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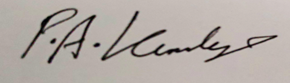
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# Abstract

The Lifestyle Scanner Web Application report outlines the development and evaluation of a responsive web application designed to aid users in making informed grocery decisions that align with their dietary preferences, allergens and lifestyle choices. In response to the increasing range of dietary requirements and the demand for fast and reliable product information, this project seeks to address the challenge of distinguishing suitable products during shopping trips. The report includes a thorough exploration of the problem space, a detailed development roadmap and a realistic evaluation of the web applications effectiveness.

The introduction introduces the Lifestyle Scanner web application and its essential purpose. It examines the underlying motivation that motivated the project, emphasizing the pressing need for an efficient tool capable of assessing product compatibility with specific lifestyles and allergens. Drawing from personal experiences and insights gained from stakeholder discussions, the report highlights the predicament of navigating through product labels and underlines the potential advantages of using a responsive web application as a practical solution.

The development process entails a detailed examination of varied dietary lifestyles, including but not limited to vegan, vegetarian, pescetarian, paleo, and allergen-based diets. The project's technological stack—MongoDB, Express, React, and Node.js (MERN)—is selected to assemble the web application. The development approach aligns with Agile principles, leveraging incremental releases to seek user feedback and iteratively refine the application's features.

In conclusion, the Lifestyle Scanner Web Application report captures a thorough journey from problem identification to solution identification. It highlights the applications potential to revolutionize grocery shopping experiences by combining technology, user-centred design and ethical considerations.

# Introduction

This section of the report will be an introduction and will provide a brief insight as to what the Lifestyle Scanner is, its uses, purposes and will include a discussion about which retailers and companies are currently using the technology present within the web application and the benefits the application will present to its users and target audience. I will be going over the background of the project, what lead me to beginning this project, an overview and outline of the project and answering various questions such as the reasoning behind building the application as a responsive web app rather than a mobile application.

## The Problem

So, the problem occurred to me when I was making food for some friends when I realised, I had a problem, one of them is vegan, now this sent me down a spiral when I was shopping for food and had me questioning everything, is this vegan? To this day I still wonder if whatever I’m buying or making is vegan. Now some manufacturers add specific logos to food to identify the requirements quicker which is good, but these logos are not always present. This is when I decided there must be a faster way than reading all these ingredients, I would be there for hours, Then I thought that there will be a good application to help me with this, so I searched around and looked for an application to do this to which I found a challenge. Then the developer in my brain started thinking why not make one.

So, from talking to people from multiple lifestyles or now stakeholders I have identified that the problem is having a way to quickly, reliably and simply find out if the product is suitable to their lifestyle or needs.

The solution is developing a responsive lifefstyle scanner web application to help stakeholders of most lifestyles and allergen groups when shopping for their groceries to identify ingredients that may be prohibited or that they may be allergic to potentially improving their health outcomes.

## Project Background

The project that I am going to be making throughout this report is a lifestyle Scanner, this scanner will be a responsive web application that will let a user search for a product and see whether the dietary requirements of the product are vegan, gluten free, vegetarian, pescetarian etc.

As previously mentioned, I have close friends that are vegan and some that have certain dietary requirements/allergies which lead me to the question of what could make living these lifestyles easier? My first thought was a mobile application but then it would have been limited to mobile and it would have been a lot of work to scale the project to more users as there’s more than one major mobile platform android and apple. So, after a discussion about scaling this application, I came to an agreement that it would become a responsive web application that could be used across all devices whether that be mobile, pc, tablet you name it. The more I thought about it the more I became interested in making this project, why stop at vegans why not cater to all the lifestyles.

Barcode scanners have come a long way from their early days in supermarkets to the mobile phone applications we use today. The first supermarket scanner was introduced in 1974(Basker, 2012) and used a laser beam to read barcodes on products. This innovation dramatically changed the retail industry by speeding up checkout times and reducing the risk of human error whilst calculating the price.

As technology continued to advance, scanners became smaller and more portable, eventually making their way into mobile devices. Today, many mobile devices come equipped with a camera that can be used to scan product barcodes and access information about the product such as prices, nutritional information and now, with the development of the lifestyle scanner web application, whether a product contains animal products or specific ingredients that are prohibited to specific lifestyle choices and to assist stakeholders that might have severe allergies (Mackarness, 1976).

In addition to their use in supermarkets, shops and food industries, scanners are also used in healthcare and other industries. They have become an essential tool for accessing information and improving efficiency in various fields this is where the lifestyle scanner will shine, I want the scanner to improve efficiency whilst shopping for groceries.

It will be beneficial to the project that I investigate other similar web applications on the market to compare aspects and accessibility to further my knowledge and discover anything I can implement into the scanner application to make it as user friendly and as functional as possible with the hope of covering most bases in terms of different lifestyles, diets and allergens.

With some of these lifestyle choices becoming more popular (Gheihman,2021), some of them due to help with health concerns (Mueller, 2020) there is plenty evidence to back up the importance of the development of the lifefstyle scanner application. With regards to allergens the scanner will be able to help people allergic to specific ingredients quickly and efficiently find out if the product might land them in hospital or not depending on how severe the reaction would be which the importance of cannot be stressed enough as read in Eating Dangerously: The Hazards of Allergies (Mackarness, 1976). Not only will the scanner be saving the stakeholders time it could also potentially be saving lives, hopefully due to the increasing food labelling regulations (Packaging and labelling, 2022) that are coming into play in the UK and the European union consumers will have to start displaying specifics such as allergens and ingredients that in the past didn’t have to be listed, with a scanner that can quickly interpret and read these ingredients the Lifestyle scanner in turn benefit the public when shopping for their groceries and help stakeholders life their life a little easier with the additional peace of mind.

Overall, these factors demonstrate that there is a clear need for a scanner application that can help people identify ingredients in food products. Such an application can benefit the public by improving their ability to make informed choices about the food they consume and massively assist stakeholders that may have severe allergies.

## Project Overview

Within this project overview I will be showing the project outlines, aims and objectives. This will include what I want to achieve within our literature review and the specific questions we will be trying to answer. I will also be going through the hypothesis of the project to explain how I will be testing the Lifestyle scanner.

### Project Outline

With lifestyles forever changing and more diets being introduced it is becoming harder and harder to shop for products that meet the dietary requirements of these lifestyles on top of the dietary needs allergens are also crucial to this project, soon enough manufacturers are going to run out of new logos to put on the back of their products, vegan, vegetarian, dairy free, gluten free etc. Using today’s technology, I want to make this an easy, reliable and somewhat enjoyable process for the stakeholders, Alongside the increasing popularity within said lifestyles there is a big boom to be healthy at the moment so with all the factors presented to me I am deciding to make the Lifestyle scanner responsive web application to be more available as it will be able to be used across all devices including computers. This will assist them in their shopping and lifestyle needs.

With respect to the project outline and gaining insight from stakeholders our research question will be:

**Can a Lifestyle scanner benefit the public when shopping for their groceries whilst being reliable?**

## Project Aims and Objectives

The main goal of this project is to develop a responsive web application that can be used across all devices, the purpose of the web application will be to scan or search a product in a shop and find out whether the product fits the lifestyle habits you are shopping for such as vegan, vegetarian etc. I am hoping that this will be very useful to the public and including the technologies in your day-to-day life should make it a fun and quick experience, the main purpose is to eliminate the need for reading through all the ingredients of a product to see if it fits a specific lifestyle.

It’s known that some brands and manufacturers use labels on their products to easily show if a product matches a lifestyle but unfortunately this is not present in all products, the only reason I can imagine not adding these is to cover their product as to not end up in legal trouble if somehow the product doesn’t match the label.

Some of the objectives shown below are what I hope will be found out after the completion of the literature review:

|  |
| --- |
| Development options explored.  Researching into the development options for the lifestyle scanner application, the full technological stack including the front end, back end, database, version control and API handling. |
| Investigate into different lifestyles and popular dietary requirements.  Researching different dietary requirements and lifestyles to find out the differences between them such as what is a vegan, vegetarian etc. This is important as they each have their own unique dietary requirements and restrictions. By understanding these requirements, I can gain insights into the benefits and challenges associated with each lifestyle and figure out what feature needs what. |
| Investigating available scanner applications  Researching into what different scanner applications are available and seeing what they do well and what they don’t do well in, how can I make my scanner better, more accessible, cooler, more fun to use and provide a better user experience than other available scanner applications. |
| Investigate what is involved in developing these scanners.  Looking into what is involved in the creation of similar scanner applications, how does it work, what stack does it use, is there a benefit developing scanner applications with a specific language. |
| How do similar applications handle the product data, where does it get the data from? API etc.  At this current moment during the project, I’m not fully sure how the scanner is going to retrieve the data and what information is actually obtainable from a barcode thankfully this idea is not new so I’m hoping to stand on the shoulders of giants and investigate how developers have done this in the past with similar scanning applications. As there are multiple scanners including big supermarkets that are widely available, I’m hoping there might be some research that is also widely available |
| What steps will need to be taken to help accessibility?  Research into accessibility is a must as I want to scale this web application to as far as possible, I need it to be accessible and usable by all end users not just some whether this be size, colour etc. Anything. |

## Hypothesis

Users who use the Lifestyle scanner application while shopping for groceries will be more likely to purchase products that align with their dietary requirements and lifestyle choices compared to those who do not use the application.

This hypothesis can be tested by comparing the purchasing behaviour of individuals who use the application to those who do not. The results of the research can either support or reject the hypothesis.

To make sure that the Lifestyle scanner web application is robust and fit for purpose a version of the application will be handed out to 3 individuals with different lifestyles and dietary requirements with the hopes of gathering as much information across the usability and functionality of the application as possible. With the information gathered from the individuals and tests I will have the answer to my hypothesis. There will also be another 3 individuals (control group) not using the applications that we will be gathering data from to compare the purchasing behaviour.

This hypothesis will be answered through the results of the various research methods, surveys, user testing to evaluate the impact of the application on user purchasing behaviour and if the web application helps influence the lifestyle choices or not.

# Literature Review

The literature review is going to be the back bones of the project and a very important piece of the puzzle, this section of the report will show the overview of the research followed throughout the project to make the web application happen. This will be looking at research that has been done by developers that have made scanner applications, looking into similar applications themselves and learning about the different lifestyles and dietary requirements that I would like to cater to.

All of which will be gathered and used to help me develop the application by learning more about the technology and how it is used to do what I want it to do. Which is to gather product data based on a name or a barcode and using keywords to define what category the product can go in.

The review will research the following fields.

* Different lifestyles and popular dietary requirements
* How similar applications look and work.
* What similar applications could benefit from and how I can implement?
* What steps will need to be taken to help accessibility?
* How do similar applications handle the product data, retrieving, displaying etc.
* Web application accessibility.
* Development options explored.

## Investigate into different lifestyles and popular dietary requirements*.*

In this literature review I will be looking into different lifestyles, common diets and popular allergens that I would like to implement into the scanner application. Below is a list of lifestyle subheadings (McRae, 2019) that are some of the options I want to cater to within the lifestyle application.

### Vegan

A vegan lifestyle involves avoiding all animal products, including meat, poultry, fish, dairy, eggs and honey. Instead, vegans focus on consuming plant-based foods, such as fruits, vegetables, whole grains, nuts and seeds, Vegans also avoid any processed foods or supplements that contain animal-derived ingredients. In addition to ethical and environmental interests.

The vegan lifestyle regarding food and consumables sounds simple but can often include particular ingredients that are often overlooked as vegan when they are in fact not such as some E numbers (not all), gelatine, vitamin D3, keratin, collagen and much more as seen in this article by Vegan food and living (Smith, 2016).

### Vegetarian

The Veggie lifestyle is somewhat simple, similarly to vegans it is a lifestyle where one avoids eating meat, poultry and fish but may still consume other animal products such as dairy and eggs. This is obviously up to the person.

### Pescetarian

The Pescetarian diet is a type of semi-veggie diet that includes eating seafood and fish but excludes meat and poultry. This unusual diet emphasizes plant-based foods, such as fruits, vegetables, whole grains, nuts and seeds, along with using fish and seafood as the essential source of animal protein.

### Paleo

Paleo is often referred to as the Caveman Diet (Tahreem et al., 2022), this diet includes that stresses only using whole, unprocessed foods that were available to our ancestors during the Paleolithic period. The diet includes foods such as meat, fish, poultry, fruits, vegetables, nuts and seeds, while excluding grains, dairy and processed foods

### Allergen Diets

Allergen diets are a type of diet that is designed to eliminate specific foods or ingredients that may cause allergic reactions or specific intolerances in certain individuals. The most common allergens that are avoided in an allergen diet include milk, eggs, wheat, soy, tree nuts, peanuts, fish and shellfish.

So as you can imagine with these diets the main goal is to steer clear of the specific foods or ingredients that can trigger these allergic reactions or intolerances in individuals. To avoid them being a patient in a hospital bed as some of these allergies are deadly. Some of which can be read about in Lisa Hungs’ article (Hung, 2018).

## Investigate popular scanner applications.

In this literature review I will be looking into popular lifestyle scanners on the market and I will be focussing on what they do good and what they do bad from this I want to hopefully avoid replicating some problems I might find during my investigation during my own development and maybe get some inspiration and ideas on what to add and how to make this scanner the best option on the market, with this I will hopefully also get a decent insight as to what common steps are executed to maintain a good user experience and with any luck get some ideas on accessibility.

This will identify gaps in the market and I can find out the difference between successful scanners and unsuccessful scanners.

I discovered a website called vegancheck.me that offers APIs that appear to be highly relevant to the needs of the Lifestyle Web Application. Other than this the majority were landing pages with links to download the application through apple or android app stores, the closest I got to finding another one was more like a blog than a simple scanner application (veganfriendly.org.uk), too much waffle and not enough answers, I want the scanner application to be efficient so I’m looking for a yes or no and maybe at most a reason why the product might not be suitable.

After thorough research, I came across a website named vegancheck.me that provides two different APIs a barcode scanner and an Ingredients API which seem to align well with the requirements of the Lifestyle Web Application. However, most of the other findings consisted of landing pages with links to download applications from Apple or Android app stores. The closest alternative I found was a blog-like platform (veganfriendly.org.uk), which contained excessive information without providing brief answers.

## Investigate the data, where does it get the data from? API etc.

In my opinion this is the most important part of the literature review as in this section I will be investigating where I am going to get the data and how I am going to use the data for both functions, search and scanning.

The accuracy and reliability of data are critical factors within this project as it would be unethical for someone to scan a product and be told it is suitable when it is not. This can affect the success of a scanner application. To obtain the required data for the application, several sources will be explored.

### Crowdsourced data collection

Crowdsourced data collection is a method in which data gathering is done by a group of people, often through an the application using the data such as MyFitnessPal “by enabling MyFitnessPal’s users to input and check data.” (Macmanus, 2015). The process involves individuals providing information, which is then collected and investigated for patterns. This method could be used but in this case the reliability of the data is critical to the project’s success so this will not be the direction for the development.

### Food Databases

One of the options for getting the data is food databases (Maringer et al. 2019), some of these are the most reliable sources of data for a scanner application. Some food databases contain thorough information on the ingredients used in various food products. These databases can be integrated into the scanner web application to provide accurate and up-to-date information on the suitability of a product.

### Application Programming Interface (API)

APIs are another source of data for the scanner application. Some food and ingredient databases offer APIs such as USDA FoodData Central or Open Food Facts (Medved, 2022), Using these the data can be integrated into the application to provide real-time up to date information on the ingredients of a product. The use of APIs can drastically improve the accuracy and consistency of the data obtained for the scanner application. Fortunately, the vegancheck.me APIs provide valuable resources (*VeganCheck.me API documentation*) that align well with our application's needs.

## Investigate what is involved in developing these barcode scanners.

In this literature review I will be looking into what is involved in developing these scanners and how the Barcode or Universal Product Code (UPC) (Maringer et al. 2019) gets the data from the code itself.

### What is a UPC?

UPC stands for Universal Product Code (Vlosky, 1994). It is a regulated barcode system used to identify products in the marketing industry, UPC codes consist of a 12 digit code, this code is numerical and each individual digit represents a unique piece of information.

### UPC Guidelines

Universal Product Codes must follow an agreed set of guidelines that are specified by GS1 (international standards organization for barcodes) (D. Savir, G. J. Laurer 1975).

Some of the main guidelines for UPC barcodes are:

|  |
| --- |
| The barcode should be used to encode the unique identification number for each trade item, which should correspond to a specific product in a company's catalogue or inventory system. |
| The barcode should be printed in a specific format, with bars and spaces that follow a specific pattern and should be of a certain size and place on the package. |
| The barcode should be scannable with a range of scanning devices, including handheld scanners, fixed scanners and mobile phone cameras. |
| The UPC number should be registered with GS1 to guarantee uniqueness and accuracy. The associated product information should be updated regularly in the organisations database. |
| The barcode should be tested for usability, accuracy and readability before getting approval to go to market. |

Sticking to the guidelines ensures that UPC barcodes are accurate, reliable and scannable across variety of devices.

### How does it get the data?

Traditionally a scanner uses a laser or LED to scan the barcode and convert the bars and spaces into an electrical signal then the electrical signal is then sent to the scanner's decoder, which in turn translates the information and sends it back to the connected device, such as a computer or mobile.

This works the same for traditional barcodes and one we see a lot of today, QR codes as they both conform to GS1 specifications.

Below is a diagram showing the specification of a UPC-A barcode (Swartz et al., 2012).

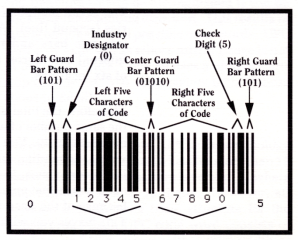


Figure 1 "Illustration of the specifications of the UPC-A symbol." (Swartz et al., 2012).

## Common web application accessibility features.

I will be investigating accessibility features and options within web applications. The reason behind doing so is simple, scalability. Accessibility options are critical in a web application because they ensure that the application can be used by as many people as possible, including those with disabilities or impairments (Fernandes, Costa et al. 2012).

Incorporating accessibility features is a fundamental aspect of inclusive design. This is a design approach that mainly focuses on creating products and services that can be used by everyone, regardless of their abilities. This could possibly assist those with visual or hearing disabilities, motor impairments and cognitive or learning disabilities.

By implementing accessibility options in a web application, I can improve the user experience for all users, not just those with disabilities. For example, keyboard accessibility can benefit users who prefer to use the keyboard to navigate the application, while clear labelling of forms can benefit all users, irrespective of their abilities.

Upon my investigation I came across a set of guidelines that I had never heard of before called the Web Content Accessibility Guidelines (WCAG) (Cooper et al., 2016) whilst looking through the guidelines I managed to find over 200 different guidelines with all sorts of techniques to assist whilst programming ranging from HTML, CSS techniques to PDF and Flash techniques, There is also a full list of common failures (Cooper et al., 2016) whilst implementing techniques and instructions and suggestions on how to fix them.

## Development options explored.

Investigations into the development options for this project would be endless so I have narrowed it down based on knowledge I already possess in terms of specifics within the development stack, As I have already got a little experience using a MERN stack I will be going with that as my chosen development stack, despite already choosing my stack I did do research to make sure it would not be a mistake doing so.

The MERN stack consists of using Mongo DB for database, Express is a minimal and flexible web application framework that will be used to create APIs and handle server-side logic. React is a JavaScript library that is used for building user interfaces, while Node.js is a server-side JavaScript runtime that enables the running of JavaScript code outside of the web browser.

MongoDB will be used within this project to store the users lifestyle selections and favourite products which will be accessed in the project to view specifics, the database might also be used for users later in the projects development if a decision might be made to go in that direction making the application a little more personal with the endless possibility of new features.

The MERN stack is a brilliant option for the development of this web application for several reasons. First, it offers a fast and efficient way to develop scalable and high-performance web applications. Second, the MERN stack is an open-source technology stack that has a large and active developer community, which means that there are plenty of resources, tools and libraries available to support the development process which is crucial as there will be a learning curve. Third, using the same language for both the client and server-side makes it easier to develop and maintain the application. Finally, the MERN stack provides built-in support for modern web development features such as real-time updates, modular code and responsive design.

For version control within our development stack, I will be using Github, my reasons behind choosing github are because I’m very familiar with the system and its capabilities of which according to statistics “The most popular version control system is Git, used by over 70% of teams.” (Abdalslam, 2023) would say that it’s the best option for what it’s for and best of all its opensource which is something common across the MERN stack (Islam, 2022).

## Literature Review Conclusion

The research method's objectives were met by the literature review. The project is supported by the cited references, which indicate that the lifestyle scanner web application will indeed provide users ingredients swiftly and efficiently in products, users will be more likely to find products that suit the lifestyle or diet they represent.

# Methods

The methods section of this report provides a detailed description of the procedures and techniques used to conduct the study. This section is necessary as it allows readers to understand the steps taken to gather and analyse the data, and to assess the validity and reliability of the results. The methods section provides a clear account of the research design, the sample selection, data collection methods and data analysis techniques used. By providing a comprehensive overview of the methods used, this section serves as a roadmap for the study, enabling readers to follow the logic and reasoning behind each step of the investigation. This section could also be a valuable resource for future researchers who may wish to replicate or build upon the work described in this report.

## Research Method

The main purpose of the project is to see if using a Vegan Scanning responsive web application will be useful to the public when going shopping for their groceries etc. Whilst doing so the hope is that the application will assist the shopper figure out if products suit their lifestyle or diet habits and saving them time in the process. To find out the answers to this I will be using somewhat mixed research methods, I will be starting a develop and test approach using an Agile software development life cycle, then later down the line after development to assist my research I might use some kind of user testing and survey or participant observations (University Libraries, 2019) qualitative research (Villegas, 2021).

To complete this project, I will be using the information and technologies gathered within my literature review to design, develop and test the responsive web application, hopefully with the succession of the development of the application I can help people of various lifestyles all over the world on almost any device as the web application will be responsive (Gardner, 2011).

## Develop the Lifestyle scanner responsive web application.

Using the knowledge from my findings within the literature review I will be continuing with the same idea of developing the lifestyle scanner as a responsive web application as this will have the most user coverage and will be able to be used across all platforms from mobile devices to tablets and computers. This will be developed using a MERN (MongoDB Express React NodeJS) stack using github to handle version control which will present a learning curve as I will need to learn how to do multiple things technically to help me with the development and API handling. Having the web application responsive is also why I want to have multiple releases due to the search function for PC and the scanner for mobile/portable use. The multiple releases is one of the main reasons behind using an agile methodology lifecycle as I want the a functional release of the application asap so that I can gather feedback to start testing on the application straight away.

## Project Development Lifecycle

As stated in the research method my chosen software development lifecycle methodology will be using an Agile approach as I plan on delivering the application multiple times using iterative delivery throughout the sprints, this way my milestones will be reflected as functional releases with different features/advancements (Kumar, Bhatia, 2012).

The main benefits of using Agile (Shultis, 2019) over other methodologies within this project mainly lie within the goal, I want the scanner to have multiple releases one with search function then I want to add the barcode scanning function in the next release. Throughout this process I will be using some scrum elements such as delivering in increments, I will also be sizing work into stories and working in sprints to set targets for myself. The reason I will be using elements rather than just scrum itself is because the main part of scrum is to be working in a team and I am working solo on this project (Gant, 2019).



Figure 2 Agile Model (Software Engineering) - javatpoint

## Test*s, Survey* and *Participant Observations*

This stage will be creating the actual tests of the application and creating a survey for the stakeholders of the project i.e. the users. I will also be gathering some participants to trial the application to help evaluate its functionality and user experience.

## Obtain participants for evaluation.

For the observations I will be finding a total of 6 participants to test the application, three will be given a version of the application in its alpha state to use and test with the hopes of gathering data and opinions on their user experience and if it actually assists them whilst shopping or is a hindrance. The other three will be a control group shopping without the scanner at hand.

The six participants chosen will all be of different lifestyles to get a good span of data across the board.

## Carry out the evaluation.

The three users will be given the same version of the lifestyle scanner web application and as they all have different lifestyles or dietary requirements I’m hoping for varying experiences as no data will be considered bad data and shall assist me in developing the app further.

The three in the control group will be shopping without the scanner.

The users will be given the application to use for 3 days and upon completion will be asked to take a survey through surveymonkey on their experience.

## Gather *findings* and analyse test *results!*

After the trials I will be comparing the purchasing behaviour of individuals who use the application to those who do not. The results of the research can either support or reject the hypothesis. Then I will check all the surveys and analyse the test results with the intention of developing a greater understanding of the user experience within the scanner application and deciding what changes to make to the application to make it more fit for purpose, accessible, usable etc.

From the evaluation research methods ideally, I will have all the information to find out if my solution addresses the issue at hand being, Will the lifestyle scanner benefit the general public and help assist them in their shopping needs, quick, fast and reliably.

# Technology Stack and Development

In this section I will dive into the technological base that supports the Lifestyle Scanner web application. The chosen technology stack, containing the MERN (MongoDB, Express, React, Node.js) stack has been carefully selected to ensure a robust (incentius, 2023), responsive and user-friendly web application. This stack seamlessly integrates a mixture of technologies to aid the development of both the front-end and back-end elements. From the design principles to the actual implementation, we explore how each technology contributes to the creation of an effective, efficient and accessible scanner application. Additionally, we outline the reasons for opting for the MERN stack, discuss the process of setting up the development environment and provide insights into the challenges faced and solutions devised during the development journey. While our current implementation serves as a proof of concept, we anticipate leveraging the full power of the MERN stack in a real-world scenario.

While the current iteration of the scanner web application does not involve the usage of React and MongoDB, these essential components are kept in mind for the integration in our envisioned production version. This proof of concept paves the way for a complete understanding of the architectural decisions, technology choices and the design considerations that guide the evolution of the Lifestyle Scanner into a robust and responsive platform.

## Introduction to the MERN Stack

The MERN stack stands as a powerful foundation for modern web application development, The popular stack is known for seamlessly integrating four fundamental technologies, MongoDB, Express, React and Node.js. Each element of the stack plays an important role, collectively contributing to the creation of a robust and responsive application architecture.

MongoDB:

MongoDB (MongoDB, 2023) is a very popular NoSQL database that serves as the keystone of the MERN stack. It offers a flexible and scalable approach to data storage whilst allowing us to efficiently manage and organize pretty complex data structures. The document-based structure of MongoDB enables adaptable schema design, allowing for changing data requirements while maintaining optimal performance.

Express:

Express is a flexible and pretty lightweight web application framework that is designed for Node.js. It makes backend development simpler by managing the routing, handling requests and organizing middleware. Express also provides a structured way to build server-side logic to ensure efficient data processing and communication.

React:

React is an incredibly powerful JavaScript library and one of the most popular choices for creating and developing interactive user interfaces. With React, we can build reusable building blocks that automatically update when the data changes. Additionally, React utilizes a clever method to swiftly display changes on the screen, providing users with smooth and real-time updates.

The "clever method" that React utilizes is known as the Virtual DOM (Document Object Model). Here's a simplified explanation of how it works first off to know how Virtual DOM works we need to know about Real Dom.

Imagine your webpage is a big puzzle made up of lots of pieces. Each piece represents something on the page, like a picture, a link maybe some text or a button. Now if you wanted to change just one of those pieces, like updating the picture on the website, the Real DOM is like taking apart the entire puzzle and assembling it back together just to put a new picture in place. Even if you only changed the smallest part, the whole puzzle would have to be rebuilt, which can take some time. It's like rearranging the whole room just to change a channel on the tv.

Now with React we introduce a concept called Virtual DOM. It's a lightweight copy of the Real DOM. But when the data in your application changes, React doesn't immediately update Real DOM. Instead, it creates a virtual interpretation of how the DOM should look after the change.

React will then compare the previous Virtual DOM with the new one to regulate the minimal number of changes required to update the Real DOM. This process is called "diffing" (because it compares the differences). Once the differences are calculated, React then applies only the specific changes to the Real DOM, rather than updating the entire DOM tree this saves time and memory, making your webpage updates smoother and faster.

Node.js:

Node.js serves as the strong basis of the stack, allowing us to use JavaScript for server-side scripting. Its unique way of handling events ensures that things run smoothly without waiting, so the application stays quick and responsive. Node.js works effortlessly with both Express and React, making sure that the front and back elements of the web application work well together.

Working Together for a Solid Architecture:

These four technologies collaborate seamlessly (*React, nodejs, Express &amp; MongoDB - The Mern Fullstack Guide - Udemy*), each fulfilling a crucial and needed aspect of web application development. MongoDB manages data storage, Express orchestrates server-side operations, React drives frontend interactivity and Node.js ensures seamless communication between these components.

The MERN stack's smooth integration and flexibility make it a perfect choice for developing the Lifestyle Scanner web application. Its ability to handle the complex data interactions, provide real-time updates and maintain efficient server-client communication aligns perfectly with our project's goals and needs.

In the sections to come, we will investigate deeper into each component's role and explore the reasons behind selecting the MERN stack to support our application's development journey.

## Justification for Choosing the MERN Stack

In developing the Lifestyle Scanner web application, I chose to employ the MERN (MongoDB, Express, React, Node.js) stack due to its proven ability to create robust, responsive and user-friendly applications. While our current implementation/iteration serves as a proof of concept, it is incredibly important to take note that we made specific decisions regarding technology components for the initial phase of the project.

For this initial iteration, I have chosen to focus on building core functionalities and demonstrating the practicality of the scanner application concept. As such, i have temporarily excluded the integration of MongoDB for data storage and React for dynamic user interfaces. Instead the current iteration has exercised alternative approaches to address these aspects efficiently for the proof of concept.

In the current iteration phase, we're not using MongoDB to store user data. Instead, i've chosen to keep user information in a local const variable. This decision helps focus on the main features without getting into complex database setups at this early stage. Also it is important to keep in mind that we are in the early stages of development. We haven't yet added features like user lifestyles, settings and favourite products. These elements will come into play as we move forward with the development of the project.

The choices have been made deliberately to ensure that the proof of concept effectively showcases the core scanner concept while also leaving room for the integration of additional features and enhancements in subsequent phases.

## Development Environment Setup

Setting up the development environment for the Lifestyle Scanner web application involves installing and configuring each component of the MERN stack – MongoDB, Express, React and Node.js as well as the IDE that will be used for the development. As this is the proof of concept I will not be explaining MongoDB or React.

I opted for Visual Studio Code (VSCode) as my integrated development environment. This broadly used IDE aligns with my familiarity and offers an extensive selection of plugins and extensions that considerably enhance the development process. Its compatibility with the project's requirements makes it an ideal and smart choice. Additionally, VSCode features a built-in terminal, which I utilized to execute Node Package Manager (NPM) commands and install packages into our web application.

Node and VSCode are both available to download from the internet and fairly simple to setup packaged within the NodeJS download is a very commonly used package manager called NPM or Node Package Manager. As previously stated is used to install packages and shared libraries into our web application. NPM utilizes a file called a package.json, which plays a pivotal role in managing dependencies and overall configuration including all the libraries, versions, application name, scripts etc.

Express is simply installed using NPM, once installed via the command the express package will be installed into our node modules folder letting us now call the express library for use within our web application.

Throughout the development process, I **utilized** the MVC (Models, Views, Controllers) design pattern to **improve** the organization of my workspace and simplify the accessibility of different components. This approach allowed me to keep distinct sections for managing data (Models), handling user interfaces (Views) and managing interactions (Controllers), resulting in a more structured and manageable environment.

Lastly as part of the Development Environment Setup, Version Control, as I am most familiar with Github I decided to use Git for version control. Committing checkpoints as I developed to track my progress and frequently pushing to the repository as I was frequently switching between a personal and a work computer, I also utilized branches to sandbox development features as to not break a working version.

Once again utilizing the integrated terminal, I consistently utilized Git for version control purposes. This involved performing various Git commands regularly to manage changes, track progress and maintain a well-organized history of the project's evolution.

## Front-End Development (React)

In the part of the website that users see and interact with, React helps make things move and change. It's like lego blocks that can change and fit together in different ways. These lego blocks are called components, they can be simple but more often than not can become quite complex. React keeps track of these components and makes sure they show the right things when information changes.

In the iteration submitted, I used basic tools like HTML, CSS and EJS to make the website look and feel a certain way. Though in the future, with React, the website will be more like a moving puzzle. When you click or do something, React will quickly decide what should change and make those changes without reloading the whole page. Making the webapp smoother and more interactive.

## Back-End Development (Express and Node.js)

In the realm that users don't directly see but that powers the web application's functionality, Express and Node.js form the backbone of our MERN stack. Express acts as a implementer, providing a structured framework for handling tasks, while Node.js allows the entire backend by enabling server-side scripting using JavaScript.

Express simplifies the backend development process by managing the routing, which directs incoming requests to their appropriate destinations. Express defines endpoints or routes that correspond to specific actions or views within the the application. For example, a GET request to '/home' might get the view for home but a POST request to ‘/login’ can handle the user's login information. This allows for developers to structure backend logic effectively, ensuring that all the different requests are handled correctly.

Likewise, Express also handles middleware, which are like checkpoint stops between requests and responses. Middleware can perform tasks like user authentication, data logging, or data manipulation before a request reaches its intended endpoint. Within the Lifestyle Scanner web application we have a couple of middleware setup for user authentication and active page, our web application like many others have used user authentication to scope specific features to users with an account for example within the Lifestyle Scanner if you are not logged in you don’t have access to use the included APIs such as the ingredient checker and the barcode scanner.

Furthermore, Express has also been crucial in developing APIs, which allow different parts of the web application to communicate. It identifies how data is requested and sent between the frontend and backend. Its ability to handle different HTTP methods (GET, POST, PUT, DELETE) facilitates various interactions. Similarly, to how a post office sends and receives letters whilst also dealing with government accounts.

Together in harmony, Express and Node.js ensure that the back-end efficiently processes data, handles requests and communication between the frontend and backend. They form an important duo that keeps the application responsive and robust.

## Database Design and Implementation (MongoDB)

As the Lifestyle Scanner web application progresses through its development life cycle, the database will play an essential part in storing crucial user information. This includes user accounts with hashed passwords, enhancing the security by protecting sensitive data. Additionally, the database will house specific user lifestyles, enabling the application to tailor its services. This strategic information will be used in the future to offer personalized product recommendations that align with individual dietary preferences and needs. This will also be used later in development to inform the user of whether the product is suitable for their dietary or allergen requirements. Additionally, this info will be used later in development to inform the user whether the product is suitable for their dietary or allergen requirements. This integration of the database ensures that the application not only secures user data but also leverages it to provide a more personalized and meaningful user experience.

## API Integration for Data Retrieval

In our application, the front-end communicates with the back-end using APIs to retrieve and display ingredient and nutritional data to the users. I established specific endpoints on the back-end that serve as access points for the data retrieval. To make requests, we utilized technologies like Axios, a JavaScript library. For instance, when a user wants to view product information, we send an HTTP request to the back-end endpoint associated with the product's barcode ID. The back-end processes the request, retrieves relevant data from databases and then sends back a response in JSON format. In the front-end, we handle this response by extracting the data and updating the user interface using JavaScript DOM manipulation. This seamless communication between the front-end and back-end ensures that users can access and interact with the application's data in a user-friendly manner.

Within the Lifestyle Scanner Web Application we use two APIs from the same resource called VeganCheck by FrontEndNetwork, within VeganCheck (*VeganCheck.me API documentation*) we used the ingredients API and the barcode scanning API, both APIs are paired with a view in order to display the data for the users.

# Application Design and User Experience

The Lifestyle Scanner web application is designed to provide users with a seamless and intuitive experience for accessing information about vegan and non-vegan products and in later interactions in the future allergens and all diets. This section outlines the design principles, user interface components and user experience considerations that contributed to the web application's functionality and usability.

## User Interface (UI) Design Principles

Within the web application I planned on designing with a "mobile-first" approach, as it involves creating a user interface that prioritizes mobile devices before larger screens. This strategy emphasizes minimalism, focusing on essential content and a clean layout. The design should adapt effortlessly to different screen sizes and orientations, utilizing touch-friendly elements, responsive navigation and readable typography across all devices. It was important to consider thumb-friendly interactions and progressively enhance the design for larger screens. Regular testing and refinement based on user feedback ensure a user-friendly experience on both mobile devices and desktops.

## Wireframing and Prototyping

The wireframing for the project involved creating visual representations of the web applications layout and structure, outlining the placement of key elements such as navigation menus, content sections and interactive features. Prototyping goes a step further by adding interactivity to the wireframes, allowing stakeholders to experience the flow and functionality of the application. This process helped identify potential usability issues early in the design phase. For prototyping I had used InVision to make a mockup of the web application whilst making it go between the views, as the web app was pretty simple in terms of design the prototype was quite simply a mobile app with a navbar that changed the view of the application.

Shown below are some early adaptions of the wireframes for the web application that were hand drawn.

A paper with lines and text

Description automatically generated with medium confidence

Figure 3 Mobile Wireframing

A paper with lines and text

Description automatically generated with medium confidence

Figure 4 Web Wireframing

## Navigation and User Flow

Navigation plays a really important role in steering users through the application. A well-designed navigation system should be intuitive, simple and easy to understand, enabling users to access different sections and features effortlessly. User flow diagrams illustrate the paths users take as they interact with the app, identifying potential bottlenecks and areas for improvement. Clear calls to action and logical navigation paths contribute to a smooth and frustration-free user experience.

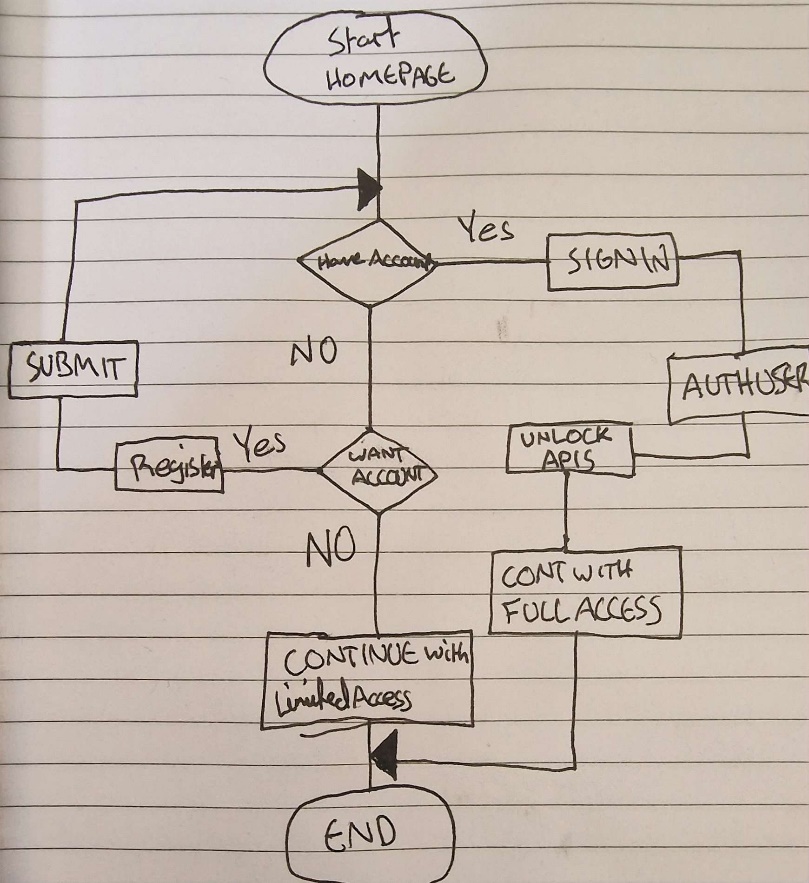


Figure 5 User Flow

## Accessibility Implementation

Incorporating accessibility features ensured that the web application is usable by individuals with disabilities. This included adhering to WCAG (web content accessibility guidelines), including providing alternative text for images, using semantic HTML elements and offering keyboard navigation options, the full web app can be navigated round literally using tab and enter which is ideal. Implementing accessible design practices enhanced inclusivity and widened the potential user base.

## User-Centred Design Considerations

User-centred design places the needs and preferences of the user at the core of the development process. Performing user research, such as surveys and interviews, helped gain insight into user behaviour, preferences and struggles. The important insights guided design decisions and feature prioritization.

# Implementation Challenges and Solutions

In this section of the report, I will be going over the challenges faced during the development of the Lifestyle Scanner Web Application and will be explaining the solutions that were moulded to fix the problems. Giving a glimpse on how I navigated complexities to deliver a robust and user-centric application.

## Navbar Dropdown Issue

During development there was an issue where the dropdown selection on the navbar for specific tabs such as the API and Information tab that would let you use the dropdown once but when actively on one of the pages that resided within this dropdown selection would not let you select the dropdown again even if it was a different dropdown, in order to fix this I updated bootstrap to the latest version, as it turned out the bootstrap version being used was quite buggy. This completely fixed the issue at hand for all devices.

## Font Awesome CDN Issue

Throughout the web application the Font Awesome CDN or content delivery network was utilized for social media link logos and show/hide password logos, At first everything was showing smoothly and working exactly as planned until one time I came on and all the logos were just blank, I wasn’t too sure if this was due to the change of machine but after some more investigation and googling it was once again to do with the CDN versioning, throughout my views for the project I had script tags and headers containing the links to my CDNs for use within the view so as I had already had the bootstrap issue and now this I decided to take every CDN link and put them all in my layout which was the base of the views, with the most recent version of the font awesome library. This approach leverages EJS's inheritance feature, ensuring that all CSS sheets and links get fed through the includes and maintaining consistency across the application.

## The Power of Chromes Dev Tools

Throughout the development process there was many times that I had silly issues with CSS and sometimes more serious concerns with requests all of which were handled quite diligently by utilizing Google Chromes Dev Tools and inspect feature. Within the dev tools you can check the network tab to see if something has not loaded as it should’ve or check if the API has successfully been fetched, you can also use the styles tab on specific lines of code to see which CSS sheets are currently styling your page.

One major use of dev tools was its emulation feature which allows you to emulate what the web application may look like on a tablet or mobile device. Dev Tools proved to be an invaluable companion, aiding in both debugging and problem-solving tasks.

## Resolving Compatibility Issues across Devices

Certain challenges arose when viewing specific pages on mobile devices such as the about page, the page was viewing above the navbar rendering the page unreadable on mobile devices, to fix this I utilized dev tools and looked through the style sheets, after altering the media query within our style sheets I managed to add specific styles to the web application so that all devices can view and read the whole web application seamlessly and effortlessly.

# User Testing and Evaluation

This is the User testing and evaluation section of the report, this is the phase of assessing the Lifestyle Scanner Web Application's usability, functionality and overall user experience. Through user testing and evaluation processes, I aimed to gather valuable insights that could shed light on the application's strengths, weaknesses, areas for improvement and more importantly the alignment with user expectations. This provides an in-depth exploration of our user-centred approach, highlighting the methodologies taken onboard and the invaluable feedback received from real users. By analysing the results of these evaluations, I can gain a deeper understanding of how effectively the application meets user needs/requirements and refine its design and functionality to suit.

## Refined User Testing Process and Procedures

The testing methodology employed for the Lifestyle Scanner Web Application was designed to carefully assess its usability, functionality and impact on users shopping experiences. Despite limitations in web application hosting and participant availability, a rigorous approach was taken to extract valuable insights. The testing phase now involved giving the application to 3 users and gathering data and insights on their interactions and experiences.

## User Experience Evaluation:

The primary goal was to assess the effectiveness and benefits of the user experience facilitated by the Lifestyle Scanner Web Application and to see if it could potentially assist them in their day-to-day life. Participants/Users were provided with an alpha version of the application for a designated 3-day trial period. Their interactions, usage patterns and decision-making processes were closely observed and collected through an interview and questioning.

## User Feedback and Observations

Overall, the feedback received from users proved to be invaluable in identifying and addressing various issues within the web application. Users perspectives provided crucial insights that guided us in refining and enhancing the web application's functionality and usability. Through notes and suggestions, we were able to rectify existing problems and implement changes that directly addressed their concerns.

## Insights Gained from User Behaviour

One of the insights gained from the user testing was the “show/hide password” button lacked a recognizable logo. The absence of a familiar symbol caused confusion among participants using the registration and login views. Responding to this feedback, i decided to incorporate a widely recognized eye icon into the button's design from a popular content delivery network known as Font Awesome. This small adjustment is expected to improve user understanding of the button's purpose and enhance the overall usability of the feature.

# **Discussion**

This section offers a comprehensive exploration of the Lifestyle Scanner Web Application's research findings and their broader implications. Investigating into the user interactions, design considerations and potential impacts that define the project's journey from concept to reality I will also be tackling the Legal social ethical and professional considerations of this project.

## Interpretation of Research Findings

During the user testing and evaluation phase, we analysed the collected data to reveal patterns in user behaviour, preferences and interactions with the Lifestyle Scanner Web Application. Participants/Users consistently displayed interest in the "Scan Barcode API" feature as their initial engagement, highlighting their enthusiasm for the application's core function. Following this, users often explored the "Ingredients API" section, indicating their curiosity about Ingredients suitability.

Preferences and decision-making insights revealed that users favoured intuitive interfaces and the interactive elements providing real-time feedback. Especially, the "show/hide password" button with a familiar eye icon was well-received, underscoring the importance of familiar symbols in enhancing usability and accessibility.

## Application's Potential Impact on Lifestyle Choices

The web application's potential impact on lifestyle choices became evident using the barcode scanners potential impact on lifestyle choices is highlighted by the seamless integration of its features with the preferences of vegans and vegetarians. By utilizing the barcode scanning functionality, users can effortlessly identify suitable products that align with their dietary requirements while shopping, offering a rapid and convenient solution.

## Implications for Design and Development

The analysis informed design and development by emphasizing the significance of prioritizing the main features like the barcode scanning and ingredients API while ensuring smooth user experiences. The detected popular trends featured the value of familiar symbols and responsive interfaces in promoting user-friendly interactions. Overall, the insights derived from user behaviour and preferences provided a strong foundation for refining the application's design and functionality to better align with user expectations.

## Legal, Social, Ethical and Professional Considerations

In this subsection of the discussion, I will be going over some of the key Legal, Social, Ethical and Professional Considerations associated with the Lifestyle Scanner Web Application. This segment will provide insights into the broader implications of the web application's use, touching on the legal and ethical aspects, Aswell as its potential societal impact and the devotion to professional standards. This aims to bring to light the responsibilities and challenges that come with the development and deployment of such a technology-driven solution in the context of users allergen and lifestyle choices.

### Legal Considerations:

This involves examining the legal framework and regulations that would apply to the Lifestyle Scanner Web Application (*Hallam, 2018*). It includes aspects such as data privacy, intellectual property, terms of use and compliance with relevant laws and regulations in the technology and food industry.

Some legal considerations might be:

|  |
| --- |
| **Data Privacy** |
| Ensuring that user data is collected and stored in compliance with data protection laws, such as GDPR (General Data Protection Regulation). This includes acquiring user consent, providing complete transparency about the data usage and implementing security measures to fully protect sensitive information.  So, for our web application this would be things like name, email, password the way the data is stored is it secure has the password been hashed or encrypted?  This is why minimizing data collection to only necessary information and regularly updating security practices are essential components to ensuring data protection and privacy for all users of the Lifestyle Scanner web application. |

|  |
| --- |
| **Intellectual Property (IP)** |
| Guaranteeing that any content, images or code used in the web application respects copyright infringement laws and licensing agreements. Properly crediting third-party resources and obtaining necessary permissions is crucial.  Within the Lifestyle Scanner Web Application this would be things like the API original developers, have I credited them, do I have permission to use the API this is why I have the API information page within the web application. |
| **Terms of Use and Disclaimers** |
| By clearly outlining the application's terms of use and incorporating disclaimers regarding the accuracy of provided information, I aim to effectively manage user expectations and mitigate the potential for legal disputes. These precautions are mandatory and particularly critical in instances where inaccurate information, such as mislabelled vegan products, could lead to unintended consequences. |

### Social Considerations:

Social considerations focus on the potential impact the web application would have on society and the community. This covers analysing how the application might influence users dietary choices, its role in promoting sustainable and ethical eating practices plus its effects on broader societal attitudes towards vegan, vegetarian lifestyles.

|  |
| --- |
| **Accessibility** |
| Ensuring universal access for all users, regardless of disabilities or impairments, such as those who may be colourblind or facing mobility challenges, is paramount. Prioritizing inclusive design not only enriches the user experience but also emphasizes the commitment to accommodating a diverse audience. This is why the web application colours and text have such a Colour Contrast. |
| **Digital Divide** |
| In terms of digital divide, we have to consider the potential impact of the application on users who may not have access to modern devices or high-speed internet. Keeping the design simple and completely visible on all devices regardless of their technological limitations. |

### Ethical Considerations

Ethical considerations probe into the moral implications (*W3C tag ethical web principles*) of the web application's features and functionalities. Evaluating issues such as user data privacy and consent, transparency in information sharing, potential biases in product recommendations and the alignment with ethical principles surrounding health and wellness.

Some ethical considerations we would need to consider include:

|  |
| --- |
| **User Consent and Transparency** |
| Clearly informing users about the purpose and features of the application and obtaining their informed consent to use their data. Users should have a clear understanding of how their data will be used and shared within the Lifestyle Scanner Web Application which as of yet doesn’t really use the users data for anything other than Authentication to gain access to the APIs and further functionality of the application but further down the line we will need to be completely transparent to the user that their user settings such as lifestyle and dietary requirements will be used to tailor the barcode scanner and ingredient results in accordance with their information. |
| **Data Usage** |
| Ensuring that user data collected by the Lifestyle Scanner Web Application is utilized solely for its intended purpose and not misused for unintended activities, such as unauthorized targeted advertising, is of utmost importance. Thus, upholding ethical standards. |

### Professional

Professional considerations address the application's adherence to industry standards, best practices and the responsibilities of developers and stakeholders. This includes ensuring the accuracy of nutritional information, the reliability of barcode scanning technology and the ethical responsibilities of providing users with accurate and trustworthy information.

|  |
| --- |
| **Documentation** |
| Thoroughly documenting (*Jones, 2022*) the web applications codebase with internal commentary, APIs and any external resources integrated into the Lifestyle Scanner Web Application is essential. Thorough documentation simplifies the task for developing the application in the future, enabling the developer to comprehend and manage the code effectively. |
| **Quality Assurance** |
| Prioritizing complete testing of the Lifestyle Scanner Web Application to minimize bugs, errors and vulnerabilities is vital. Dedication to quality and user satisfaction not only enhances the user experience but also contributes to maintaining a strong professional reputation. |

In conclusion, the analysis of legal, ethical, social and professional considerations plays a critical role in influencing the development and deployment of the Lifestyle Scanner Web Application. By thoroughly addressing data privacy, intellectual property, user consent, accessibility, societal impact and more, the web applications foundation is reinforced with credibility and user trust.

The alignment with ethical principles ensures that the user data is handled responsibly and transparently, adopting an environment where user needs are met with integrity. These factors collectively contribute to the web applications ethical standing, user-centric design and potential to positively impact users dietary and lifestyle choices. By holding to industry best practices and standards, the application not only functions smoothly but also establishes itself as a reliable and trustworthy tool in the pursuit of more informed living and allergen-conscious choices.

# **Conclusion and Future Work**

In the concluding section of this report, we compress the key findings, achievements and future trajectories of the Lifestyle Scanner Web Application. Through an exploration of the project’s accomplishments and potential avenues for further development. This section investigates into both the present outcomes and the exciting prospects that lie ahead, emphasizing the iterative nature of the applications evolution.

## Summary of Achievements and Contributions

Throughout this development life cycle, several prominent achievements have been realized. Successfully integrating the barcode API stood as a very significant milestone for this web application, enabling seamless scanning functionality. Additionally, ensuring full responsiveness across a various range of devices, including iOS, Android, PC and even TVs, emphasizes the application's commitment to accessibility and user-centred design.

## Recap of Hypothesis and Research Objectives

At the outset of the project, the hypothesis and research objectives were planned to guide the development of the Lifestyle Scanner Web Application. The main goal was to create a responsive web application capable of seamlessly scanning and identifying products that align with specific dietary requirements and lifestyle choices. The project aimed to offer a user-friendly experience, simplifying the process of making informed choices while shopping. The hypothesis speculated that individuals using the Lifestyle Scanner application during grocery shopping would be more likely to purchase products that match their dietary preferences and lifestyle choices compared to those who do not use the application.

To address these goals, the following research objectives were outlined:

* Development Options Explored
* Research Different Lifestyles and Dietary Requirements
* Investigate Available Scanner Applications
* Investigate the Development Process
* Research Accessibility Requirements

The hypothesis was intended to be tested with two groups of three participants each, but it was ultimately carried out with two individuals due to constraints. One participant held to a vegan lifestyle, while the adhered to veggie. The testing involved providing the Lifestyle Scanner application to these participants, while a control group of two individuals (1 vegan, 1 veggie) did not use the application. The primary objective was to collect thorough data on the application's usability and functionality and to assess its influence on user purchasing behaviour. The research methods employed user testing and a comparative analysis of the purchasing behaviours exhibited by users who utilized the application and those who did not.

Although the intended sample size was not fully achieved, the testing process aimed to shed light on the application's potential impact on users adhering to their lifestyle choices and making informed shopping decisions. In conclusion, the project successfully addressed its objectives by developing a responsive web application that integrates a barcode scanner and ingredients API to aid users in making informed purchasing decisions based on their dietary preferences. The results of the research confirmed the success of the hypothesis.

## Ideas for Future Iterations and Enhancements

There are many ideas and iterations that will continue to shape the development of the Lifestyle Scanner beyond the completion of this phase. Some of these ideas involve expanding the Web Applications scope to include all dietary preferences and allergens. By incorporating personal profile information, the application will be able to customise its data to suit each users individual needs and preferences.

In addition to these additions, I am eager to explore the development of a proprietary API that can effectively handle a comprehensive range of dietary requirements and lifestyles. This self-developed API would allow the Lifestyle Scanner to offer a more comprehensive and tailored experience to users, whilst accommodating a vast array of dietary preferences and needs.

This evolution represents an exciting prospect for the continued improvement and refinement of the Lifestyle Scanner, catering to an even wider range of users and their more specific lifestyle choices.

# References

Basker, E., 2012. Raising the barcode scanner: Technology and productivity in the retail sector. *American Economic Journal: Applied Economics*, *4*(3), pp.1-27.

Mackarness, R., 1976. *Eating Dangerously: The Hazards of Allergies*. Houghton Mifflin Harcourt P (Accessed: February 17, 2023).

Gheihman, N., 2021. Veganism as a lifestyle movement. *Sociology compass*, *15*(5), p.e12877. (Accessed: February 17, 2023).

Packaging and labelling (2022) Food Standards Agency. Food Standards Agency. Available at: https://www.food.gov.uk/business-guidance/packaging-and-labelling (Accessed: February 19, 2023).

Mueller, M., Ganesh, R. and Bonnes, S., 2020. Gut health= mental health? The impact of diet and dietary supplements on mood disorders. *Current Nutrition Reports*, *9*, pp.361-368. Available: https://link.springer.com/article/10.1007/s13668-020-00340-2 (Accessed: February 17, 2023).

McRae, L. (2019) Vegan, vegetarian, pescatarian, Flexitarian and macrobiotic diets – what's the difference?, NorthShore. Available at: https://www.northshore.org/healthy-you/vegan-flexitarian-vegetarian-pescatarian-and-macrobiotic-diets--whats-the-difference/ (Accessed: February 17, 2023).

Smith, R. (2016) *34 non-vegan ingredients to avoid on a vegan diet*, *Vegan Food & Living*. Available at: https://www.veganfoodandliving.com/features/food-ingredients-avoid-vegan-diet/ (Accessed: February 17, 2023).

Tahreem, A. et al. (2022) FAD diets: Facts and fiction, Frontiers. Frontiers. Available at: https://www.frontiersin.org/articles/10.3389/fnut.2022.960922/full (Accessed: February 17, 2023).

Hung, L. (2018) On The Topic of Allergies, IMMpress Magazine. Available at: https://www.immpressmagazine.com/on-the-topic-of-allergies/ (Accessed: February 17, 2023).

Macmanus, R. (2015) *How myfitnesspal became the king of diet trackers*, *ReadWrite*. Available at: https://readwrite.com/trackers-myfitnesspal-excerpt/ (Accessed: February 17, 2023).

Medved, E. (2022) *Food API – 18 most popular food apis [Q3, 2022]*, *Suggestic*. Available at: https://suggestic.com/blog/food-api-ultimate-list (Accessed: February 17, 2023).

*VeganCheck.me API documentation* (no date) *VeganCheck API v0 | FrontendNetwork - Open Web*. Available at: https://frontendnet.work/vegancheck-api (Accessed: 13 August 2023).

Maringer, M., Wisse-Voorwinden, N., van’t Veer, P. and Geelen, A., 2019. Food identification by barcode scanning in the Netherlands: a quality assessment of labelled food product databases underlying popular nutrition applications. Public health nutrition, 22(7), pp.1215-1222.

Vlosky, R.P., 1994. Influences of interorganizational information system technologies on business relationships: Wood products sellers and home center buyers. The Pennsylvania State University.

D. SAVIR and G. J. LAURER, 1975. The characteristics and decodability of the Universal Product Code symbol. Available at: https://ieeexplore.ieee.org/abstract/document/5388144 (Accessed: February 17, 2023).

Jerry Swartz et al. (2012) Bar code scanning. Scholarpedia, Available at: http://www.scholarpedia.org/w/index.php?title=Bar\_code\_scanning&action=cite&rev=137139 (Accessed: February 17, 2023).

FERNANDES, N., COSTA, D., DUARTE, C. and CARRIÇO, L., 2012. Evaluating the Accessibility of Web Applications. Procedia Computer Science, 14, pp. 28-35.

Cooper, M. *et al.* (2016) *Techniques for WCAG 2.0*, *W3C*. Available at: https://www.w3.org/TR/WCAG-TECHS/ (Accessed: February 17, 2023).

Cooper, M. *et al.* (2016) *Failures for WCAG 2.0*, *W3C*. Available at: https://www.w3.org/TR/WCAG20-TECHS/failures.html (Accessed: February 17, 2023).

Research guides: Research methods guide: Research design & method (2019) Research Design & Method - Research Methods Guide - Research Guides at Virginia Tech. University Libraries. Available at: https://guides.lib.vt.edu/researchmethods/design-method (Accessed: February 15, 2023).

Islam, M.M. (2022) *MERNjs*. Available at: https://mern.js.org/ (Accessed: February 19, 2023).

Abdalslam, A. (2023) *Version control clients statistics, trends and facts 2023*, *Abdalslam*. Available at: https://abdalslam.com/version-control-clients-statistics#:~:text=The%20most%20popular%20version%20control,used%20by%20less%20than%205%25. (Accessed: February 19, 2023).

Villegas, F. (2021) Participant observation: What it is, Types &amp; Uses, QuestionPro. Available at: https://www.questionpro.com/blog/participant-observation/ (Accessed: February 15, 2023).

Gardner, B.S., 2011. Responsive web design: Enriching the user experience. Sigma Journal: Inside the Digital Ecosystem, 11(1), pp.13-19.

Kumar, G. and Bhatia, P.K., 2012. Impact of agile methodology on software development process. *International Journal of Computer Technology and Electronics Engineering (IJCTEE)*, *2*(4), pp.46-50.

Shultis, G. (2019) Agile vs. waterfall: Pros & cons, use cases, & more, Glasscubes. Available at: https://www.glasscubes.com/agile-vs-waterfall/#:~:text=Agile%20projects%20are%20typically%20cheaper,and%20take%20longer%20to%20deliver. (Accessed: February 16, 2023).

Gant, M. (2019) *Scrum and the solo dev*, *Medium*. Medium. Available at: https://medium.com/@jmgant.cleareyeconsulting/scrum-and-the-solo-dev-fb8e810ed42b (Accessed: February 15, 2023).

*Agile Model (Software Engineering) - javatpoint* (no date) *Javatpoint*. Javatpoint. Available at: https://www.javatpoint.com/software-engineering-agile-model (Accessed: February 16, 2023).

Is The mern stack right for me? (2023) Incentius. Available at: https://www.incentius.com/blog-posts/is-mern-stack-right-for-me/ (Accessed: 13 August 2023).

Why use mongodb and when to use it? (no date) MongoDB. Available at: https://www.mongodb.com/why-use-mongodb (Accessed: 13 August 2023).

React, nodejs, Express &amp; MongoDB - The Mern Fullstack Guide - Udemy. Available at: https://www.udemy.com/course/react-nodejs-express-mongodb-the-mern-fullstack-guide/ (Accessed: 13 August 2023).

VeganCheck.me API documentation (no date) VeganCheck API v0 | FrontendNetwork - Open Web. Available at: https://frontendnet.work/vegancheck-api (Accessed: 13 August 2023).

Hallam (2018) Website legal requirements: Laws and regulations in the UK (2018), Hallam. Available at: https://www.hallaminternet.com/internet-marketing-and-the-law-legal-issues-affecting-you-and-your-website/ (Accessed: 13 August 2023).

W3C tag ethical web principles (no date) W3C. Available at: https://www.w3.org/TR/ethical-web-principles/ (Accessed: 13 August 2023).

Jones, J. (2022) 11 best practices for developing secure web applications, LRS Web Solutions. Available at: https://www.lrswebsolutions.com/Blog/Posts/32/Website-Security/11-Best-Practices-for-Developing-Secure-Web-Applications/blog-post/ (Accessed: 13 August 2023).

## Appendix

## Appendix: GitHub Repository

This section contains a link to the GitHub repository for the Lifestyle Scanner Web Application project. The repository serves as the home for the project's source code, documentation, collaboration and further iterations/development.

Repository Link: [Lifestyle Scanner Web Application Repository](https://github.com/PeterKemley/Dissertation)