# Project Definition

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## Intro

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## Project Motivation

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Project Aims  
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* The motivation and context are evidenced through reference to initiatives or reports from government, industry, public bodies or academic sources.
* There are clear, ambitious and detailed aims for the project. There is evidence they can be carried through to completion. Aims are imaginative and creative. These are conveyed precisely and effectively to the reader.
* Extensive independent research and effort using primary sources
* Mature and thorough evaluation of previous work including a critical comparison and reflection on the knowledge and evidence of integration into the project.

# Understanding The Topic

## Background Research

This section contains information about my project and the research that’s gone into the structure, design and implementation of my project. This section also includes Information about different services and tools used in my project.

### Laravel

Laravel is a php web application framework, this is the main framework I will be using to build my project [6]. Laravel is open source and contains many libraries, such as this one: [Laravel-Permission](https://github.com/spatie/laravel-permission), that can allow me to focus on implementing features like a complete permissions system [7].

There are plenty of free courses and tutorials [8] to teach me the basics of Laravel and other specific features such as Migrations and Authentication [9].

Laravel requires other services in order to run correctly. A server is needed and so is a database framework. To solve this issue, I have decided to use Laravel’s homestead [10]. Homestead is a pre-packaged virtual box, which includes a web server called ‘Nginx’, ‘MySQL’ and more. This means the server used to run my project will be on a virtual machine. This means none of the requirements of the server will be part of my development machine. This requires me to have Virtual-Box and Vagrant installed on my development machine in order to run homestead.

### Use of Third-Party Applications

#### Java SE Runtime Environment

I plan to integrate the Java SE Runtime Environment 8 (JRE 8) into my project. This is a Java Virtual Machine (JVM) that will be obtained from Oracle and installed on the host machine. The JRE will be primarily used as a form of automatic marking of submissions. When a coursework deadline is reached, The JRE will be executed on the host machine and all the submissions will be compiled and if any Junit tests were found, they will also be run. This means when the Professor proceeds to mark the submission, they will know if the submission was able to compile and pass any provided tests. This is a form of automatic marking and can be used solely to mark submissions if set by the coursework creator.

The complexity of this is medium. The installation of the JRE on the host machine is simple. The path to the JRE will be added to the hosts external variables so can be accessed from the command line. The results of the compilation and tests as well as the output string from the compiler will be stored in a json string and will belong to a ‘submission’ on the database. This means the results from the JRE can be collected at any time and displayed on a webpage.

#### Moss

Moss is a third-party software tool used to detect plagiarism between files or programmes. This is different to services such as ‘Turnitin’ as it runs offline and only checks for plagiarism in files provided as input. Moss was created to be used in the classroom to check code was not copied in class. I plan to use Moss to check for similarities in different submissions within a single coursework. Its use will be to notify users marking the submission of similarities, not that submissions were copied or plagiarised, this will require manual investigation by the user reviewing the submission [2].

The complexity of this is medium. As Moss is just an application, it will be installed on the host machine. The path to the moss executable will be added to the hosts external variables so it can be run from the command line. Once the deadline of a piece of coursework has been reached, the Moss application will be executed and will check all submissions for similarity and store the result within a json string and will belong to a ‘submission’ on the database. This means results can be displayed on a webpage and viewed only by a user with marking permissions. The time it will take to run through all the submissions with Moss in big O notation will be: O(n2). This is because for each submission it will have to compare itself to all other submissions in the coursework.

#### Problems with invoking applications on the host machine

Running an application on a host machine will take a certain amount of time to complete. During this time more of the hosts machine’s CPU will be occupied by other tasks. This can lead to other server-side tasks taking longer to run while these applications are running.

If multiple coursework’s hard the same deadline then this can lead to a large server side slow down as multiple applications will be running on the server at the same time. This is because the applications are executed when the coursework deadline is reached. A solution to this can be creating a queue. So, the server-side applications only work on one coursework at a time even if they have the same deadline. This will prevent overloading the CPU on the host machine.

### Database Design

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### Front End Development

#### Cascading Style Sheets

When it comes to styling the html for my webpages, I will use bootstrap as a framework. All the custom style sheets I write will complement this style. Bootstrap is an open source framework that contains great front-end component libraries such as navigation bars and containers. Using this framework will reduce the development time of the front end of my project and will reduce the size of my custom style sheets to improve readability. [4]

#### JavaScript

I will be using a JavaScript library to help speed up the development time of my front end. I will be using jQuery. This is a feature rich library which allows easy manipulation of html elements and contains useful JavaScript functions. jQuery is also open source and supports all modern browsers. [5]

## Related Work

### Turnitin

Turnitin is the leading internet plagiarism detection service. Swansea University use this service to collect coursework submissions. Turnitin is integrated into blackboard and is primarily used for text matching and checking plagiarism within assignments that are submitted by students. Tutors are also able to use Turnitin to mark and provide feedback on students' work [3].

Turnitin’s support for coding coursework is limited. It does not include line indention or syntax highlighting. Computer Scientists marking submissions usually download the files and view them in an IDE which includes these missing features **(PROVE THIS)**. My project relates to Turnitin as it’s an alternative way to specifically submit coding coursework and includes features such as syntax highlighting and line indention, so downloading files is not necessary.

The implementation of a similar feature to Turnitin, to search the web to check for plagiarism of submitted coursework, is out of the scope for my project. This feature is too large and beyond my knowledge and ability in implementation. As a compromise, I plan to implement a smaller feature that will check for familiarities between submissions for that specific coursework. I will achieve this by using third party software called ‘Moss’ [2]. This software checks for similarities between files.

### Blackboard

Blackboard is a web-based coursework management system. Swansea University uses this web application to manage coursework and modules. This is like my project as it’s also a coursework management system. The project will contain its own eco system of users, all with different level of permissions. Some users will be able to create Modules and coursework’s within them, whereas some users will be students to those coursework’s.

### Bitbucket

Bitbucket is like GitHub, it’s a web-based version control repository hosting service (I’m using this service to control my project). Bitbucket contains similar features that I want to implement within my project. When making a pull request on bitbucket, it gives other people the ability to review the code before it gets merged to a remote branch. Bitbucket allows users to highlight certain characters on a line and write comments of feedback for that line. This makes It very clear for people to understand the line of code the comment is referring to; I plan to implement a similar feature for my Project. When users receive feedback when using my project, they will be able to see which line of code the comment is referring to.

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* Demonstration of a sound body of understanding across the topic, and effective judgement in the selection of appropriate techniques.
* In depth understanding of technical background and evidence of ability to apply it in a constructive fashion.
* Critical evaluation of approaches and the current limits of knowledge are appreciated.
* Substantial progress has been made for this stage of the project.
* Original thinking has been demonstrated.
* Demonstration of conceptual understanding at the forefront of the discipline.

Project management  
Life Cycle  
The model I have chosen to use for my project is the Iterative model. This model applies the waterfall model to multiple chunks of the project. This breaks up the project into something more manageable as it allows me to individually plan and implement each chunk separately.

As I have chosen this model, it means that if during the implementation of the project I discover an important software or user requirement that I missed, I can just begin documenting a new section and begin work on it. If I was using the waterfall model, I would not be able to do this as it wasn’t in the original software requirement documentation.

If I am unable to reach my deadline, I will still have some implemented and fully tested chunks, whereas if I used the full waterfall model, I may only have half implemented the project and not completed any testing.

I decided to choose this model over the V-shape model and the waterfall model as these are too strict when it comes to its different phases. I need the flexibility to keep moving through the phases of implementation and requirements as I am learning the Laravel Framework as I go. As I work on the project, I will learn more about the framework and its possibilities which could lead to me making changes to the implementation or requirements later into development. The Iterative model gives me this flexibility as it takes me back to the requirements phase after each chunk.

Front end development follows the iterative model nicely. Each webpage is a chunk, so I would design the webpage and create the requirements for it first, then implement it and finally test it.

## Plan

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Risk assessment  
Risks are an obstacle that can prevent the success of a project. I believe it is important to assess the possible risks within a project ahead of time so that there can be enough plans made to prevent these risks or reduce their severity.

I have created a risk assessment table [1] which identifies possible risks when completing different tasks. These risks are identified with actions to reduce their severity or prevent them entirely.

|  |  |  |  |
| --- | --- | --- | --- |
| Risk | Type | Hazard | Mitigation |
| Time Management | Generic | This risk emerges when failing to assess how long tasks will take to complete. This can lead to failing to complete work on time. This risk also emerges when working too many long hours which can lead to burn out. | A solution to reduce the severity of this risk is to follow the time management graph I have created. Writing down an estimate time to complete tasks will help organise my time. |
| Dependency Software Updates | Specific | Software projects have their dependencies. Using libraries that fulfil certain functions saves us time and maintenance. However, if a dependency a project uses updates and changes its behaviour it could break the project that depends on it. This can lead to a time-consuming process of trying to debug where the problem has come from which is expensive. | A solution to this risk is instead of just depending on the latest version of a software dependency, I will depend on certain version. This way I guarantee that the behaviour of that dependency will always be the same. |
| Hard Drive Error | Generic | It is possible a hard drive can become corrupt during development. This can lead to a loss of work on that machine, which can be very time consuming to replace. | A solution to this problem is to have the code base and other resources backed up by source control on a separate computer. This is so work is easily recoverable. I will be using A bitbucket cloud server as my source control. |
| Change in Development PC | Specific | Moving to a new computer for development can be stressful. The project compiles on the previous PC but may fails to compile on the new PC. This is usually due to a new development environment. Time will have to be spent setting up the new PC to match the development environment of the previous machine. | I will create batch or python scripts to set up the development environment on my PC automatically, this will make moving to a new PC easier. |
| Internet Access Issues | Generic | Development requires access to the internet. This is mainly required when fetching new dependencies from online, browsing the web for solutions to issues or committing changes to remote branches. The loss of internet can slow down progress on a project massively, as the tasks mentioned above cannot be completed. | I will make sure I am close to multiple locations that include access to the internet. I will use my Laptop as a development PC and so can move to another location with internet access if it is lost. |
| Git Server Failure | Specific | This project will be using a Bitbucket Cloud server to store its source code. It is possible that Bitbucket may go down for maintenance and so will mean that a lack of access to the source-controlled code. It’s also possible that this, wherever it is in the world could be damaged or stolen, this will lead to a loss of source code under source control which will be very time consuming to recover. | This risk is extremely unlikely, however a way to solve this is to keep a up to date checkout of my master branch on one of my local PC’s. This means if their server goes down, I have an up to date version on my local computer. |
| Requirement Overload | Generic | When writing the software requirements for this project it can be easy to overlook how long the features will take to complete. It’s possible that there will be too many requirements created with not enough time to complete all the requirements. | To avoid requirement overload, I have created a set of minimum requirements (Minimal Viable Product). These are the requirements that I will complete first before starting any additional work. |
| Feature Overload | Generic | It’s an easy mistake to focus on creating features rather than fixing bugs and writing tests. This can lead to a feature overload as the product may be feature complete but can be very unreliable and under tested which could lead to lots of bugs and issues not being discovered until deployment. | Feature overload is solved by the same problem above. The use of a Minimum viable product will make sure only the minimum required features are added first. |
| Inadequate User Interface | Generic | A user interface that is not easy to use will discourage new users to learn how to use the product and can lead to users being unaware of certain features and getting lost within the user interface. | To solve this risk, I have created some wireframes which focus on making a smooth and easy to use user experience. When creating the UI for the web application, these wireframes will be copied into the application. |
| Developing Wrong Purpose Functionality | Generic | When developing features, it’s possible that the point and use of that feature may be misunderstood. This can lead to a creation of a feature that does not fulfil the user requirements. This leads to wasted time and additional code being added to the code base. | To prevent wrong purpose functionality, I have created a set of requirements that have to be bet, I will not implement a feature if it does not reach any of the requirements. |

I have identified these risks by using multiple different approaches:

* I have investigated problems that have occurred for other previous third year students and industrial software development projects.
* I have investigated all aspects of my own project, including generic risks and specific risks related to my project.
* I have also spoken to other students with experience in software engineering as they may be aware of risks that aren't obvious to me.

I will continue to manage the risk of my project by following up with another risk assessment which will be used to identify new risks and update the risk assessment table above.

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* Effective judgement in the selection of a software development model has been demonstrated.
* There is a clear and precise description of how the chosen SDLC will be applied.
* The work schedule identifies deliverables that are detailed and ambitious.
* The size of each deliverable is appropriate and demonstrates progression.
* Each deliverable is associated with a method to measure its success, and risks are identified with mitigation.
* Delivery is timetabled appropriately.
* The reader is convinced that effective project management will take place as an integrated and useful component of the project.
* All risks are identified with mitigation. These include generic and project specific risks.
* It is clear how risks will be identified during the project, and risk management is a core component of the project.

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