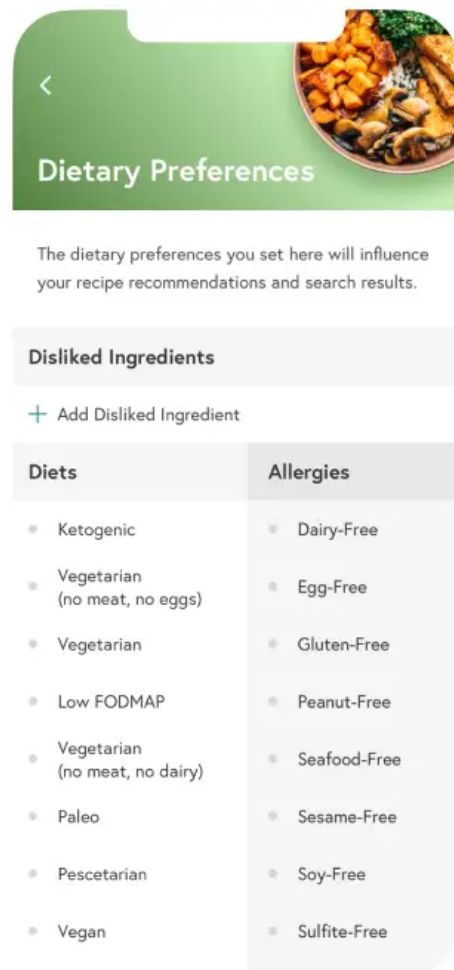


Fig. 5: (Yummly, 2021)



## ChefTap

ChefTap may not have as many features as Paprika or BigOven, but it's still simple enough to use when you're in a hurry. However, you must pay to manage your meal plans, scale ingredients, or copy recipes, therefore it is lacking in free functionality. Recipe Clipping is ChefTap's strongest feature, due to the fact that it is both free and simple. They explain on their website that with clipping users can "Easily grab just the recipe from any website or blog, and leave the rest behind." (ChefTap – ChefTap Recipe App, 2021). ChefTap not only integrates with your browser while searching for recipes online, but it also has its own built-in library. Meaning you can easily import recipes from the web into ChefTap.

The figures below demonstrate recipe clipping from ChefTap. Figure 6 is a recipe the user wants to add to his or her private cookbook. Figure 7 shows the choice to add a new recipe by URL clipping, the user has pasted the desired URL. Figure 8 shows that the recipe has been clipped to the user's cookbook. This feature of the application is interesting because it allows the user to copy a recipe from a website that they like straight to the cookbook without having to type a single word. This is a feature of the ChefTap that will be looked at more in-depth so that a similar feature can be implemented for the project.

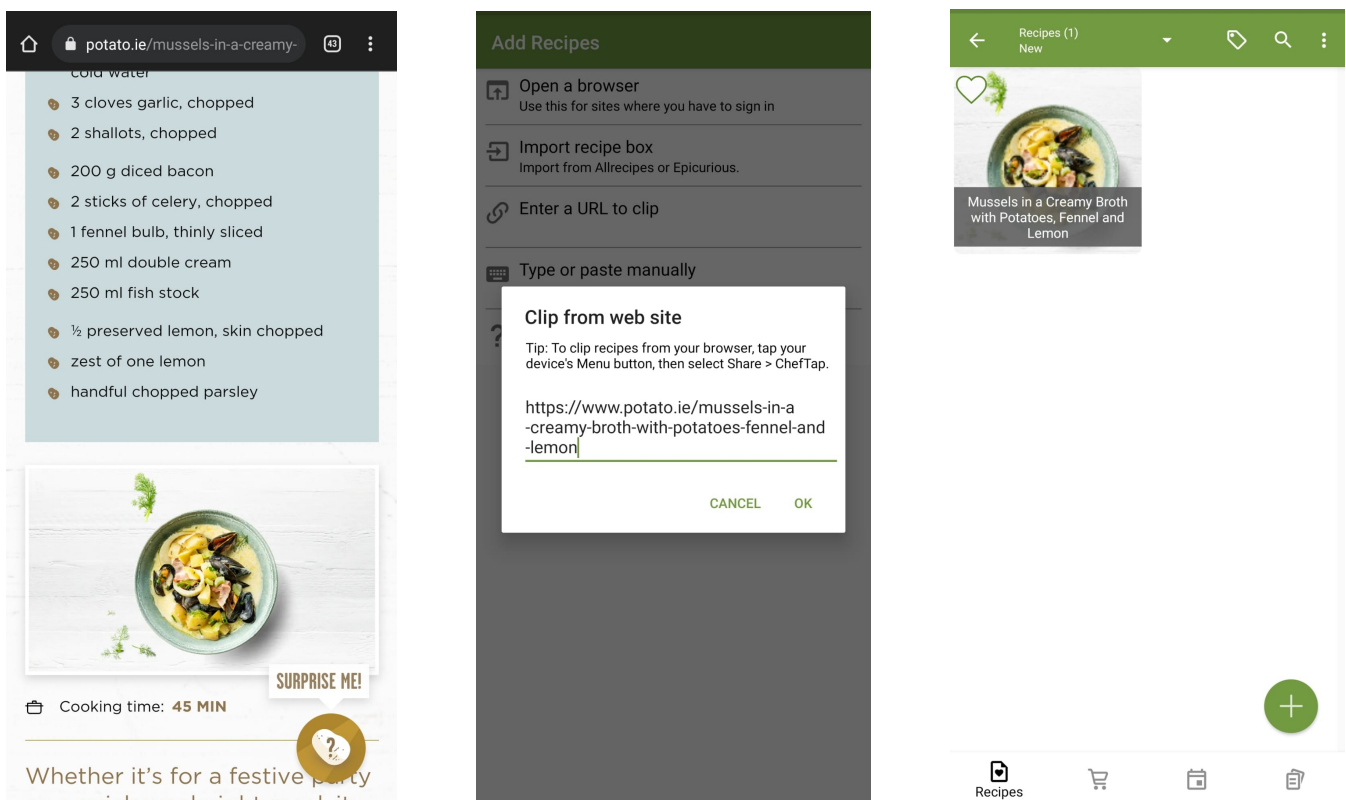


Fig. 6, 7 & 8: (ChefTap. 2021)

# Progressive Web Application

## Why Progressive?

During the research phase of this project, I have to design a Progressive Web Application (PWA). There are several advantages to designing a progressive web application, which this research will discuss in detail, but before that, we need to know what PWAs are.

In some aspects, a progressive web application is a link between ordinary online apps and native mobile applications. First and foremost, they are responsive. As a result, the PWA will be displayed correctly for the window or screen size from which the users are viewing it. PWAs use service workers to enable offline use, allowing the application to be utilized even in locations with weak internet connectivity. Although today many typical online apps are responsive to the wide range of screen sizes, they cannot be used when offline. This is the first instance of the previously described link between regular web and native apps.

While executing within a browser, progressive web apps provide the user with an app-like experience. They were previously only supported by Google's Chrome browser, but support has now been extended to several other browsers. PWAs have a URL since they run in a browser, but they are different from normal web apps because they can be installed. This implies that the user may install the PWA and it will appear like a native app on the home screen of their smartphone or PC.

A progressive web application is simple to update. The developer can add more features or solve bugs and send the modified files to the server, where they will be downloaded automatically provided the app is properly developed. PWAs, as native mobile applications, also allow push notifications. PWAs can be downloaded, but they are not available through an app store like the Apple app store or Google's Play Store. Instead, the PWA may be installed directly from the PWA's URL.

Figure 9 below is showing how the service worker interacts with the application, cache and network.



Fig. 9 : (TechAhead, 2021)

Service workers, as previously said, allow progressive web apps to function offline. They are scripts that run in the user's browser in the background, providing features like push notifications and background synchronization. This Javascript file can listen for events and sits between the network and the browser. The service worker does not require the web application to be open because it operates in the background. Even if the application is not open, the service worker can respond to push notifications delivered from the server.

Figure 10 below compares Twitter's app size as Android and IOS native apps and a PWA. From this image, we can see that a PWA is much smaller compared to native apps.

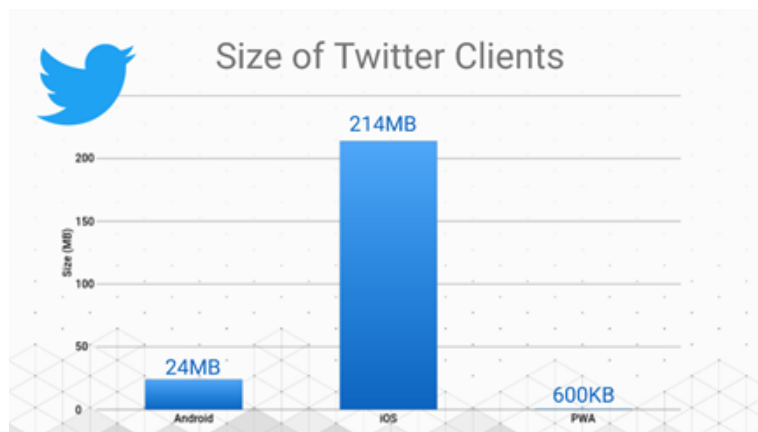


Fig. 10: (WebrtcHackS, 2021)

## The Benefits

There are many benefits to Progressive Web Applications. This section of the report will go more in-depth on some of the most important benefits of PWAs. Some of those benefits are as follows:

**Responsive** - Progressive Web Apps (PWAs) are responsive, meaning they adapt to different screen sizes. These applications work with a variety of operating systems and are easily available on a variety of devices, including smartphones, tablets, desktops, and laptops.

**Offline Access** - Unreliable connectivity difficulties frequently impact and degrade the user experience. Even if your internet connection is lost, PWA is still available. It ensures that if you use the app while offline, you will be able to see the data that has been saved.

**Low Usage of Data** - PWAs require fewer data to be installed. When compared to native apps, the utilization of service workers allows PWAs to keep data use low after installation. This is useful in areas where internet speeds are slower.

**Behave Like Native Apps** - PWAs offer the appearance and feel of native programs while remaining accessible via a web browser. You may also install a PWA and add it to your mobile device's home screen or app drawer. Push notifications may be used by the PWA in the same way that native apps can.

**Low Development Cost** - PWAs are less expensive than native mobile apps since they are produced with modern development tools and methods. Furthermore, you get data protection, security, minimal app complexity, and cross-platform software at a considerably lower cost.

**Secure** - HTTPS is required for secure app access, the usage of Service Workers, and installation on the home screen.

**No Required Update** - PWAs do not require to be updated because the developer's updates to server files are automatically downloaded.

**Not App Store Required** - PWAs aren't required to be available in app stores though they can be uploaded to the app store. Developers gain the most since they don't have to create the same software for numerous devices. Multiple devices will be able to use the same PWA.

## Issues

Although there are many benefits to PWAs there are also many issues and pitfalls about PWAs due to the fact that it's only a 6-year-old technology. Some issues are listed below:

**Fewer functionalities** – PWAs offer fewer functionalities than native applications. On Apple devices, iOS does not support all of the features of PWAs. As a result, many users' access to PWAs is limited. A lack of user experience is a genuine loss because the user experience is as important as the marketing of the product itself.

**Hardware Limitation** - While PWAs may access the device camera, some of the most recent hardware, like fingerprint scanners and face recognition, are not currently supported.

**No Current Older Devices Supported** - PWAs have only been available for a few years, so older mobile devices with outdated web browsers don't support them very well. While this issue will certainly be resolved in the future, it may become a cause of client complaints about some businesses.

In Conclusion, Progressive Web Applications are gaining traction in the digital world for a variety of reasons. Users have several issues with native apps, including storage space, excessive data usage, development costs, internet access, and many more.

PWAs address all of these challenges while also providing a fantastic user experience, increased accessibility and discoverability on the web, cost-effective development, cross-platform accessibility, and most importantly, offline data access.

As time goes on progressive web apps grow and some of the issues will become less of a problem. The crucial thing to remember is that, in comparison to native applications, they are only 6 years old.

# Technologies

This section of the research will look at different technologies and development environments that may be used to develop a progressive web app. The focus of this research is to discover what technologies are currently being utilized to develop PWAs and to determine which technologies are most suited to the project proposal.

## Languages

A progressive web application can be developed in a variety of languages. The next portion of the research will provide an overview of a few of these languages.

### HTML5

HTML is the foundation of any website (Hypertext Markup Language). It's the markup language that determines how a web page is structured and presented. It will be the foundation of any web page created for this project's progressive web application. HTML5 is the fifth version of the markup language. "HTML5 is an effort to bring order to web development chaos by organizing common practices, embracing implementations from various browsers." (According to Techopedia, 2021). An HTML web page, when utilized alone, will be incredibly simple and ugly. CSS and JavaScript are used to make websites more attractive in terms of aesthetics and functionality.

### CSS3

CSS (Cascading Style Sheets) is used in conjunction with HTML to improve the aesthetic attractiveness of online pages. They specify how an HTML page should be rendered. While HTML is used to structure things on a web page like headings and paragraphs, as well as allowing you to embed photos, video, and other media, CSS is used to design a page's layouts, colours, and fonts. CSS3 is the third version of CSS, and it includes several new features including flexboxes and grid layouts. Some of these qualities are required for the development of responsive websites. These elements will be necessary since a progressive web application must be responsive in order to look good on many devices.

### JavaScript

Although an aesthetically pleasing website can be created using simple HTML and CSS, functionality is severely limited. This is when JavaScript enters the picture. According to MDN Web Docs "JavaScript is a scripting or programming language that allows you to implement complex features on web pages, every time a web page does more than just sit there and display static information for you to look at, displaying timely content updates, interactive maps, animated 2D/3D graphics, scrolling video jukeboxes, etc, JavaScript is probably involved." (What is JavaScript? - Learn web development | MDN, 2021). JavaScript is currently supported by the majority of desktop and mobile web browsers. The bulk of the frameworks covered in this research relies on JavaScript, making it a critical component of the project.

## **JSON**

According to MDN Web Docs, “JavaScript Object Notation (JSON) is a standard text-based format for representing structured data based on JavaScript object syntax.” (Working with JSON - Learn web development | MDN, 2021). In simple terms, JSON is an easier-to-read method of storing data in key-value pairs. It is critical that websites load data rapidly without causing delays in loading or rendering and that's where JSON comes in. In Progressive Web Apps in order for the application to be installable, it must contain a web app manifest file. This file contains information about the application, such as its name, icons, and start URL, among other things and this manifest file, is made up of JSON data.

## **SQL**

According to an article online “SQL (Structured Query Language) is the language of databases. It facilitates retrieving specific information from databases that are further used for analysis.” (What is SQL & How Does It Work? A Guide to Structured Query Language, 2021). Since the progressive web application will be used by several users, some data will need to be saved. For example when a user logs in the application will need to access the stored data. This data will need to be entered into a database and to communicate with the database, SQL will be used.

## **NoSQL**

NoSQL is another database type that will be examined. “NoSQL database technology stores information in JSON documents instead of columns and rows used by relational databases” (Couchbase, 2021). In simple terms, different from SQL databases, NoSQL databases are non-relational, meaning that data is saved as key-value pairs, similar to how JSON stores data. MongoDB and Google's Firebase are two examples of noSQL databases. Later in this research, Google's Firebase will be examined and explained more in-depth.

## Frameworks

This section of the report will outline possible frameworks that will be used for the development of the application. To begin with, it is important to understand what a framework is. A framework is a development platform that may include libraries that allow developers to reuse existing functionalities rather than reinvent new ones. Frameworks allow programmers to rapidly get a project up and running while also providing structure.

### Bootstrap

Bootstrap is an HTML, CSS, and JavaScript front-end framework. Bootstrap gives developers the tools they need to create a responsive web app. The developer can also tweak the components to meet their own requirements. Bootstrap also comes with a variety of templates that can help get started building a web app much faster.

Bootstrap uses a grid system “They create layouts of pages by using multiple columns and rows in which the content can be inserted. If the device screen on which the page is being viewed gets bigger, the grid will scale up to 12 columns. This fits the page onto the screen.” (What is Bootstrap and How does it Work?, 2021). In addition, the grid layout can be collapsed to suit smaller screens. Developers can build more mobile responsive web applications because of this freedom. Below are some of the pros and cons of using bootstrap to develop a web application.

#### Pros

- **Helps save time** - Bootstrap has an extensive library of tools that helps developers to build web applications fast and it also has detailed documentation on every component, so finding information about certain components is easy and all this helps cut down on development time.
- **Helps prevent cross-browser bugs** - Bootstrap is open source and it has a big community that means anyone can come across bugs and also provides fixes.
- **Helps developers to follow the best practices**

#### Cons

- **Style overrides** - Frequently developers utilize Chrome's DevTools to find the default style attributes when not compiling. Those styles end up being replaced in a new stylesheet and this results in some code repetition, which causes the web application to load slowly.
- **Default look** - Bootstrap has a distinct look for its components, so in order to make a web application not look like it is only using default styles, the developer will have to do some work to make the design look better.
- **Learning Curve** - in order to develop a web application using Bootstrap the developer has to always think about mobile devices first and this is sometimes it a little difficult. Bootstrap also has a lot of classes and class components that a developer needs to understand in order to start developing.

## **NodeJs**

“**Node.js** is an open-source, cross-platform, JavaScript runtime environment that executes JavaScript code outside of a web browser. Node.js is a popular, lightweight web framework for beginners, and it is used by many big companies like Netflix and Uber.” (What is Node.js? A beginner's introduction to JavaScript runtime, 2021).

Node.js is a popular choice since it allows code to be run as a standalone application rather than solely in a browser context. NodeJs has some important benefits. This framework is asynchronous and event-driven, it is a fast framework, it only uses a single thread but it is highly scalable and it has no buffering meaning data is outputted in chunks.

## **React**

“React is a JavaScript library created for building fast and interactive user interfaces for web and mobile applications. It is an open-source, component-based, front-end library responsible only for the application’s view layer” (What is React, 2021).

Below are some reasons why React has become so popular for front-end development:

- In comparison to JavaScript, where writing frequently becomes difficult very fast, React makes it easier to build dynamic web apps since it needs less coding and provides greater functionality.
- Components are fundamental to every React application, and most apps include numerous components. These components have their own logic and controls, and they can be utilized across the application, reducing the development time significantly.
- React is simple to pick up since it mixes core HTML and JavaScript ideas with a few useful features.
- React can be used to develop websites and mobile applications.

There are many other reasons why React is a popular and good framework. React can also work in conjunction with Bootstrap making it a great option for this project.

## **GitHub**

It is critical to use some type of version control in each project. Developers can save their work and interact with their teams using version control. Version control allows developers to see earlier versions of their code and even roll back to a prior version if an issue with the current version emerges. Version control comes in a variety of forms. Git is the one being used for this project.

A web-based host is required to keep a git repository online. GitHub is a hosting service for git repositories. It is likely that if the local system breaks, there is going to be a loss of personal data and code. As a result, a web-based host like GitHub is essential. Github will be used for this project for version control.



## Database Firebase

This section of the report will outline an overview of Google's Firebase database and why this database is a good fit for this project.

"Firebase is a Backend-as-a-Service (Baas). It provides developers with a variety of tools and services to help them develop quality apps, grow their user base, and earn profit. It is built on Google's infrastructure." (What is Firebase?, 2021). As said before in this report Firebase was created by Google and it is a noSQL database that stores data in Jason-like files.

So why use Firebase for this project?

There are many reasons why Firebase is going to be used for this project.

This database was picked based on the following topics:

**Database** - The platform's NoSQL database ensures that all data in collections and documents are securely saved. Firebase's database is non-relational, which is better for storing big volumes of data while keeping a high degree of speed since it is more flexible and scalable. Firebase makes it exceptionally simple to build messaging chat and user dashboard making it a great database for this project.

**Faster development** - Firebase provides a set of backend development requirements, making the overall development cycle quicker and easier. When developing the frontend of the application the developer can use the Firebase stack to get particular backend data. As a result, money is saved on costs and dependency-related issues are removed or at least lessened.

**Personalization** - Firebase makes it easy to integrate Google Analytics within the application. Analytics allows the tracking of user activity, making it easier to utilise the information to improve the application's personalization. By analyzing customer behaviour, introducing new features will increase customer experience and engagement making the life cycle of the application last for a long time.

**Pricing** - Firebase has two options to choose from, based on long-term goals for the application. The plan is as follows:

**Spark** is a free plan with basic features and resources that are limited.

**Blaze** is a pay-as-you-go service that lets the developer scale up and down as needed.

The Spark package will be sufficient for what is needed to build this project and if down the line more tools are needed the Blaze package will allow the application to scale up.

**Integration simplicity** - The detailed documentation, ready-to-use APIs, easy user interfaces, and other fantastic features make integration and setup simple. One of the advantages of utilising Firebase for this project is the ability to build an app without the need for extensive setups.

Although Firebase has a lot of positive points, there are also some negative points to it too, such as limited query capabilities, limited data migration, its platform dependant, it is centred more on Android devices and it has less IOS support. With all of this in mind positive and negative points, Firebase's benefits outweigh its issues and are the best database option for this project.

## Development Environments/Code Editors

There are many development environments that developers can choose from. This part of the report will provide a review of 3 different development environments with the goal of determining which one is more suitable for this project. So what is a development environment? According to SUSE, “A development environment is the collection of processes and tools that are used to develop the source code for a program or software product.” (Development Environment | SUSE Defines, 2021).

### Visual Studio Code

“Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control. It aims to provide just the tools a developer needs for a quick code-build-debug cycle and leaves more complex workflows to fuller featured IDEs, such as Visual Studio IDE.” (Visual Studio Code Frequently Asked Questions, 2021).

Visual Studio Code also known as VSCode is configurable, and it comes with themes that may assist a developer to see syntax highlighted in different colours, which is extremely useful when working with many languages at once. VSCode runs on macOS, Linux, and Windows and is free to use including debugging and version control features.

VSCode was developed with web development in mind. Visual Studio Code integrates the finest of the web, native, and language-specific technology in its architecture. Some technologies that are well represented in VSCode are as follows JSX/React, HTML, CSS, SCSS, Less, and JSON.

Figure 11 below shows an example of some JavaScript code in VSCode.

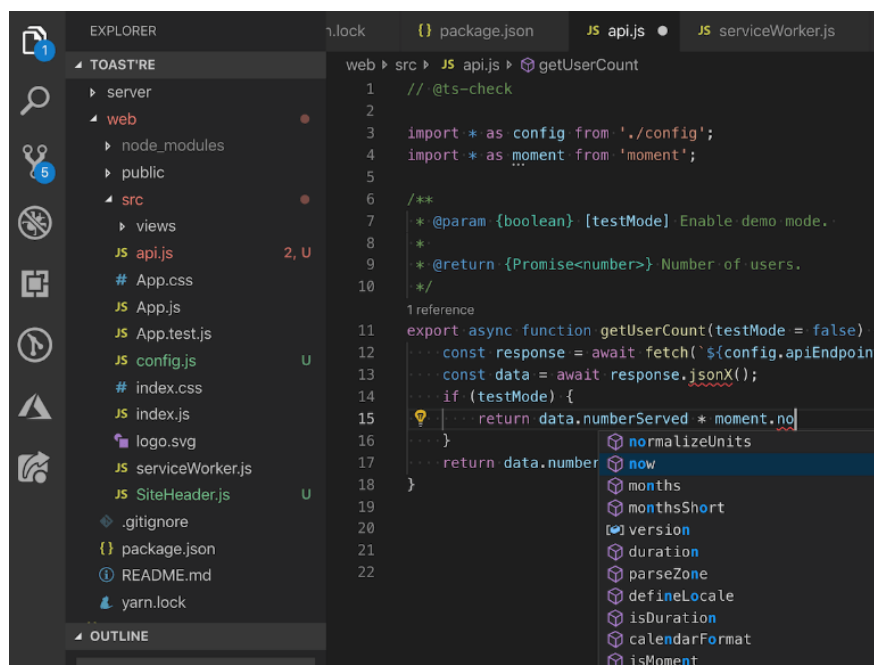


Fig.11: (JavaScript Code Editors, 2021)

Visual Studio Code is one of the best code editors for developing a progressive web application due to all its compatibility, tools and popularity.

### **WebStorm**

“WebStorm is an integrated development environment for coding in JavaScript and its related technologies, including TypeScript, React, Vue, Angular, Node.js, HTML, and style sheets.” (Getting started with WebStorm | WebStorm, 2021)

JetBrains claims that WebStorm is the smartest JavaScript editor available. JetBrains is a development tool that can be used on both the client and server sides. WebStorm is not free, which makes it unsuitable for programmers. There is, however, the option of obtaining a free student licence. Installable plugins and debugging capabilities are also provided for both client and server-side applications.

### **Atom**

“This free, open-source code editor is self-labelled ‘a hackable text editor for the 21st century. And hackable, it is. Atom allows developers to fully customize the look, feel, and requirements to speed up their workflows.” (CloudApp, 2021)

Atom was developed by Github in 2014 and since then developers love using atom to create responsive and interactive web applications. The reason why developers love Atom so much is that it makes coding much less complex and it also offers the following features:

- Colour styles can be changed to make the code easier to read.
- A large number of third-party plugins for detecting code errors
- Workflows can be sped up by using keyboard shortcuts.
- Indentation of code is done automatically.
- The language-specific syntax is highlighted.
- Provides an option to see the file and folder structure of your project in a tree structure.

When looking back are the options for this project there are only 2 code editor options to consider. WebStorm can not be used for this project just for the simple fact that it is not a free code editor. Visual Studio Code and Atom are both great options for this project, because of all the features both editors have. Due to the fact that Visual Studio Code is a more familiar code editor, it will be the chosen editor for this project

# Technologies Summary

With the exception of the development environments, practically all of the technologies listed above are expected to play a role in the final outcome of this project. Visual Studio Code is the code editor that will be utilised for the front end, according to the research. Visual Studio Code is a very appealing option due to a large number of plugins and syntax highlighting.

Google's Firebase will be the database used for this project as it is simple to integrate with the application, it also helps speed up the development time, it allows integration with analytics to see public engagement and it offers free and paid database plans in case the web application needs to be scaled up or down.

All of the languages listed above will be used for this project based on the research conducted. The progressive web application will be built on HTML, CSS, and JavaScript. React in conjunction with Bootstrap will be used to help make the progressive web application responsive, as responsiveness is one of the most important aspects of being progressive.

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