PRCO304

Final Stage Computing Project

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*Dissertation Report*

# Acknowledgements

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# Abstract

This report entails the full project lifecycle of a code learning application designed to enable computer science students to learn how to code without having the restrictions of deadlines and timings to allow for a relaxed approached to studying and to allow for more user-focused, confidence building educational methods to achieve the goal of improving coding outside the classroom.

The report will introduce the background information that led to certain methods being adapted into the application as well as the objectives and deliverables of the project that are a result of these adaptations, which also include the current technologies that are readily available and the limitations that are found within them. The report will also talk about the various limitations and issues surrounding the legal, social, ethical, and professional elements that come with any computer-based application development process.

Furthermore, the report will go on to talk about the how the project management and design work, paved the road towards what and how the application interacts with its user to meet their requirements. This includes how the project deliverable timeline and structure led to certain elements being developed with priority to meet project expectations and goals.

The core element of the report discusses how the project stages were developed and how these affected the project timeline using an Agile approach to break down each requirement into Sprints and tackle each task within the given period. Each element of the project is then reviewed with issues encountered being worked on to improve the application as a whole before the next element is worked upon due to the nature of some aspects within the application requiring a previous element to have been completed before the next can be started. This is followed by a short section about how the project was tested to see what and where parts worked, or not so.

Finally, the end sections of the report will present an evaluation of the project and discuss the successes and flaws within the final product, looking into how certain decisions regarding technologies used and the design of the end-product through the project post-mortem and user evaluation. There is also an appendices section in which all screenshots and images used to display graphical information can be located at the end of the document.

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**Word Count: 1990**

*Link to code repository*: **ADD LINK TO GIT HERE**

# 1.Introduction

The project idea began after being in education and reflecting on the years of study to define where improvements could be made and how the education of a computing subject could be expanded to more than just lectures and practical work to be completed within the boundaries of the classroom. There are many pathways and ideologies that make up how students learn and grow within a specific topic, therefore providing a method of doing so without the complications of having to meet expectations and deadline, would be to practical to both student and teacher much like in industry and the standards they carry.

Education, at its core, is the process of learning more about the world to then be able to apply this knowledge to the factors that conform to industrial or commercial businesses. Education is vital to growth as both an intellectual and as a person and so by having the correct tools to do the job, and by having a way of utilising these tools to the best of the users capabilities would mean that the education process and methods work and their effects can be seen by the student becoming more then just a student, and that of a individual with the mind-set to take industry head on.

This application was developed with these principles in mind and so by providing the user with the necessary knowledge and concepts of what it means to study and learn programming, allows said user to then expand upon what they already know or fortify their current knowledge. With the potential access and use of multiple computing languages, and the use of a clean and vibrant interface, the user is more engaged with the content they are viewing and learning about without having to be restricted with long speeches by lecturers and time constraints of practical in-class lessons.

# 2. **Background, Objectives & Deliverables**

## ***2.1. What is coding leaning and why it is needed***

As more and more people migrate into the world of computing through more and more companies relying on computers to carry out their day to day jobs and certain life styles, companies are half-expecting new employees to have at least a basic concept of what programming is and so computing is being taught at a higher standard earlier in schools then it has been in the last 20 years, from books and lectures to now iPads and websites being more favourable and more easily accessible(**Koraline Kraj, 2019**)! Using and having readily accessible applications to aid this trend means to provide to people in a more modern way and in a fashion that can be adapted and changed with time unlike that of a book that is solidified in the older ways.

## ***2.2 What is already available***

Despite the application not becoming that of a commercially distributed piece of software, gaining the knowledge on what currently technologies and services are already used, aids the development and project plans as with this information a more solid background can be assured as the project would aspire to be as good, if not better, then what the user can already access. The two primary solutions that were analysed were as follows:

### ***2.2.1 Udacity***

This is an application which has a vast variety of computing and programming languages the users can tap into to be able to learn what they want from the services provided. The service branches out to more then just coding by teaching about Data Analytics, Industry jobs such as Data Engineers and even Project management, providing that little bit extra then what most applications can and providing the necessary information about each topic as well. Furthermore, the application provides its users with taught programs that are treated similar to that of class work but can be accessed and completed from home removing the need for having to go to a facility or school of some kind to use the software. Udacity further breaks down these topics into more manageable chunks, courses, and provides a fast and efficient way to master the tech skills that many employers are looking for in industry (**Udacity, 2020**).

### ***2.2.2 W3 Schools***

As an alternative to an application, W3Schools allows for users of all backgrounds to be able to use the website and obtain the knowledge they are looking for and have that knowledge transpired so that the user builds up their confidence and are able to build applications and websites of their own in a matter of minutes. The use of tests and a simple interface allow for users to get to what they want quickly and can search through hundreds of documents to optimise the users training and learning whilst providing to be the world’s largest web developer site through a simple to view and use user interface (**W3Schools, 2020**).

## ***2.3 Project Aims***

The project objectives are as simple as they are broad in that the application being used isn’t just to see how well people know or don’t know how to code, but more to aid the individual grow in a particular area of expertise that is growing to become such a vital part of society and to enable the user to look at certain aspects of life and be able to think outside the box and become a better problem solver overall and then be able to build from this foundation and apply it to many different situations not just that of a coding or programming.

The main objective of the application is to provide a service for users that will; enable and promote the learning of programming within an environment that helps to reinforce what has been learnt. Achieved by providing practice opportunities and building confidence through an instant feedback mechanism to enable meaningful learning. The application also aims to be user-friendly through a progress tracking system in which users will be able to track their progress on each topic and see a visual representation of what they’ve learnt as well as progress through tests and quizzes.

### ***2.3.1 Project Deliverables***

* Develop a web application that can teach and aid in the learning of programming and coding practices.
* To provide an instant feedback system that is integrated into the application allowing users to view progression within most aspects of the application.
* To enable users to have the knowledge to produce small applications of their own from the code knowledge obtained and with the theory behind how and why code works the way it does in different computing languages.
* To develop an application which aids to fill in blanks or to help generate newfound knowledge in the user to increase confidence and drive to progress further in a computing business or career.

# **3.Method of approach**

## ***3.1 Agile Project Development***

Due to the scale of the project it required a platform that could be used in conjunction with the development software as this would be where the user and developer would come together as they would both be sharing in the same end result. Hence the project adapted an Agile methodology to its development plans as by using Agile, the development method can anticipate change and allow for more flexibility over that of more traditional methods such as Waterfall(***Visual Compass, 2013***) and so the project could adapt to small changes on the fly rather than breaking the code and having to rebuild it. Agile also allows for these small changes to be made and with little repercussion to the result of the project meaning that this methodology would be more feasible and suited to the project over that of Waterfall, which is known for being outdated and can cause more issues the closer the project is to being completed then that of Agile and it’s incremental approach with more end-user and developer communications through client meetings at regular intervals over the course of the project lifecycle.

## ***3.1.1. Sprints***

A sprint is summarised as a short, time-based period in which a team, known as a scrum in Agile, works towards a goal within the given time frame. Sprints are very useful as they can be set to shorter periods of time which then allow for smaller changes to be made more regularly if need be. These blocks are what the entire Agile methodology is based off, and so if sprint planning is well thought of and executed, projects can be completed in a timely manner and will be less strenuous on the project members(**Max Rehkopf, 2020**). Therefore, by following the same style of project methodology and integrating sprints into the application time frames, larger issues and more complex content can be broken down into more manageable pieces.

# **4. Legal, Social, Ethical and Professional Issues**

## ***4.1. Legal***

### ***4.1.1. Licenses***

The project contains a variety of different software’s and libraries and so this section will talk about legal licensing regulations they have and how they are being followed to prevent any legal issues from arising.

**WAMPserver/phpMyAdmin** is the software accessed through WAMPserver and both of which are deemed free software, allow developers to redistribute and modify the application, within reason, authorised and published by the Free Software Foundation. The terms of the GNU General Public License, version 2 is included within this software and grants the permission to use said software with no legal penalty within the project. These software’s provide the application with its MySQL database as well as the localhost server that the application is hosted through (**phpMyAdmin, 2020**).

**Font Awesome** is a free, open-source and GPL friendly therefore its license allows for commercial use without penalty (**FontAwesome, 2018**) and the license is accessible from their website, hyperlinked into CSS file within project.

**PhpStorm** is an IDE that is free for educational purposes and its license is valid for use if the distributed copy is not used for the development of any organisation’s products or services and that the license is not shared. Therefore, given the nature of the project, the licensing agreement allows for this to be included within the project.

**HTML, CSS, JS, C#, and C++ Logos** are all free to download and use images. There is not a vast amount of data about their usage but given that there are a multiple sources for them and there are no negative comments about the use of these logos, the respected companies were emailed to verify their usage but with no reply. Given the nature of the project and that the project will not be distributed or sold, they have been included within the project until further notice.

### ***4.1.2. Data Protection***

Due to an element of the application requiring the potential acquisition of the user’s full name and email, the application will need to conform to both the Data Protection Act 2018 and the General Data Protection Regulation (GDPR) which states that strict rules called “data protection principles” my be followed and that all information is:

* “used fairly, lawfully and transparently”
* “used for specified, explicit purposes”
* “used in a way that is adequate, relevant and limited to only what is necessary”
* “accurate and, where necessary, kept up to date and kept for no longer than necessary”
* “handled in an appropriately secure manner, protected against unlawful access, loss, destruction or damage” (**gov.uk, 2020**)

This is upheld during the course of the entire application as the data used is only for the lifecycle of the project itself and upon conclusion, all data is no longer necessary and can be destroyed given that the user is told about this prior to it’s occurrence. Any data stored within the application database is stored for a specified purpose and, where applicable, will be stored using encryption such as with the passwords for user accounts.

## ***4.2. Social Implications***

As the project aim is to produce a web application for computer science students, there are a few implications that come with its development in the terms of social interactions and adapting the application to make it as user-friendly as possible.

Moreover, the application needs to be accessible to as many users as possible therefore the application needs to be modified as to accommodate for these users. This can be done in a variety of ways such as the use of accessibility tools or by developing the application in a way that means that anyone is able to pick it up and use it without having to change any settings from the get-go through the use of a mono-colour styling but in doing this, the application can lose the style and aesthetics that come with that, this is why the application has been developed using mostly primary colours but with these colours, each element has a text based counterpart as to not discourage people with possible colour-blindness. Furthermore, there are no topics that are talked about within the application other then that of the programming languages and their history, therefore there is no socially bias or objective opinions used that can be seen as offense to other.

## ***4.3. Ethics and the Ethics of Teaching***

There are many conflicts and implications that can revolve around the topic of ethics and so the application has been designed to follow certain criteria in which to be ethical and fair to all. What this means is that there is no judgement for wrong answers in tests, users are not made to feel unwanted or under-achieved whilst use the application. From a teaching standpoint, there is a fiduciary duty to act in this way towards students who want to learn (**PSPC, 2020**).

The application aims to encourage and wants its users to feel accomplished when completing certain tasks, which is then relayed using the instant feedback systems.

Furthermore, the application has also been approved by the University of Plymouths’ ethical application form in which allows the asking and obtaining of information from university students within the Plymouth campus. The form stated this clearly and as per its documentation, there have been no breaches and any data used for either the testing of the application or the questionnaire sent out to obtain census data that reminded participates that they have all rights to withdraw their data if they so wish and that all data collected has been and will remain anonymous.

## ***4.4. Professionality of Project***

As with all applications, the user base needs to be treated with the amount of respect as the developer would expect for themselves. Therefore, it is essential that professionalism is followed to the final line of code and all comments are written in a professional manner without the use of slang or short-hand which can obscure the point the developer is trying to make when explain to the user or when providing feedback. As such, the application uphold this side of the argument by not using profanity when relaying information to its users as well as not using any form of sexualised wordings, imagery or sound effects that could otherwise compromise more then just the developer but also the supervisor as they were to keep the developer on track throughout their projects lifecycle. Finally, the project keeps with its professionalism by not using code that had been generated by another else not had the project used any form of plagiarism as this is an offence against the university module guidelines but also would be an offense to the developer as then the project is truly their own.

# 5. Project Management

## 5.1. GitHub – Code Repository

Version control is key during project management as this is how both the developer as well as future developers and users can track to see how the application began and how it evolved over time. There are a few different types of version control software and plug-ins, but the use of a GitHub repository allowed for easier integration with the IDE of use, familiarity with the software development and version control mechanics. GitHub also allows the user to develop and store very large, multi-document projects meaning that despite having many files and folders to manage, GitHub allowed for this to be sorted and stored locally if needed but also had a hosted variant online as to keep a back-up of the projects version control. Using GitHub like this allowed for the project to be managed in a way that meant, if the local version of the repository were to go down, there would be another copy to be accessed. GitHub also allowed for sharing of repositories to allow the developer and client to share what the project version is, what and when certain files are uploaded to the repository further giving to the version control, but more towards to client this way.

## 5.2. Trello – Task Management

Trello is a web-based Kanban-style list making application that tells you what is being worked on, who is working on what, and where something is in a process (**Trello, 2017**).

Moreover, it is an application which allows users to develop a better way to plan and show a type of version control that is more flexible over that of GitHub without the ability to share code elements. Kanban style mean that there are actions that can be taken to show the current elements being worked on as well as past and future elements using “To-do”, “Doing” and “Done” lists. These are the generalised headings that are used for the more basic style of Kanban approach as opposed to how this project was carried out as in **FIGURE ???** in the appendix. The use of Trello in this project allowed for more lists to be generated which began with ideas that could have been added to the project but it mainly veered towards Sprint plans and they could be noted down, state whether the sprint was completed or not, and could also stay as a reminder to aid in remembering what had happened during the last sprint. The Trello application also allowed for the developer to move each task between each state to show how the project is developing and to give a physical representation of the project at a glance without needing to explain the code or show coded elements resulting in a cleaner and more understandable project overview.

## 5.3 Time-Management of Project

Further to the use of GitHub and Trello, the project utilises both of these to produce a time frame of what happened during each week to aid the developer in what was achieved and what needed to be worked on during either the next sprint or following week. This was also accompanied by stand-up meetings with the project supervisor who was there to ensure the project stayed on track and was there to provide guidance if there were an issue that was troubling the developer. These meetings were weekly for the first 5 weeks and then fortnightly after this which allowed for the supervisor to still see the progress of the project but weened off this support as the project developed further. The supervisor was not allowed to aid any form of project development as in they couldn’t apply any help with code generation but could bring up a topic that may have been of use and/or considered for a better project outcome.

# 6. Project Design

## 6.1. Project Requirements

## 6.1.1. Functional Requirements

This section of the report will break down each component of the requirements list set out for the user stories of the project. There are two different types and that is of the user’s functionality and that of the developer’s functionality, or that of the application admin. Further to the user’s functionality, there are also two types of user story with one for new users and one for users who have logged into the application. However, the user stories that apply to the new user, also apply to the logged in user BUT the logged in user stories are not to be applied to that of the new user.

There are as follows:

**New User:**

* The user can access and view theory information about a topic
* The user can access multiple languages as opposed to just one all the way
* After a test, the user can see how well they performed during that test
* During a topic, the user can see how much progress they have made through the topic
* The user can register for an account
* The user can login to an account

**Logged-In User:**

* The user can access their account page and see their overall progress on tests
* The user can access their account page and see their overall progress on topics
* The user can view their topic progress within a progress bar
* The user can view their test progress within a progress bar
* The user can request to delete their account
* The user can select a topic to add to favourites
* The user can select a test to add to favourites

**Developer / Admin:**

* The developer can approve account deletion requests
* On the admin account, they can see all user topic progress as a table
* On the admin account, they can see all user test progress as a table

**Optional Extras, desired to add if more time**

* The user can access a badge case with which they can then acquire icons which display certain achievements upon being obtained.
* The user can pick up from where they left off in topics
* The user can pick up from where they left off in tests

## 6.1.2. Non-Functional Requirements

These are the requirements which specify how the application performs upon a certain function, that is, how the system should behave and what are the limits of its functionality. These include:

* Validation of user inputs – the application will notify the user when they have not input something or have input it incorrectly.
* Security – The application does not share any information outside of itself and its own scope and certain areas cannot be accessed without the required authorisation.
* Usability – The application includes a simple and easy to use interface.
* Reliability – The information that the application obtains is not lost or not received incorrectly.

## 6.1. Application Design

# 7. Project Development

## 7.1. Development Technologies

# End-Project Report

# Project Post-Mortem - Now the project is over, reflect on what it is like now, how things are now the project lifecycle is finished

Now that the projects lifecycle has come to an end, it is clear to say that the project could have been bigger then it was but at the same time, the project contents could have been more tightly thought about in the sense that the project’s contents are quite vast and so the content for each topic included within the application are not as detailed as they could have been. The project could be expanded upon further and this is something that could be considered as the application does have potential and the software’s and other similar applications currently online, don’t have the same appeal as these seems to focus more on having a broader perspective that also incorporates other companies and businesses that know of them to gain more traction on a globe scale. As a whole, the project wasn’t a complete success but neither was it a complete failure as there were elements that put the application in a light which could be adapted by other projects or applications to allow them to evolve further and be more beneficial then they already are today.

# Conclusions

In conclusion…

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# Appendices

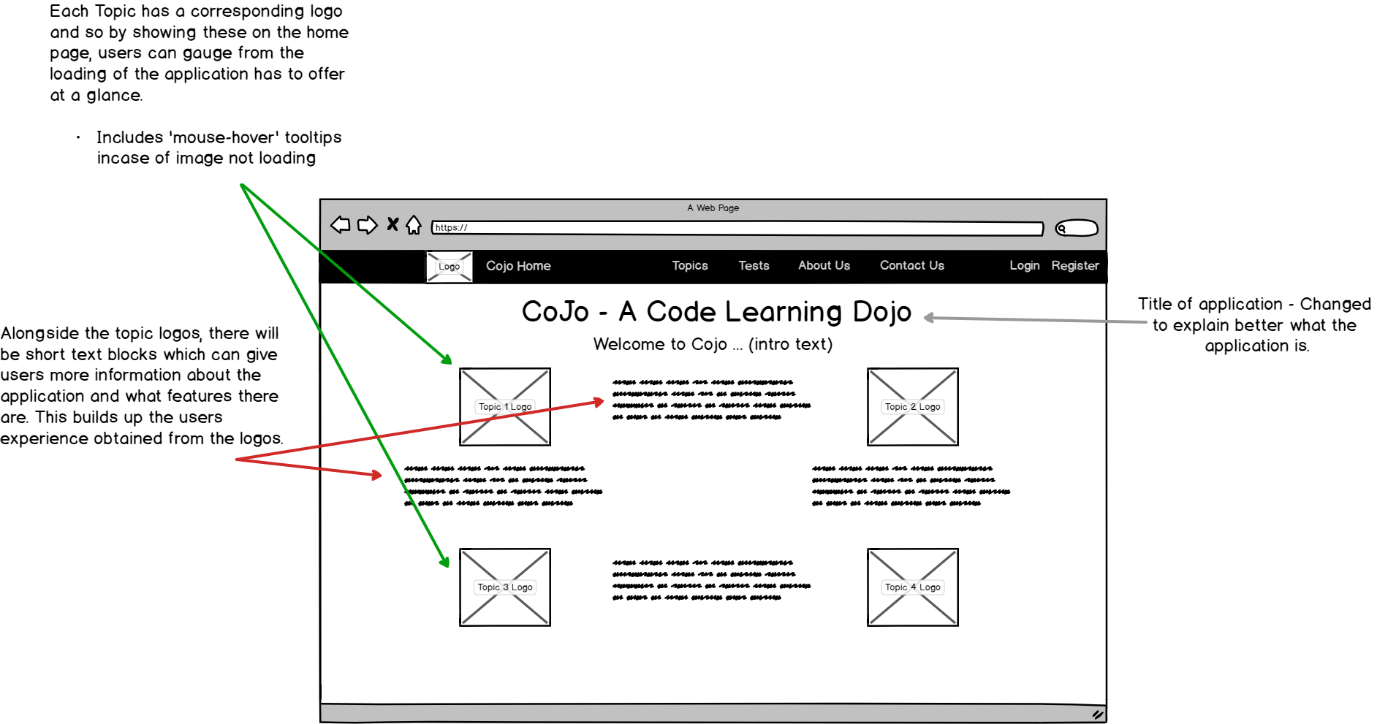
# A close up of a map Description automatically generatedWireframe Home Page Design V1

# Wireframe Topic Page Design V1

A screenshot of a cell phone

Description automatically generated

# Wireframe Home Page V2



# Wireframe Topic Page V2

A screenshot of a cell phone

Description automatically generated

# Wireframe Topic Example Page

A screenshot of a cell phone

Description automatically generated