Higher Nationals – Assignment Front Sheet

Student Name/ID	Vo Dinh Nhat/ GCD210218		
Unit Title	Unit 30: Application Development		
Assignment Number	Assignment 1	**Assessor**	Pham Thanh Son
Submission Date		**Date Received 1st submission**	
Re-submission Date		**Date Received 2nd submission**	

Grading grid

P1	P2	P3	M1	M2	D1
✓	✓	✓			

Assessor Feedback:

*Please note that constructive and useful feedback should allow students to understand:

a) Strengths of performance
b) Limitations of performance
c) Any improvements needed in future assessments

Feedback should be against the learning outcomes and assessment criteria to help students understand how these inform the process of judging the overall grade.

Feedback should give full guidance to the students on how they have met the learning outcomes and assessment criteria.

Grade:	**Assessor Signature:**	**Date:**

Resubmission Feedback:

*Please note resubmission feedback is focussed only on the resubmitted work

Grade:	**Assessor Signature:**	**Date:**

Internal Verifier's Comments:
Signature & Date:

* Please note that grade decisions are provisional. They are only confirmed once internal and external moderation has taken place and grades decisions have been agreed at the assessment.

FPT Education
TỔ CHỨC GIÁO DỤC FPT

UNIVERSITY OF GREENWICH
Alliance with FPT Education

Pearson | BTEC

Group 6:

2 Members:

-Lê Nguyễn Thiên Ân

-Võ Đình Nhật

Software Requirements Specification

1. Introduction

<TO DO: Please provide a brief introduction to your project and a brief overview of what the reader will find in this section.>

Over the past ten years, technology has evolved significantly and is now affecting every aspect of human existence. Its effectiveness has been proven through implementation in many fields, including the recruitment industry. GreenWich University chose to develop a recruitment web application called FPTJobMatch as a technology startup.

FPTJobMatch is a web-based software system designed to help job seekers and employers interact and search for jobs effectively. This application provides a platform to manage information about jobs, candidates and the recruitment process, thereby making searching and recruiting easier. FPTJobMatch consolidates and optimizes the recruitment process, from posting job advertisements to processing candidate profiles, helping to save time and effort for both job seekers and employers.

In this section you will find functions for account management, login, registration, updating personal information and job search. At the same time, you can also see features to manage job postings, view and apply to job positions, and many other features related to the recruitment process.

1.1 Document Purpose

<Identify the product whose software requirements are specified in this document, including the revision or release number. Describe the scope of the product that is covered by this SRS, particularly if this SRS describes only part of the system or a single subsystem.

TO DO: Write 1-2 paragraphs describing the purpose of this document as explained above.>

The goal of this document is to give a comprehensive description of FPTJobMatch. It will go over the features and capabilities of the system, its user interfaces, what it can accomplish, the constraints it must work under, and how it will respond to external stimuli. The document will address the technical design, risk assessment, and project

architecture. This document is intended for both system developers and stakeholders, and it will be made available on the Enterprise GW browser.

1.2 Product Scope

<Provide a short description of the software being specified and its purpose, including relevant benefits, objectives, and goals.

TO DO: 1-2 paragraphs describing the scope of the product. Make sure to describe the benefits associated with the product.>

We developed the project requirements after interacting with the University of Greenwich. The FPTJobMatch program is a web-based software solution designed to help employers and students looking for jobs. This will be the online recruitment web platform used by many employers. Three roles will be available in the app: customer, recruiter and admin. With the different roles outlined above, the program provides basic authorization and authentication. Users have the freedom to modify their login information. Once logged in, the system will guide users to relevant pages based on their account. Users have the option to view every accessible job along with all its details thanks to the system. Depending on their job search needs, they can find good jobs. Additionally, it offers customers the ability to use search engines to find the right job they are looking for.

1.3 Intended Audience and Document Overview

<Describe the different types of reader that the document is intended for, such as developers, project managers, marketing staff, users, testers, and documentation writers. Describe what the rest of this SRS contains and how it is organized. Suggest a sequence for reading the document, beginning with the overview sections and proceeding through the sections that are most pertinent to each reader type.>

This document serves as a comprehensive guide for various stakeholders involved in the development and utilization of our web-based recruitment system. It caters to audiences such as lecturers, bookstore owners, development teams (including testers, developers, project managers, and marketers), as well as the university's founders and other interested parties.

The document provides an introductory overview of the recruitment system's capabilities, followed by detailed descriptions of its functionality, technical requirements, design aspects, and risk assessment.

In the "Overall Description" section, readers will gain insights into the system's features and a broad understanding of its functionalities tailored for recruitment purposes.

The "Specific Requirements" section will outline all technical requirements of the application, including use case models for different user roles and the system's workflow, ensuring clarity for developers and project managers.

In the "Technical Design" area, developers and project managers will find detailed information about the database design, system flow, and other technical intricacies, facilitating the implementation and maintenance of the system.

Finally, the "Risk Assessment" section concludes the document by identifying potential risks associated with the system and proposing appropriate risk management strategies to mitigate them effectively.

2. Overall Description

2.1 Product Overview

TO DO: Provide at least one paragraph describing product perspective. Provide a general diagram that will illustrate how your product interacts with the environment and in what context it is being used. This is not a formal diagram, but rather something that is used to illustrate the product at a high level.

FPTJobMatch Web is an online platform designed to support the recruitment process of FPT and candidates. This platform will speed up and simplify the process of finding, registering and applying for job positions for candidates, while helping recruiters manage their candidate database and job positions. . The system will allow users to register and log in with different roles, including candidates and recruiters. Administrators will have complete control over all system operations, ensuring smooth and efficient operations.

2.2 Product Functionality

TO DO: Provide a bulleted list of all the major functions of the system

There will basically be three roles in the system: admin, recruiter, and Job Seeker. Each role will have its own powers. The administrator will hold the highest position and be responsible for all system activities.

-As a Job Seeker, they can:

+Job seekers shall have the ability to search for job listings based on various criteria such as job title, location, and industry.

+Job seekers should be able to apply to job listings by writing a short self-introduction or submitting their resumes and cover letters

+Confirmation notifications must be sent to job seekers upon successful application submission.

+Job seekers shall maintain a profile with personal and professional information.

+The system must allow job seekers to update their profiles, including resumes and contact information.

-Employers:

+Employers shall have the ability to create and post job listings

+Each job listing must include details such as job title, job description, required qualifications, and application deadline.

+Employers should be able to view and manage incoming job applications.

+The system shall provide tools for employers to shortlist, review, and respond to job applications.

+Employers must have the capability to view detailed profiles of job seekers.

+Tools for sorting and filtering candidates based on relevant criteria should be available.

-Administrators:

+Admins shall have the ability to manage user accounts, including account creation, suspension, and deletion.

+Password reset functionality must be available for both employers and job seekers.

+Admins should review and approve/reject new job categories requested by employers.

+Automated notifications should inform employers of the category approval status.

3. Specific Requirements

3.1 Functional Requirements

TO DO: Provide a list of functional requirements using the User Story Format.
Example: As a website user, I want to be able to create a new account, so that I can access personalized features.

ID	Roles	Actions

1	Job Seeker	Search for job listings based on various criteria such as job title, location, and industry.

		Apply to job listings
		Maintain a profile with personal and professional information.
		The system must allow job seekers to update their profiles, including resumes and contact information.
2	Employer	Login to the system
		Ability to create and post job listings.
		Each job listing must include details such as job title, job description, required qualifications, and application deadline.
		Employers should be able to view and manage incoming job applications.
		Tools for sorting and filtering candidates based on relevant criteria should be available.
3	Admin	Login to the system
		Create new user with roles

		Ability to manage user accounts, including account creation, suspension, and deletion.
		Password reset functionality must be available for both employers and job seekers.
		Review and approve/reject new job categories requested by employers.
		Automated notifications should inform employers of the category approval status.

3.2 Use case Diagrams

TO DO: Provide a use case diagram that will encapsulate the entire system and all actors.

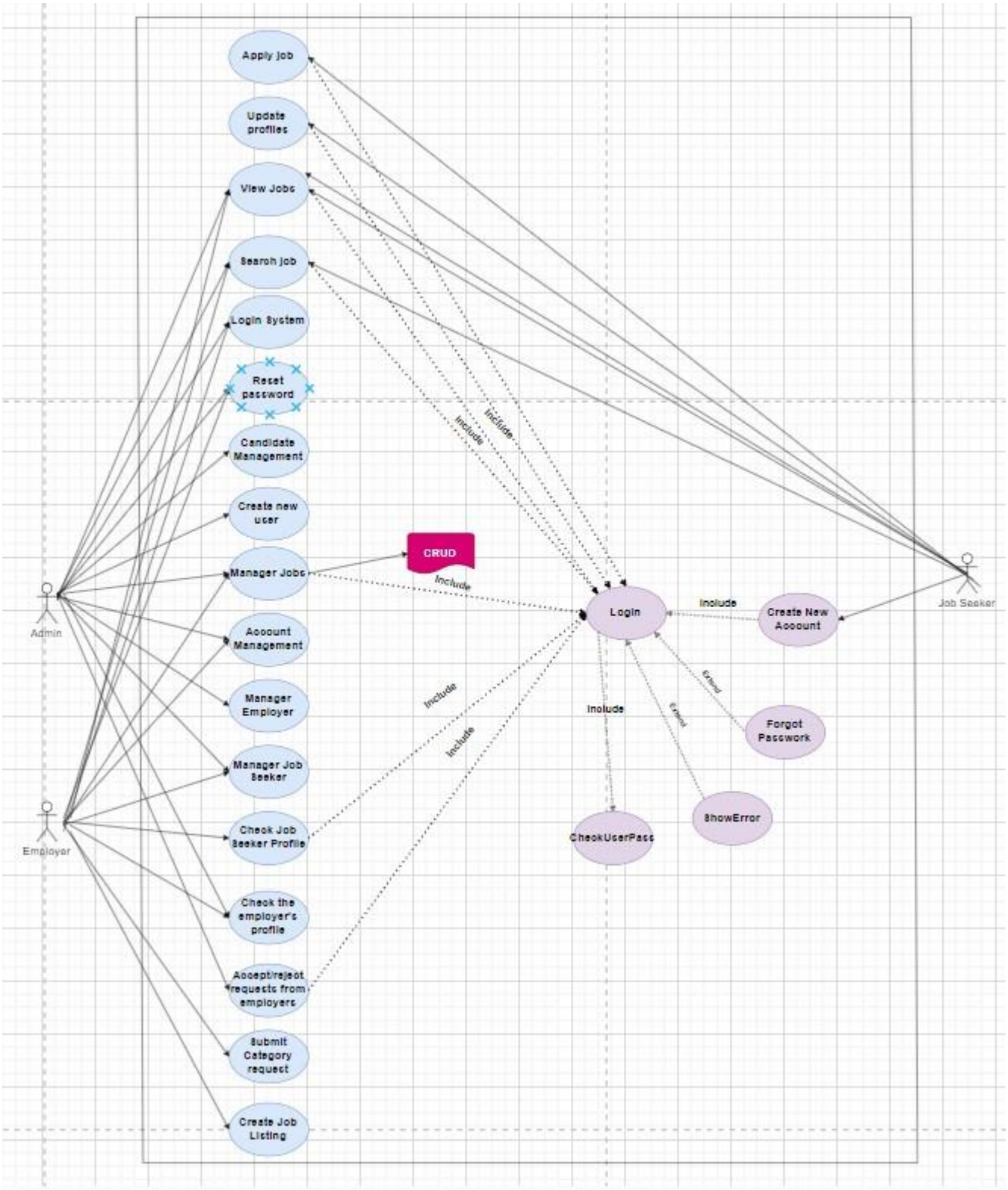

Apply job
Update profiles
View Jobs
Search job
Login System
Reset password
Candidate Management
Create new user
Manager Jobs
Account Management
Manager Employer
Manager Job Seeker
Check Job Seeker Profile
Check the employer's profile
Accept/reject requests from employers
Submit Category request
Create Job Listing
Admin
Employer
CRUD
Include
Login
Create New Account
Job Seeker
Forgot Password
ShowError
CheckUserPass
Extend

Figure 1:Usecase diagram

3.3 Site Map

TO DO: Provide a site map of the system

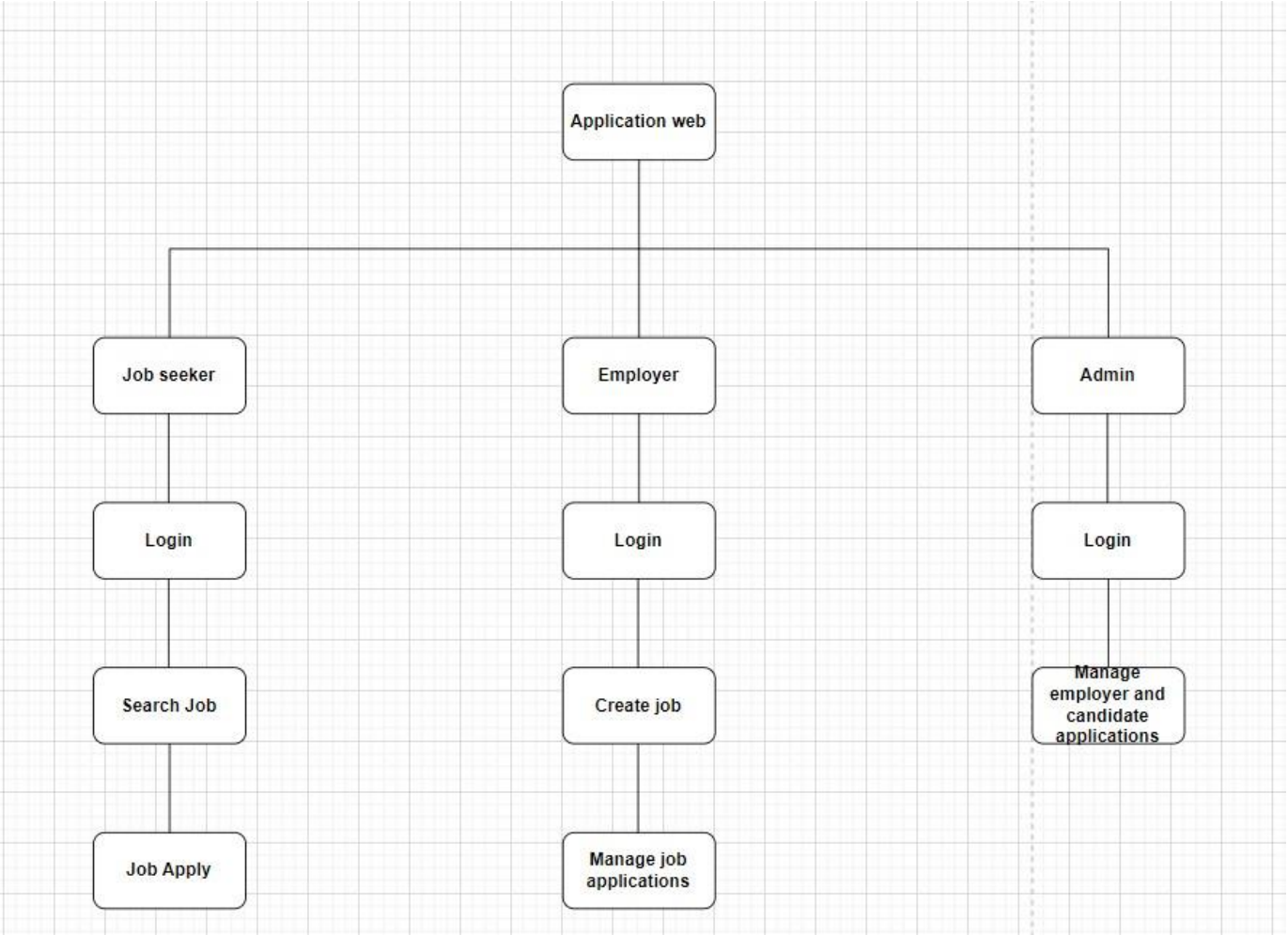


Figure 2:Site map

4. Technical Design

TO DO: Provide the technical diagrams of the system

4.1Entity Relationship Diagram

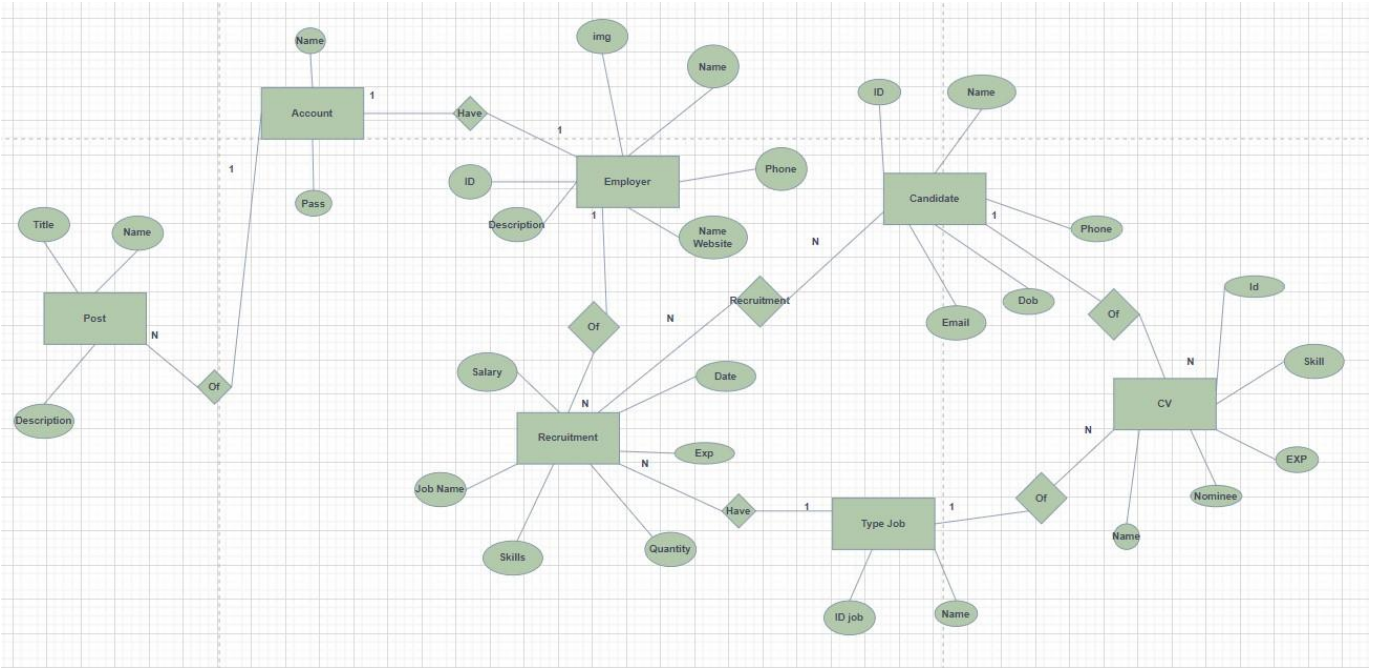


Figure 3: Entity Relationship Diagram

4.2Class Diagram

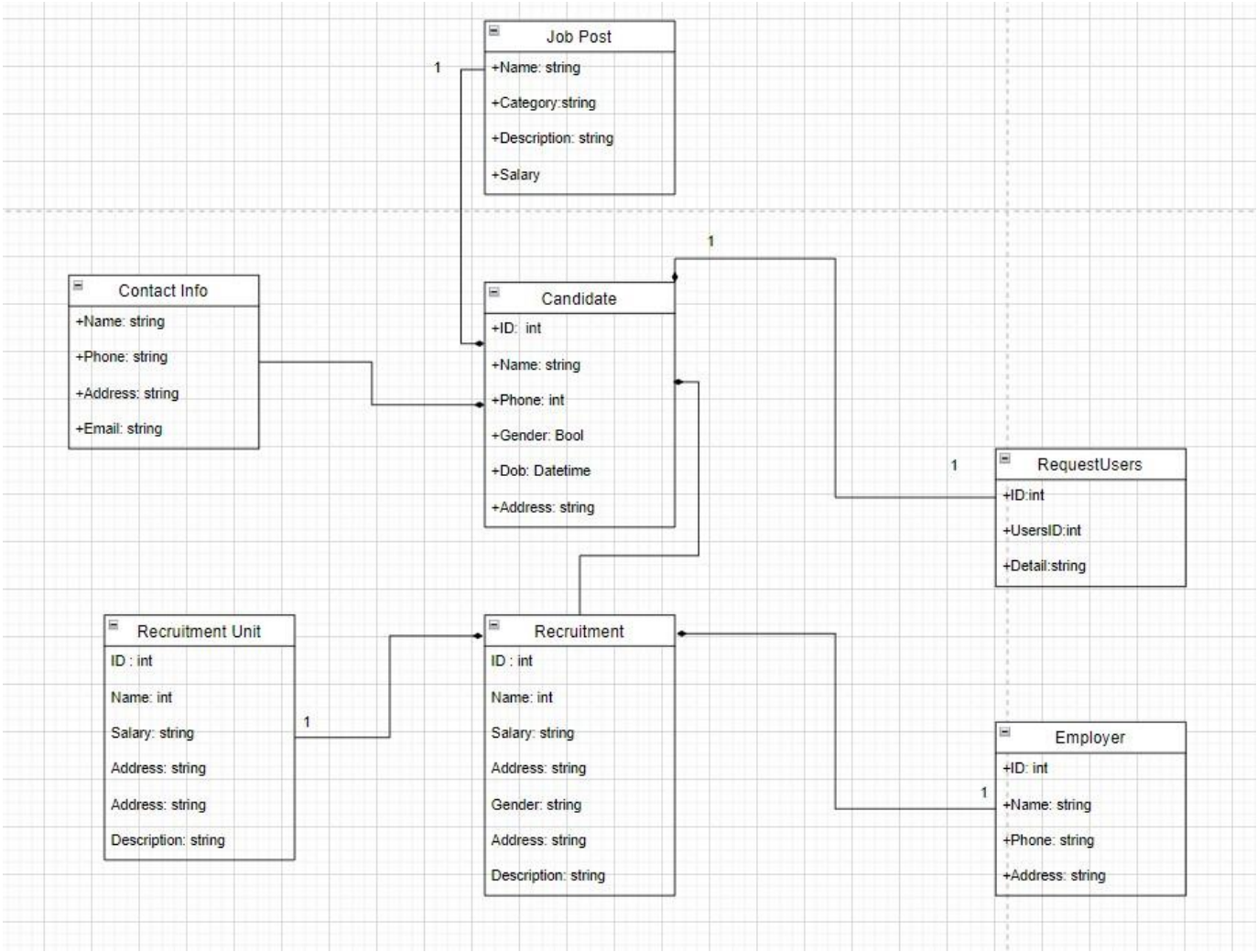


Figure 4:Class Diagram

4.3Activity Diagram

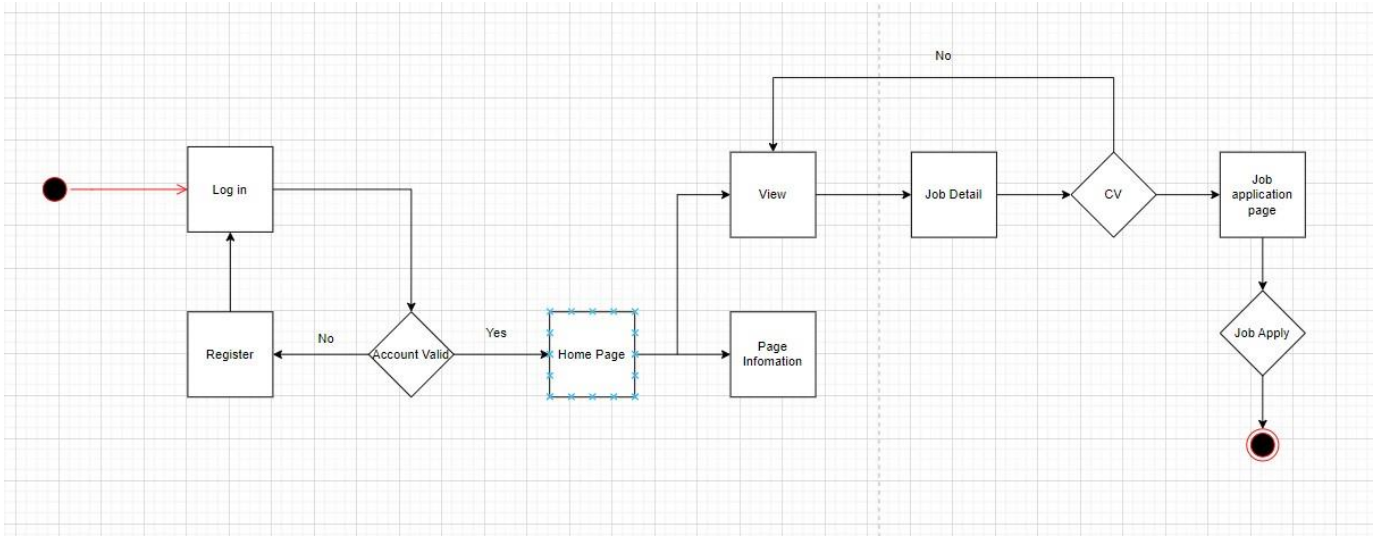


Figure 5:Wireflow user

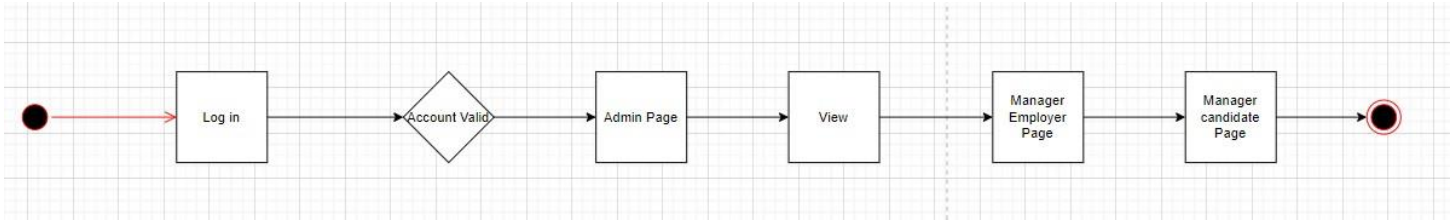


Figure 6:Wireflow Admin

4.4Gantt Chart

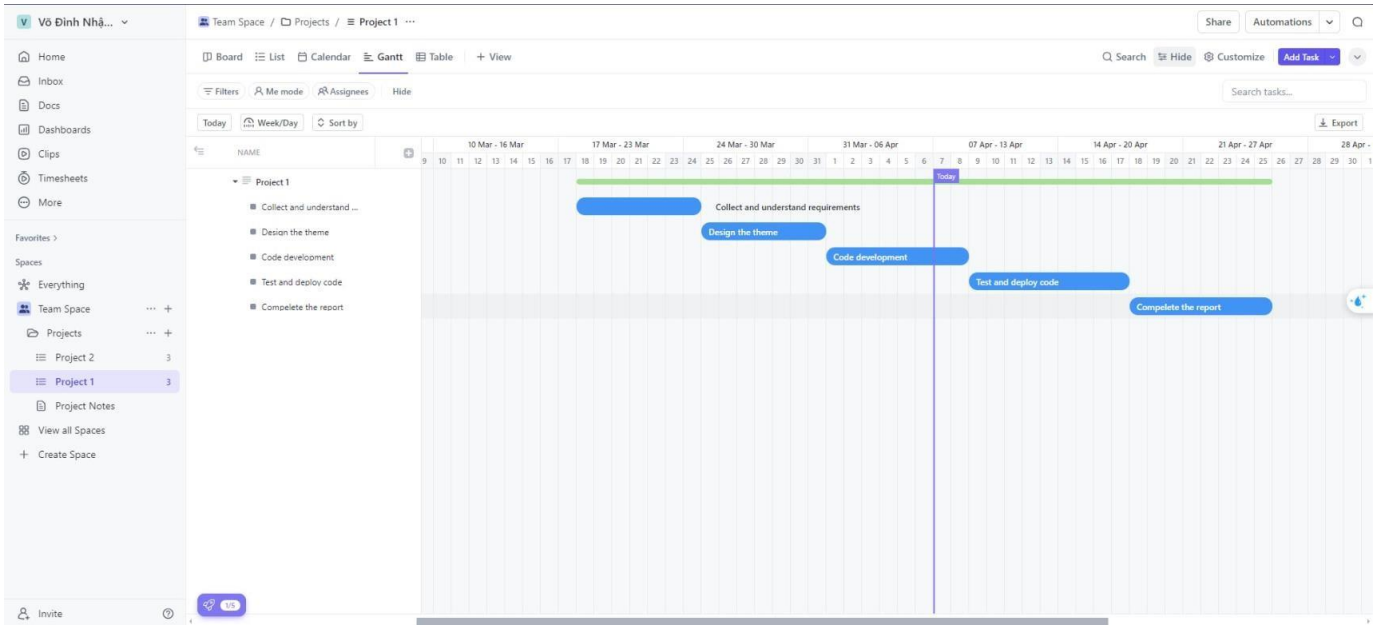


Figure 7:Gantt Chart

5. Risk Assessment

TO DO: Provide the risk assessment and mitigation plan of the project

Category	**Risk**	**Risk Level**	**Measurement**
Technical	Compete with other recruitment websites	Low	Finding out more about Greenwich University's book management may be impacted to some extent by developing a new website with few names.
	not fulfill every prerequisite	High	Call a meeting to discuss all project needs before beginning work on the

			project.
	Section of GitHub that is asynchronous	Medium	A developer is required to notify the project manager and other developers when they push their code to GitHub. The project manager will merge the developer's branch into the main branch once each task is completed.
	losing user data as a result of inadequate security	Medium	Teach team members the fundamentals of website security and how to implement security measures to safeguard user information.
Productivity	Overload work	Low	There will be a fair distribution of tasks among the team members. If a team member encounters any difficulties during the procedure, they can seek for assistance.
	Poor communication between team members	High	To stay up to date with the work, members are urged to speak with one another.

	Reference source	Medium	With this recruitment topic, there are quite a
			few reference documents, making it difficult for the group to research
	Scope of use	Medium	It will take a long time to spread widely since the relationship between the creation of a new website and the extent of its use is new to all of us.

1. Scope Creep: There's a risk that additional features or changes may be requested during the project, leading to scope creep and potentially delaying the project.

Mitigation: Clearly define the project scope at the outset and obtain stakeholder sign-off. Implement a change control process to evaluate and approve any requested changes. Regularly communicate with stakeholders to manage expectations and ensure alignment with the agreed-upon scope.

2. Resource Constraints: There might be a shortage of resources, such as skilled developers or designers, which could impact the project timeline.

Mitigation: Conduct resource planning at the beginning of the project to identify required skills and allocate resources accordingly. Consider outsourcing certain tasks or hiring additional temporary resources if needed. Cross-train team members to mitigate dependencies on specific individuals.

3. Technical Challenges: Unforeseen technical complexities or issues may arise during the development process, such as compatibility issues, security vulnerabilities, or integration challenges.

Mitigation: Conduct thorough research and planning during the initial stages of the project to anticipate potential technical challenges. Allocate time for prototyping and testing to identify and address issues early. Maintain open communication channels within the development team to quickly address and resolve technical issues as they arise.

4. Timeline Slippage: Delays in any phase of the project could lead to overall timeline slippage, impacting project delivery.

Mitigation: Break down the project into smaller, manageable tasks with clear deadlines. Regularly monitor progress against the project plan and identify any potential delays early. Implement strategies such as task prioritization, resource reallocation, or schedule adjustments to mitigate delays and keep the project on track.

5. Security Risks: The website may be vulnerable to security threats such as data breaches, SQL injection, or cross-site scripting attacks.

Mitigation: Implement secur

Evaluation Report

6. Design Tools

TODO: Various tools for designing UML and User Interface will be evaluated, and a decision on the application design tools will be made based on their effectiveness and compatibility with project requirements.

a. Tools to design ULM

- **Lucidchart**: Lucidchart, a popular diagramming tool among developers, offers a selection of basic features. Because Lucidchart uses HTML 5 for its coding, it operates in real time on a wide range of systems. Lucidchart has integrations with MS Team, Slack, G Suite, and Confluence.

- **Gleek**.io: UML diagrams of the following kinds are produced by Gleek.io: class, object, state, and sequence diagrams. In addition, teams may make mind maps, flowcharts, org charts, and many other types of diagrams with Gleek.io.
- **Diagrams**.net: A straightforward drag-and-drop interface for graphs and flowcharts is provided by Diagrams.net (previously draw.io), which may also be used for UML. Diagrams.net is useful for many different kinds of jobs, however certain users could find it lacking in specific features.
- **Cacoo**: Many different users can have an excellent diagramming experience using Cacoo. Most people can begin diagramming fairly quickly thanks to Cacoo's user-friendly drag-and-drop interface.
- **Gliffy** offers a variety of UML diagram templates and themes. The drag-and-drop interface is used by Gliffy. Gliffy is also a great tool for making different kinds of diagrams and charts.

- **EdrawMax**: Users who are accustomed to Microsoft products will enjoy EdrawMax. The user interface of EdrawMax resembles that of Microsoft Word. When it comes to exporting UMLs to other formats, a lot of users prefer EdrawMax.
- **Microsoft Visio Pro**: Users who are accustomed to Microsoft products will enjoy EdrawMax. The user interface of EdrawMax resembles that of Microsoft Word. When it comes to exporting UMLs to other formats, a lot of users prefer EdrawMax.

b. Tools to design UI.

- **Figma**: With Figma, designers can build interactive models and representations, assess their viability, and update the team on design progress.

- **Sketch:** Another venerable and well-known design tool in the field is Sketch. The digital design tool's library of symbols and layer or text styles has undergone universal modifications. In terms of usability, it's regarded as intuitive and seamless.

- **InVision**: Another industry powerhouse, InVision offers a comprehensive set of tools that enable designers to produce completely functional prototypes with dynamic features and animations.

- **Proto.io:** Since 2011, Proto.io has operated as a for-profit online platform that develops prototypes for smart devices. Since then, it has grown to become a dynamic framework that can support several devices.
- **Craft:** InVision's Craft plugin integrates effortlessly with any design and features a real-time updating sync feature. Craft provides design elements that enhance cooperation and prototyping. Over time, the team has adjusted, modifications, and other integrations of responsive design to make this a competitive option.
- **Maze:** With the help of Maze, designers may quickly test ideas, concepts, or copies while conducting thorough tests without the need for prototypes. Designers can display their work at any point during the process with Maze.
- **Axure:** With the aid of the UX tool Axure, UX specialists may create practical, realistic prototypes. Along with many other characteristics of well-known prototyping and UI design tools, it has a seamless interface.

c. Conclude which tool will be used for the design of the application.

1. UML tools –Diagram.net.

- A wide range of tech-related professions are targeted by the open-source diagramming application Diagrams.net, including network administrators, programmers, IT analysts, and user interface designers. Its flexible diagram layouts, drag-and-drop dashboard, and vector graphics—which maintain their quality even after numerous edits—make it an easy tool to use.

- Additionally, Jira, a well-liked project management and issue tracking service, is accessible through diagrams.net and is plugin compatible. Jira allows developers to create wireframes, mock-ups, network diagrams, entity relationship graphics, and development flowcharts specifically for Jira settings.

- The Confluence Cloud collaboration platform is also accessible with a monthly membership option.

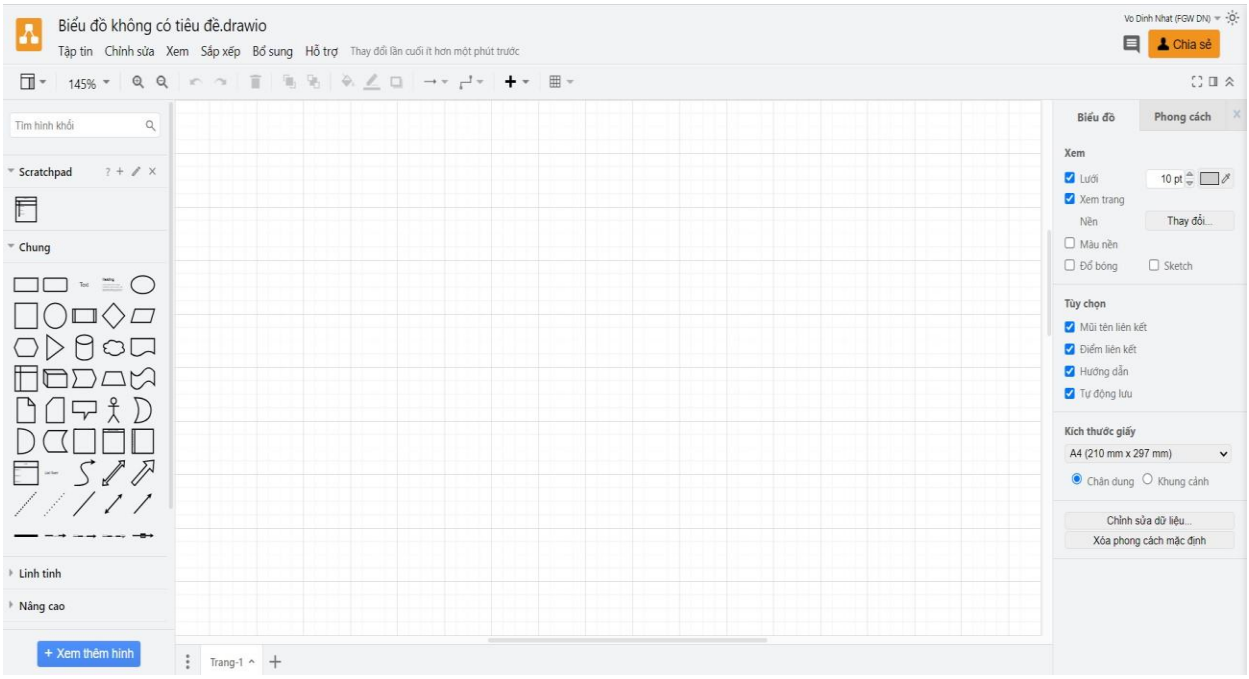


Figure 8: Diagrams.io

- Pros:

- Contains all necessary components, including wireframes, rich picture databases for modeling, databases, and other important use cases.

- Modifiable diagram templates: A variety of visible diagram parts are available with this tool, and each one has several customization possibilities, including text color, border width, item inclination, rotation, and font size and style. The user can alter any component to personalize each design or graphic.

- User interface simplicity: It is simple to use even for those without any experience with design or Photoshop or other tools because of its intuitive interface.

- Collaboration: It could be difficult to collaborate electronically when there isn't a whiteboard in front of us. Nevertheless, by arranging your mathematical calculations and diagrams, you can use Diagram.net to precisely illustrate your thoughts.

- Cons:

- Use restrictions: This diagram software's free edition is fairly priced, but it still has some problems with text and shapes, particularly arrows in forms.

Security: Diagrams.net lets users keep their modifications and paradigm shifts anywhere they'd want, including local devices or the cloud, as opposed to being limited to workstations overseen by a single Specialized manpower.

- Reason for use: I decided to use Diagram.net to construct the class diagram and ERD for the project. I've been using Diagram.net since I was a freshman, so I know a fair amount about it. I can design more swiftly and easily with this tool's help. Additionally, even though this edition is free. The application design process is fully supported, something that many other diagramming tools do not offer.

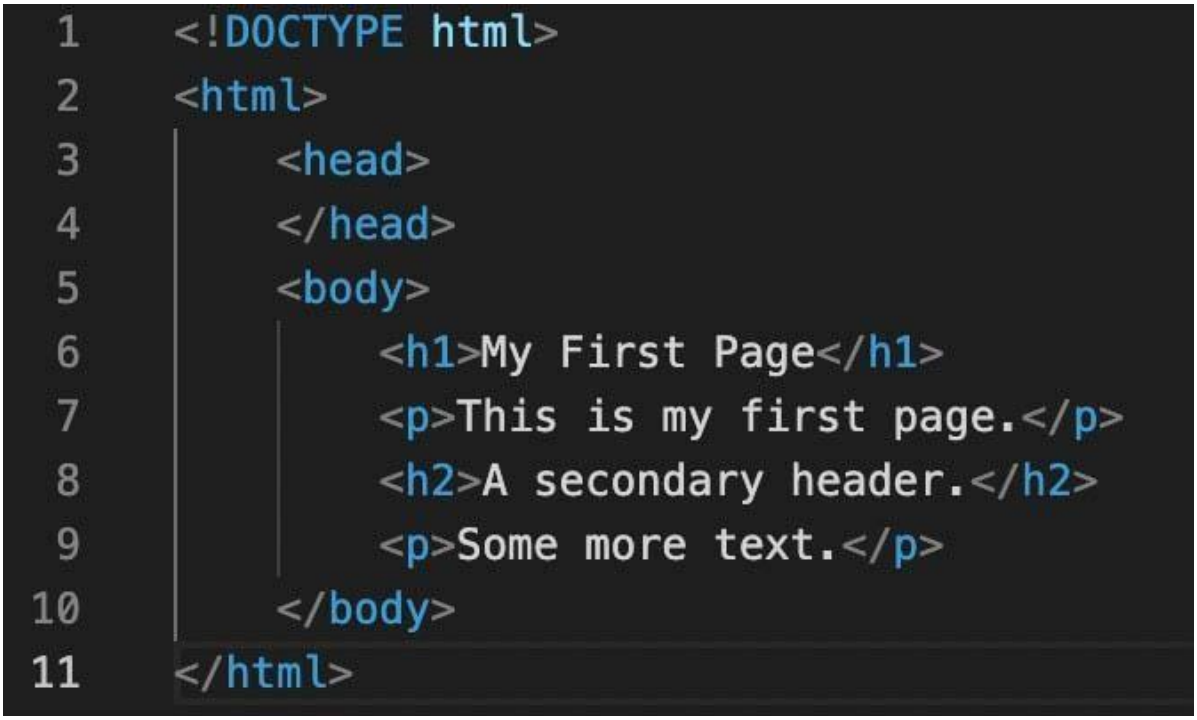
7. Front End technology

TODO: The front-end development will utilize HTML, CSS (including SCSS, SASS, LESS), and a JavaScript library or framework, along with a CSS framework, chosen based on their appropriateness and alignment with project needs.

a. Hypertext Markup Language (HTML)

- The standard markup language for documents intended for online viewing and display is called Hypertext Markup Language, or HTML. HTML-using programs also facilitate the construction of pages. It has many labels because it is a markup language. Tables, text-display labels, requested records, unordered records, and so on.

- HTML is a cross-platform language that may be used on Linux, Mac OS X, Windows, and other operating systems. We may code the archive's numerous sections, headings, tables, and other objects by using these HTML labels.



```
<!DOCTYPE html>
<html>
    <head>
    </head>
    <body>
        <h1>My First Page</h1>
        <p>This is my first page.</p>
        <h2>A secondary header.</h2>
        <p>Some more text.</p>
    </body>
</html>
```

Figure 9: HTML synstax.

- Pros:

- Browser-friendly: Many programs, including Mozilla Firefox, Opera, Google Chrome, and others, support HTML. HTML is incredibly program friendly because it's currently one of the best programs available.

- Support usage: HTML is free to use because it is an open-source format. Just as there's no compelling reason to purchase additional tools in order to, say, generate HTML code, it's quite beneficial for individuals as well as businesses.

- Simple to learn: The foundational language for web development is HTML. It should come as no surprise that students can create a simple homepage with photos and tones using HTML.

- Simple design: HTML is a fundamental language with well-defined labels, features, and structures. Put another way, with enough practice, you'll get comfortable with the simple HTML structure and be able to write HTML code.

- Cons:

One example of a static language is HTML. This implies that HTML webpages for websites won't change unless they are physically modified. Moreover, dynamic results are not supported.

- Reason for Restricted Security: Everyone needs security. On the other hand, HTML's limited security features are one of its main drawbacks.
- A lot of code: A lot of code must be written, even for simple web sites. The development team finds things more challenging when there is a lot of code. Simple site layouts can help us fix this problem. *b.*

TypeScript

Since TypeScript is a strict superset of JavaScript, it provides the freedom to add new features and may be used to construct any kind of JavaScript implementation. It is a free, open source, strongly typed, object-oriented programming language. As things stand, converting TS code to JavaScript code makes integrating it into JavaScript projects simpler. Taking Up It could lead to more reliable software for a large project that can still be installed in the same locations as a standard JavaScript program. It will not eliminate bugs from your program. Still, a lot of type-related mistakes can be avoided by using it. Other than the Smart IntelliSense as well. By looking at a little sample of code, you should be able to see why this strictly typed programming language is necessary.

Figure 10: TypeScript.

c. Cascading Style Sheets (CSS).

CSS, sometimes known as cascading sheets, is a text-based coding language used to specify how websites should be laid up and used. Site designers have total control over style elements like layout, color, and typefaces thanks to the language, which also affects how HTML content is written and displayed. Web designers can control how an

HTML text is formatted and displayed on a webpage, as well as how the website interacts with web browsers, by using CSS, which is a method sheet language.

```
<!DOCTYPE html>
<html>
<head>
    <title></title>
    <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
    <div></div>

</body>
</html>
```

Figure 11: CSS Syntax

The main objective was to distinguish between the substance of papers and their presentation, which includes design elements like color, style, and typefaces. The appearance and design of an internet page are controlled by CSS. You can use CSS, among other things, to change the text's

layout, color, column size, paragraph spacing, and typeface style. CSS gives HTML instructions on how to present a webpage so that visitors can see it.

- Advantages:

- Timesaving: During the web development process, CSS saves a great deal of time and effort because it is quicker and simpler to maintain. Here, the designer's effectiveness is guaranteed in a shorter amount of time.

- Better Device Compatibility: To see a particular website, people use a variety of smart devices. It might be a PC, laptop, or smartphone. Websites must therefore be responsive across a wide range of devices. The task will be completed without any problems because of CSS's improved compatibility.

- Consistent Design: You've probably been to a lot of beautiful, user-friendly websites.
  These websites are all designed in the same way. Developers may ensure that style elements are applied consistently across several web pages by using CSS.

- Disadvantages:

Cross-Browser Issues: A website's developer can make the first CSS modifications. If the CSS has consistent modification implications across all browsers, you need to evaluate compatibility. Because CSS responds differently in a variety of browsers, it is straightforward.

- Security: The open text-based technique of CSS makes it simple to employ. The formatting and overall look of your website could be completely destroyed by a small typo or other file-related issue. All you need is to read/write access to the desired website in order to reverse the changes.

Figure 12: JavaScript Syntax

- Pros:

- Velocity: Being an “interpreted" language, JavaScript compiles more quickly than other computer languages like Java. Another client-side script that reduces the amount of time needed to connect to the server is JavaScript. expedites the execution of a program.

- Simplicity: Learning and comprehending JS is simple. The framework is simple to use for both developers and users. Additionally, it is quite simple to use, which enables web developers to provide dynamic

content at a much lower price.

- JavaScript's widespread usage can be attributed to its compatibility with nearly all modern browsers. JavaScript is used by nearly all major corporations, such as PayPal, Google, and Amazon.
- Rich Interfaces: A variety of interfaces are available to developers using JavaScript, enabling them to design visually appealing websites. Users may find websites with drag-and-drop features like sliders to be more interesting. Users interact with the website more frequently as a result.

- Cons:

- Client-side security: Third parties may exploit the JavaScript code, which is visible to the user. Using the source code in an anonymous manner may be one of these actions. Moreover, adding code to a website that weakens security is not too difficult. of information transmitted by it.
- Browser Support: various browsers interpret JavaScript in various ways. Because of this, the code needs to work on many different platforms before it can be released. We also need to take a look at the older browsers because some of the new features aren't compatible with them.
- Rendering Problems: The entire website's code may stop rendering due to a single JavaScript mistake. It is made to appear to the user that JavaScript is not installed. The browsers, however, are willing to overlook these mistakes.

d. CSS Framework

- Foundation:

a strong and adaptable framework with a variety of capabilities for developing responsive websites and applications.

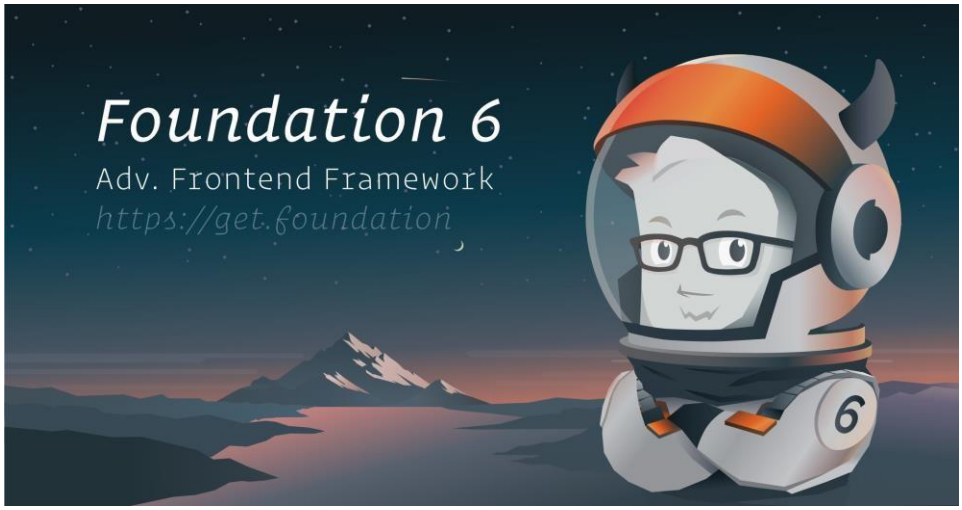


Figure 13: Foundation.

- UIKit:

A user interface kit, or UI kit, is an assortment of pre-made UI elements and tools for mobile and internet development. They frequently have several color and design possibilities, enabling designers to fully alter components, templates, and internal layouts to create their own user interface and preserve uniformity throughout. brand quickly and easily with a few clicks or easy drag-and-drop techniques.

Figure 14: UIKit.

Taiwild CSS:

All Tailwind CSS is a Utility first CSS framework designed to make custom user interfaces quickly. It is a low-level, extremely versatile CSS framework that provides all the necessary building components. It's also a clever technique to create a beautiful user experience with inline styling without writing a single CSS line.

Figure 15: Taiwild CSS

- My choose: Bootstrap

- The most widely used framework for front-end web development is called Bootstrap. It was created by the Twitter team and consists of HTML, CSS, and JavaScript code to assist web designers in creating UI (User Interface) components. In essence, it is a package of free tools for creating online apps and responsive webpages.

Figure 16: Bootstrap

Benefits:

- Timesaving: You won't even need to write code anymore because Bootstrap comes with excellent documentation for every component. You can get started developing right away if you have even a basic familiarity of HTML, CSS, or Javascript. You won't need to spend days just figuring things out because it's so simple to use.

- Why Consistency: Bootstrap became the most popular framework among web developers by resolving the discrepancies between the development front and the end users. Because Bootstrap produces uniform results across all platforms and browsers, it effectively solves the primary issue of several discrepancies that may arise during a project between developers and designers.

- Excellent Grid System: Bootstrap clearly provides the most responsive grid system out there. A robust grid is necessary for developing page layouts. The content of a Bootstrap website is constantly organized into 12 adaptable, responsive columns. It makes it simple to move between columns, which is excellent if you want to conceal content exclusive to a particular platform. Using the provided classes will make learning to utilize the grid much quicker and easier.

- Responsiveness: Since mobile devices are now used for the majority of first searches, having a responsive website is crucial. Making responsive webpages is the main objective of Bootstrap. Because of the aforementioned fluid grid, achieving the ideal level of responsiveness requires very little effort.

- Drawbacks:

- Similar UI Result: Bootstrap is a specially constructed tool that deviates from accepted web development rules, as it was developed with the goal of expediting work on a unified interface. Every creation created with Bootstrap will have a comparable look. Although style sheets can be manually changed and overridden, doing so kind of defeats the purpose of using the framework in the first place.

- Giving the project more weight: While Bootstrap facilitates the development of responsive websites, users may encounter significant battery drain and slower download speeds with the end product. Moreover, Bootstrap can produce extraordinarily large files, which would significantly slow down your computer.

- Rationale for usage: Bootstrap is one of the most well-known CSS frameworks available today. While I was creating my first website, I employed Bootstrap in my methodology. I can use Bootstrap to style HTML components.
  To save more time on the back-end, I sometimes use the entire Bootstrap code for my user interface, making changes only when needed. It also provides icon services, which improve your website's user interface.

Another reason I chose to use Bootstrap is its documentation. The documentation made specifically for Bootstrap can be understood by a developer who is not experienced with HTML and CSS. It also includes a ton of branches and variations from the original Bootstrap, like Bootswatch, which contributes to the overall theme design of your website.

e. JavaScript library

- Vue.js:

a JavaScript framework with component architecture for creating user interfaces. Its main goals are to make application development simpler and to integrate seamlessly with already-existing projects.

Figure 17: Vue.js

- React:

A declarative, flexible, and effective JavaScript user interface library is called ReactJS. This independent, opensource front-end library is based on components and controls the application's view layer.

Facebook created the ReactJS library as a solution to some of the issues we were having. It's not a framework. Declarative and efficient user interface construction is made possible by the open-source ReactJS JavaScript package. It is a component-based front-end library that only controls the view layer in an MVC architecture. React is a user interface framework that facilitates the creation of reusable parts for dynamic data visualization and modular user interface design.

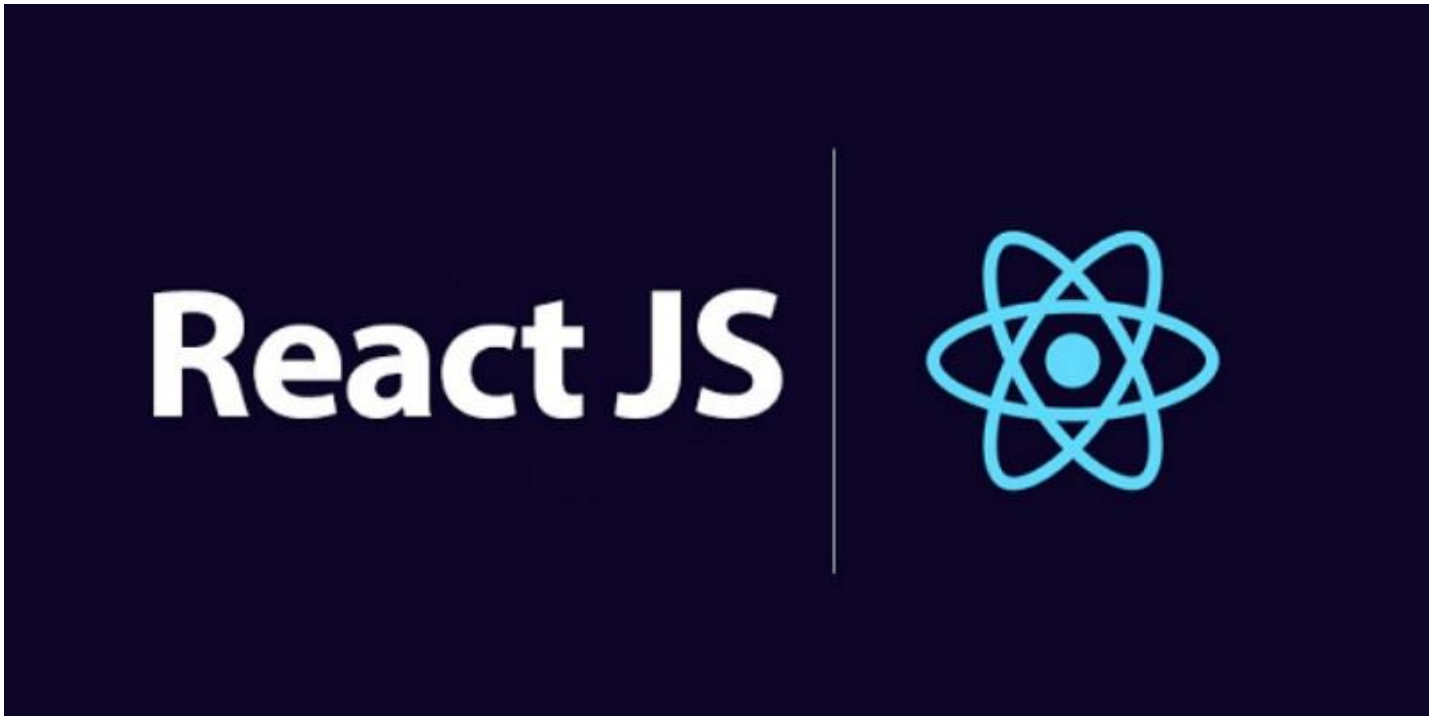


Figure 18: React.Js

- My choice: Jquery:

- jQuery has been crucial to the evolution of online, particularly in the early days when cross-browser compatibility and web standards were still difficult to achieve. Here are some advantages and justifications for why jQuery is a popular choice among developers.

- Simple to Use and Learn:
  The purpose of jQuery is to make event handling and DOM interaction simpler. The simplicity and ease of learning of its syntax contribute to the decreased complexity of producing JavaScript code. Cross-browser Compatibility: jQuery makes sure that your JavaScript code functions consistently in a variety of browsers by resolving cross-browser compatibility problems.

- DOM Manipulation: jQuery offers useful functions and methods for choosing and modifying DOM components. like $(element) methods.hide(); $(element).When using addClass('className') instead of vanilla JavaScript, complexity is reduced.

- Ajax and Animation: Offers easy-to-use techniques for generating animations and making Ajax requests.

- Plugins & Community: JQuery boasts a sizable and vibrant community, which means a multitude of tutorials, articles, and plugins have been created with specific uses in mind.

- Shorter Code: jQuery frequently facilitates the writing of shorter code that does the same functionality as vanilla JavaScript, which expedites the development process.
  But it's important to note that jQuery's function has slightly decreased as web standards have advanced and contemporary JavaScript frameworks like React, Angular, and Vue.js have emerged. In order to benefit from ECMAScript capabilities and increase performance, a lot of new projects employ JavaScript code that does not require libraries.

Figure 19: JQuery.

8. Back End technology

TODO: The selection of the back-end technologies, including the programming language, operating system, web server, database, hosting solution, and frameworks, will be concluded after a thorough assessment to ensure alignment with the project's goals and requirements.

a. Programming Language

- Python:

Figure 20: Python.

Two well-liked frameworks for Python web development are Flask and Django. With frameworks like Flask and Django REST framework, Python is frequently used for both front-end and back-end development.

- Java:

Figure 21: Java.

Java can be used for front-end and back-end applications (using Vaadin and Spring frameworks, for example). One common solution for the Java system's front end is JSP (JavaServer Pages).

- Go (Golang):

Back-end developers are using a new, high-performance programming language. Web development with Go is made easier with the help of frameworks like Gin and Echo.

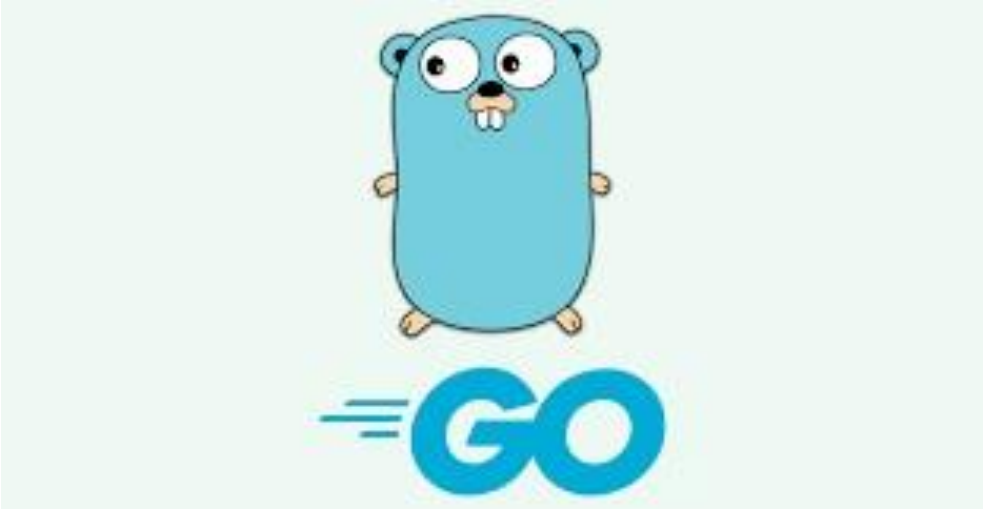


Figure 22: Go.

- My choose: C#

Modern general-purpose programming languages like C# can be used to accomplish a wide range of activities and goals across a wide range of sectors. Although it can be used on other open-source platforms, C# is most frequently utilized using the Windows.NET framework. Because object-oriented programming (OOP) is still relatively new, it is immensely popular adaptable. C# can be used to create a wide range of programs and applications, such as games, websites, desktop and mobile apps, cloud-based services, and enterprise software.

```
1  using System;
2  using System.Collections.Generic;
3  using System.Linq;
4  using System.Text;
5  using System.Threading.Tasks;
6
7  namespace SampleApp01
8  {
9      class Program
10     {
11         static void Main(string[] args)
12         {
13             Console.WriteLine("Hello World");
14             Console.ReadLine();
15         }
16     }
17 }
```

Figure 23: C# Synstax

- Pros:

- Easy to get going C# is a high-level language that is more akin to other well-known programming languages like C, C++, and Java, making it easier for beginners to learn.

- Frequently used to create desktop and web applications: C# is a programming language that is frequently used to create desktop and web applications. It is one of the most often used languages on business computers. C# is the recommended language for anyone who wants to develop Microsoft apps.

- Community: More involvement will result in the development of new software and technologies that will improve the community. There is a substantial C# community, therefore efforts are made to improve and preserve the language.

- Developers can develop, test, debug, and compile code in an environment called an Integrated Development Environment (IDE), which includes Visual Studio as a native IDE. One of the industry benchmarks for an IDE's appearance is Visual Studio. Utilizing it with every.NET
  software courses, regardless of the programming language used C# or another supported one. Visual Studio also supports the use of various C-related languages and associated frameworks.

- Cons:

- Dependency on.NET platform: C#'s ability to function across a variety of platforms and operating systems is largely reliant on the.NET foundation. You must utilize different runtimes for different platforms when using C#, and you must modify the code to meet the system requirements. While.NET offers all the necessary tools, writing pure C# code might be difficult at times.

- Challenging learning curve: Learning C# is challenging in and of itself, but using.NET frameworks adds another layer of complexity. There are thousands of materials to understand before you can start working with C# programming, and.NET libraries are updated frequently.

- Compiled code: generated code has numerous drawbacks in addition to its many benefits. Because the code needs to be compiled every time you make a small change, handling it might be challenging. A single change to your code requires a complete recompile. and the user's installation of your application. It happens often that a minor adjustment that isn't fully tested causes new issues.

- Reason to use:

- Simple syntax: C# is an object-oriented programming (OOP) language that gives programs a clear structure and permits code reuse, both of which lower development costs. When I first learnt about OOP, I generally used C# as my primary programming language. Its concise syntax, similar to that of C, C++, or Java, makes it easy to switch between.

- Big community: C# is used to write programs for the Microsoft platform because Microsoft created the programming language. All subjects pertaining to C# and.NET are included in the Microsoft documentation. It also guarantees that they will be updated on a regular basis on the latest features of this programming language.

- Windows Integration: There is considerable compatibility between Windows and the C# programming language. No further setup is required to run a C# program in a Windows environment. Web applications, Windows services, or desktop. C# programs and apps are simple to install over a network. Now that we don't need to install any additional tools in order to compile and run the code, we can cooperate more quickly.

b. Operating System

- Linux:

a well-known open-source operating system available in a variety of variations, or distros, including Ubuntu, Fedora, Debian, and CentOS. Embedded, frequently utilized for servers, and growing in popularity for personal laptops and PCs.

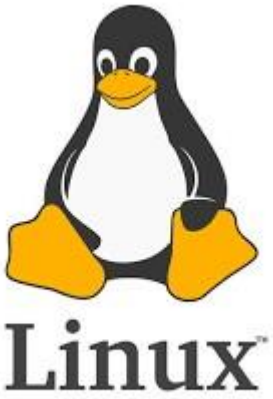


Figure 24: Linux.

- MacOS:

The operating system that runs on Macintosh computers, developed by Apple. macOS is frequently linked to Apple products, such as iMacs and MacBooks.

Figure 25: MacOS.

- My choice: Windows.

Windows is a graphical operating system created by Microsoft. Apart from offering internet connectivity, it lets users launch apps, browse and store data, play games, and watch videos. It was made available for both business and individual use.

Figure 26: Window operation.

- Advantages:

- Hardware support: Since Windows OS is used by 95% of users, most device manufacturers offer Windows drivers.

- Simplicity of use: Thanks to a shared feature, users can switch between Microsoft Windows versions with ease. Because most of Windows 10's features are similar to those of Windows 7, users of Windows 7 can easily switch to it. Furthermore, compared to UNIX and MAC, Windows has a user interface that is simpler to use.

- Software support: Windows is the ideal platform for software and game developers.
  Windows is a popular operating system; therefore, developers enjoy creating games, applications, and utilities for it. It is preferable to utilize Windows for app building because Linux users are unable to create Windows apps.

- Support for plugins: Plug and play functionality allows for instant device detection on the majority of devices. Hardware that can be used right away after being connected, like a webcam, keyboard, mouse, mobile device, etc., doesn't need to be manually installed.

- Disadvantages:

- Security: Windows is a common target for hackers. Hackers can easily circumvent Windows' security measures. Consequently, Windows customers who rely on antivirus software to safeguard their data are required to pay companies on a regular basis. Unless they switch to a different operating system, Windows users are unable to keep current on security fixes.

- License: Windows OS requires a purchase and cannot be used lawfully for free, but Linux is open source and free for all users. Moreover, purchasing a copy of Windows OS is expensive. In order to use the computer for routine office work, you will also need to purchase other Microsoft software, such as Office.

- Resources for computers: It takes a strong graphics card, a sizable hard drive, and a lot of RAM to install Windows OS on a PC. This is as a result of Windows' features. 16 GB of RAM is advised if you wish to install Photoshop or other graphics programs.

- Reason for use:

Since my project employs C#, I would prefer to use Windows since it supports this programming language and other operating systems do not. Although my C# code still works on Linux, it's more convenient to work with Windows because both C#.
Since Windows is a Microsoft product, there shouldn't be any disagreements when working on the project. A further reason for my adoption of Windows is because I have never used any other operating system.
Especially with Linux, it can take a while to get used to a new operating system before switching. I also won't be moving to another OS for the time being because Windows has better support for C#.

c. Webserver

- Nginx:

- Since its initial success as a web server, the open-source web server Nginx has been extended to include applications for load balancers, reverse proxies, and HTTP caches.
  High concurrency and minimal memory use were priorities when developing Nginx. Rather than Nginx uses asynchronous, event-driven processing, launching new processes for each web request; requests are processed on a single thread.

- A single master process can manage several worker processes when using Nginx. While the workers carry out the actual processing, the master oversees the worker procedures.

Nginx is asynchronous, thus the worker can process requests one after the other in parallel. without having an impact on subsequent requests. In benchmark tests, Nginx consistently outperforms other well-known web servers because of its foundation in performance optimization under scale, especially in situations involving static content and/or a large volume of concurrent requests.

Figure 27: Nginx.

- Pros:

- Compatibility with many web apps: WordPress, Python, Drupal, PhpBB, and many more popular online applications are very compatible with the NGINX server.
- Because of this, users can use NGINX on multiple workstations and yet enjoy a faultless online browsing experience.
- Strain Balancing: By serving as a "relay" and facilitating quick scalability to the HTTP servers, NGINX manages the strain on incoming traffic. The NGINX server swiftly reviews the metadata upon receiving the incoming load before forwarding these requests to other relevant services. This leads to a quick and simple deployment since there is no incoming traffic misallocation and complete meltdown prevention.
- Minimize risk of data loss: Despite several assertions that the NGINX server might corrupt, interfere with, or cause other servers linked to it to malfunction, users shouldn't be afraid to utilize it. These are all just bad ideas; nothing more.

- Cons:

- Extensions are little modules that programmers use to customize websites to their specifications. These modules and extensions are not supported by NGINX.

- Limited community support: In contrast to rival web servers such as "Apache," the NGINX web server has limited community support. Instead, it is contingent upon your level of experience and the NGINX web server's use case. The documentation is inadequate compared to the Apache web servers.

- MongoDB:

Figure 28: MongoDB.

is a type of non-relational database management system (NoSQL) used mostly for JSON document data storage. Ideal for online apps that use dynamic data in particular.

- Oracle Database:

Figure 29: Oracle.

is a potent database management system that is frequently employed in significant business applications.

- Redis:

Figure 30: Redis.

a key-value database management system that is mostly utilized for memory-based data storage. Frequently employed to improve speed for apps that require fast data access.

- My choose: Database-SQL Server:

- A relational database management system (RDBMS) called Microsoft SQL Server is utilized in many business intelligence, analytics, and transaction processing applications in enterprise IT environments.
  One of the top three database technologies on the market right now is Microsoft SQL Server.
- SQL is a standardized programming language that is used by database administrators (DBAs) and other IT specialists to administer databases and query the data they contain. The foundation of Microsoft SQL Server is SQL, just like other RDBMS applications. TransactSQL (T-SQL), a Microsoft implementation of SQL

that expands the fundamental language with other proprietary programming extensions, is included in SQL Server.

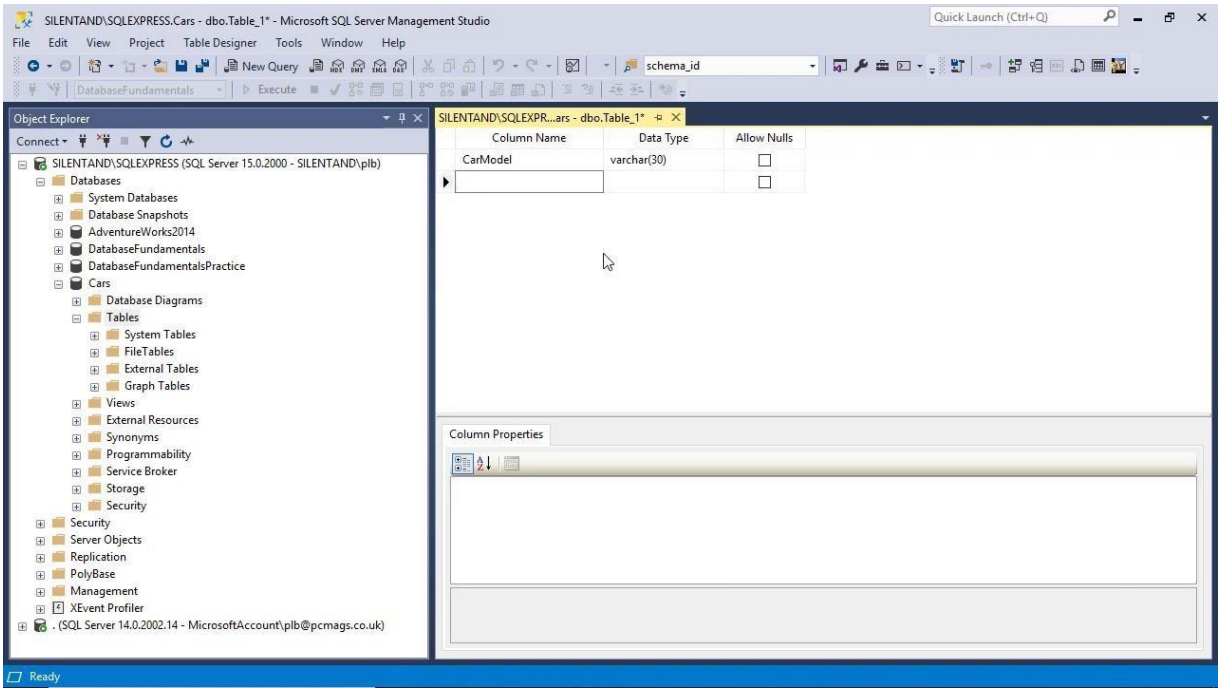


Figure 31: SQL Server user interface.

- Advantages:

- Data protection: Safeguarding your database is one of Microsoft SQL Server's main goals, especially when using a Microsoft SQL Server database administration service. Using a table structure to link the features and data this program provides helps to protect the security of the data you now own. Security and integrity are essential for databases that store sensitive data, such as client information.

- Optimized data storage: If you're utilizing a different device, Microsoft SQL Server eliminates the need for additional data storage from the same database. This allows you to handle data quickly and effectively without the need for maintenance or issues. As a result, you can save time and focus on other crucial facets of your company.

Configuration simplicity: Installing and configuring Microsoft SQL Server is simpler than with alternative database management systems. Software updates are carried out automatically, and no special tools are needed for installation. You don't need to follow any complicated instructions to install extra components to further tailor the program for your company. Microsoft SQL Server is an excellent option if you're searching for software that makes database administration easy.

- Disadvantages:

- Price: A free edition of Microsoft SQL Server is available. However, you will need to spend a lot of money and purchase more expensive editions of the program if you want more sophisticated databased applications and features.

- Restricted compatibility: If your company uses little to no Microsoft infrastructure, you could need to spend more money on Microsoft products. You will continue to be able to utilize Microsoft SQL Server on your platform, even though these new commitments may result in increased expenditures for your business.

- Hardware requirements: The most recent versions of Microsoft SQL Server require modern hardware to function. Therefore, if the majority of your hardware is older, you might need to make an investment in newer gear in order to use Microsoft SQL Server. Additionally, you will need to expand the hard disk capacity if your company requires a larger database.

- Reason to use:

- A number of operating systems are supported: Despite being developed by Microsoft, SQL Server may run on many different operating systems, such as Windows, Linux, Kubernetes, and others.

- Security: To protect data, SQL Server provides monitoring, classification, and data encryption features. It provides authentication and database authorization to the user. To add even more security to the database, developers have the ability to modify the writing function.

- Big Data clusters give you intelligence on all of your data: when utilizing SQL Server, developers may query their whole data estate from Oracle to SQL Server without requiring replication.

- Scalability: SQL Server makes it simple for developers to interface their database management systems with all devices and Azure services, improving performance and data analytic capabilities.

d. Hosting-Amazon Web Service

- The company's broad and expanding cloud computing platform is called Amazon Web Services (AWS). It combines platform as a service (PaaS), infrastructure as a service (IaaS), and packaged software as a service (SaaS). AWS services can give a company access to content delivery networks, computational power, and database storage.

- AWS provides businesses and software developers with an extensive range of tools and solutions that may be used in data centers across up to 190 countries. The AWS portfolio offers over 200 services, including database management, app development, processing, infrastructure management, and security.

Figure 32: AWS.

- Advantages:

- Security: One of the main advantages of AWS is its outstanding security, which can protect your IT infrastructure, data, and much more. Because of AWS's more dependable security protocols, your data is always protected. With 12 data centers spread over the globe and five more scheduled to open this year, this is the safest location for your sensitive information.

- A capacity solution: In the past, businesses had to pay for data storage in advance, even though they had no idea if they would really use it. Because Amazon Web Services provides a scalable alternative, businesses no longer have to "wait and see" if they'll truly use all the extra space they acquired.

  Fast and nimble: Applications may run quickly and effortlessly with Amazon Web Services. With a simple setup procedure, an application can be launched in a matter of minutes, improving speed and agility while saving time and money.

  Similarly to its rival Azure, Amazon Web Services charges only for the services that are actually utilized under the pay-as-you-go model. The procedure is easy to use, safe, and enables basic automated scaling based on your cloud consumption. However, clients have previously encountered bill shock; we'll go into further detail.

- Cons:

- Cost confusion: Despite being a great service, AWS's billing system has a serious problem that could confuse users. This could be confusing for a small business owner who is not tech savvy. Therefore, collaborating with a reseller can be more beneficial. The services will remain the same, but now you will be able to comprehend the bill or invoice.

- Amazon's EC2 Restrictions: One other drawback of AWS is that its resources are location specific. As a result, the number of resources you have at your disposal depends on where you are. Additionally, as a new user, AWS prohibits you from overusing resources and squandering money. This safeguard was put in place to stop malevolent users from launching hacking attacks on the system by utilizing its resources. If you need more, you can always ask to have additional resources provided.

- Common Concerns with Cloud Computing: When moving to the cloud, consumers frequently worry about security risks, privacy concerns, backup security, downtime, and a lack of control. These issues impact all cloud computing platforms rather than just AWS. Businesses Nevertheless, none of that will have an impact on your company because Amazon recognizes how critical it is to protect these.

- Incentive for use: Because of AWS's reputation, efficiency, and recommendations, I selected it over a wide range of other cloud web service providers, such as Heroku, Google Cloud Platform, Microsoft Azure, and others. The following benefits of using AWS for my project are:

- Performance: If you are not required to share your bandwidth or storage with other businesses, your application will run more smoothly.

- Value: Although AWS is initially slightly more expensive than its competitors and may see further price increases in the future, it provides value that is consistent with its cost. One of the biggest companies in the world will offer cloud services to companies, along with ways to stop security concerns, privacy problems, data leaks, and other things for your application.

- Scalability: Easy to use and rapid.

  Data security: AWS backs up the data used in your application. There won't be any need to consider data loss of any kind when choosing AWS.

e. Framework

- Applications created for desktop, web, and mobile platforms using the open-source.NET framework are compatible with all operating systems. The languages, libraries, and tools included in the.NET framework facilitate the development of contemporary, scalable, and high-performing applications. The.NET platform is supported and updated by a strong development community.

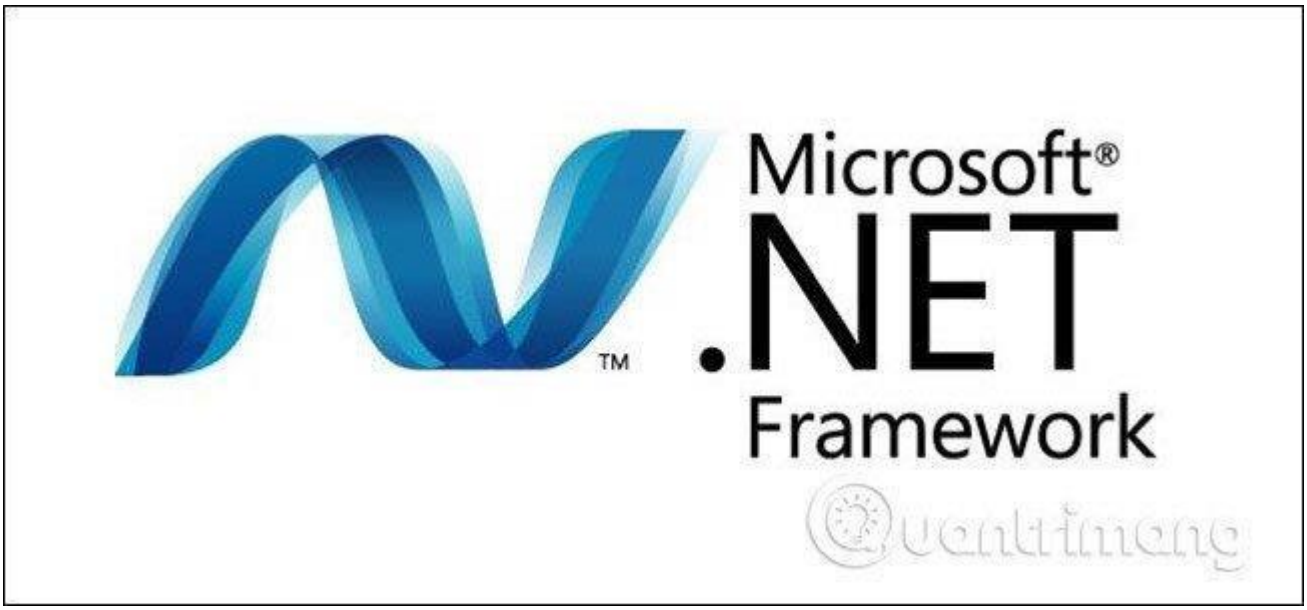


Figure 33: Framework.Net

- Benefits:

- Object-Oriented Programming (OOP): The foundation of OOP is one of the best features of.NET. Here, the program is broken up into manageable portions so that engineers can focus on each one independently. After completing the prior component, they can move on to the next one. The smaller parts can be integrated and handled more skillfully once they are finished.

- Cross-Platform Development: Since its first release, .NET has evolved into a cross-platform implementation that enables the creation of programs for a variety of operating systems, although not being an operating system at the time. It will be simple for developers to use their preferred programming languages. Additionally, it is open source, allowing developers to modify it.

  Easy to Deploy and Maintain: The.NET family of development tools makes it remarkably simple to deploy and maintain programs. App developers can efficiently disassemble their apps, update or fix the ones that require it, and then reassemble the apps thanks to their modular design. Finding the one sentence that is driving everyone nuts doesn't need reading through a ton of scripts.

Large community: Since its release, the.NET has managed to amass a sizable community, but it wasn't until Microsoft declared it open source that the platform truly took off. The company's products and services were used so widely that the development framework had a significant impact straight immediately. And now it has expanded much more.

- Drawbacks:

- Issues concerning Object-Relational Support: The Entity Framework offers a fix.The peculiarities of NET programming in object-relational mode (OOP). Concerns have been expressed over this system's ability to adapt to new database designs due to the chance that it won't support them.

- Vendor lock-in: Unfortunately, as Microsoft is the owner of the.NET package, any changes or restrictions made by the corporation would inevitably affect programs that utilize the framework.

- Developers will therefore have less sway. Issues with New Release Stability: Finally, the documentation and support may not be sufficient if the business wishes to update existing features or add new ones. The stability of development projects could be compromised by this.

- Reason to use:

- Can run on several platforms: Although C# and.NET could initially only run on Windows, this feature was added recently. Any type of application running on any platform can be targeted with.NET. In each of them, developers can comfortably reuse their code and knowledge. As a result, developers may produce apps more quickly and for less money.

- Rich documentation: Unlike other frameworks, Microsoft created the.NET framework, which was used to create the operating system's software. Because of this, Microsoft is fully aware of the necessity of providing documentation for this framework. The Microsoft website provides developers with access to the most recent documentation for every upgrade.

- Security: In addition to developing new features for the.NET framework, Microsoft also provides security services for it. Developers are no longer concerned about common security flaws like SQL Injection, crosssite scripting, and cross-site request forgery. .NET provides the ability to automatically hash user passwords, especially when utilizing the Identity package, to further safeguard user data.

9. Tools for source control management

TODO: The determination of development tools, such as Git, GitHub, GitLab, etc., will be made based on a comprehensive evaluation to ensure the optimal selection for the project's needs.

a. Tools for source control management

- Git:

Figure 34: Git.

- Advantage:

Git is a distributed version management system that offers many advantages to developers. It first provides a thorough history of all modifications made to a codebase, which simplifies tracking and undoing changes. By enabling developers to work independently and offline on local branches, it promotes concurrent development and lessens disputes. Git makes it easier for developers to collaborate by allowing them to swiftly resolve conflicts and merge changes. Strong branching and merging capabilities enable experimenting with new features and the maintenance of several code versions. Git has a sizable community and extensive documentation, providing developers with tools and support as a result of its widespread use and popularity.

- Disadvantages:

Git has a lot of advantages, but there can be disadvantages to consider as well. One disadvantage is the initial learning curve associated with understanding Git's concepts and methods. For developers who are not experienced with version control systems, learning the Git language and process may take some time and effort.

Additionally, Git's decentralized structure may make sustaining large projects with lots of members more challenging. Conflicts may arise when merging changes from different branches, and they must be carefully resolved. Git's reliance on command-line usage may also be difficult for people who are not comfortable with command-line tools or who would rather utilize graphical user interfaces.

- Git Lab:

Perfect for use as a whole project life cycle with Git-based tools like version control, project management, CI/CD, etc. Perfect for use as a whole project life cycle with Git-based tools like version control, project management, CI/CD, etc.

Figure 35: GitLab.

- Features:

➢ It makes Git workflows, CI/CD integration, and project administration easier.

➢ Over 30 million users and 100,000 organizations are present.

➢ A single application that addresses each stage of the DevOps workflow.

- Advantages:

GitLab is an online platform that developers and teams may use to manage Git repositories and work together on projects. It offers various advantages. To begin with, GitLab provides a comprehensive feature set for the entire DevOps lifecycle, including source code management, continuous integration and deployment (CI/CD), issue tracking, and more. This all-in-one platform streamlines the development process and reduces the need to combine multiple technologies. GitLab offers robust collaboration functionalities as well, facilitating effective project milestone management, teamwork, and code review for teams. Additionally, GitLab can be self-hosted, giving companies complete control over their code and data and allaying security and legal concerns. Additionally, GitLab has a thriving community of developers that provide resources and support.

- Disadvantages:

Despite GitLab's many advantages, there can be disadvantages to consider. One disadvantage of the platform is its complexity, especially for those who are not experienced with GitLab or DevOps practices. Because of the extensive feature set and customization options available, there may be a learning curve and an initial financial outlay involved in understanding and configuring the platform. In addition, selfhosting GitLab requires the setup, upkeep, and management of an infrastructure, which can be resource-intensive for smaller teams or businesses. Another factor to consider is that GitLab's business edition, which is more expensive but offers access to more features and support, may have more functionality than the open-source version.

- GitKraken:

Figure 36: GitKraken.

- Is a Git program with a graphical user interface.
- Offers a user-friendly and intuitive interface for repository management.

- My choose: Github:

Software engineers may collaborate and manage version control more easily with the help of GitHub, an online platform. Git is a tool for keeping track of all code modifications and project source code storage. More effective work on a project is made possible by the availability of tools to handle potentially conflicting changes from multiple developers. For private repositories, GitHub offers a variety of premium alternatives; however, its public repositories are free to use and enable developers to improve, modify, and personalize software. The files for each project are stored in a private or public repository, together with a history of all file modifications. Repositories can be private or public, and they can include several participants.

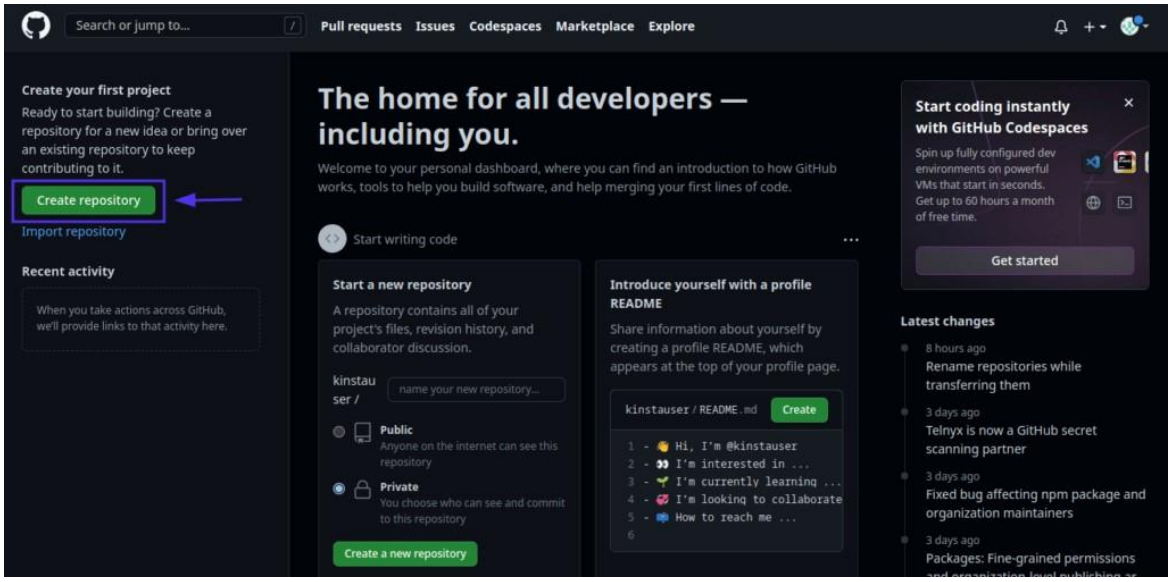


Figure 37: GitHub main page.

On GitHub, engineers employ three key terms: merge, pull request, and fork. A repository that has been cloned from one member's account to another is known as a fork, often known as a branch. A developer can make changes without altering the source code by using branches and forks. The developer can send a pull request to the original repository owner in order to share the changes. The original owner can accept the changes and merge them with the original repository if, after reviewing the modifications, she decides she wants to include them to the repository.

- Pros:

- Great for teamwork: GitHub is a practical and somewhat adaptable tool. It works well for web work processes and is suitable for projects of any size. It can be used as a tool for collaboration, version control, and posting your work at first. Your projects are stored on GitHub, where you can share them with colleagues to collaborate on them or exchange ideas. Its appeal lies in its capacity to facilitate remote collaboration among multiple individuals working on a project.

- Help you take charge of the development process: Git is best understood as an approach to preventive maintenance, where you can enter the flow and perform tasks like pushes, pulls, commits, reverts, and other activities as needed. If something goes wrong or you need to roll back any code, it can save you a lot of hassle. Error logging is one of the nicest features, and GitHub greatly simplifies this process. It is possible to have open problems on GitHub, and you may associate commits with them and make them related to the issue.

- Rich documentation: You won't run out of content when using GitHub thanks to its vast help section, which has articles covering nearly every subject under the sun as long as it has to do with Git. It contains instructions to assist you in making SSH keys. There is a handbook available that describes the ideal Git workflow. For example, Gitignore (and other places) has a plethora of samples for your next project.

- Cons:

- Security: GitHub's free and subscription tiers provide access to private repositories, although even these have restrictions. You are giving GitHub and anybody else with a login access to highly valuable intellectual property. Similar to numerous other websites, GitHub has already experienced security breaches and attacks. Even with GitHub's attempts to improve security (such adding the Depend Bot feature to GitHub Enterprise), there is still some danger associated with the platform's cloud-based design.

- Maybe challenging for new users: GitHub is a strong tool; therefore, it could be challenging for them to become used to it. The vast array of choices and methods available on GitHub could be daunting and perplexing for novice users. Many users have issues as a result of the software's inconsistent handling of commands and arguments, as well as the abundance of ambiguous commands on GitHub.

- Justification for using GitHub: It provides all the resources I need to construct my project:

- Repository: The place all of the code is stored

- Git command: Because this project necessitates teamwork, we need a place to share and frequently update our code. The best tool on the market is GitHub. It provides us with a location to store our code, which we can upload to Git and allow users to download to their personal computers. To work on our individual projects apart from one another, we can even split into separate branches. After finishing our project, we might merge all of the branches into one.

Version control: Git not only acts as a repository for the code, but also keeps track of every action taken by project participants. Every push, pull, and merge request will have a record to ensure that other interested parties are aware of the project's progress.

10. Software Development Models

TODO: After introducing various SDLC models including Scrum, Waterfall, V-model, etc., the decision on the preferred SDLC model for development (e.g., Waterfall, Scrum) will be concluded following a detailed analysis, considering factors such as project complexity, flexibility requirements, and stakeholder involvement.

a. Definition of software development model

- Software development models are the various techniques or processes that are selected for a project's development according to its aims and goals. Development life cycle models come in different forms and have been developed to achieve different necessary aims. The models outline the various process steps and the order in which they must be finished.

- The testing that is conducted is greatly impacted by the model that is selected. Regression testing will be impacted, what, where, and when of our planned testing will be specified, and the test techniques to be used will essentially be specified.

b. Waterfall model

The waterfall model was one of the first procedures in the software development life cycle. It was the first software development process model ever used. It is divided into several phases, with each phase's output serving as an input for the subsequent phase.
Phases must be finished one after the other before moving on to the next; if the first phase is not finished, we cannot move on to the next. The phases of the waterfall model flow from the top level to the lower level in a way that is akin to a waterfall that falls from above to below, hence the model's name.

- The waterfall model operates in this manner:

- Gather all user preferences, regardless of size, and make sure to accurately document each one so that you can understand the demands of the user for the product.

- The user needs are mentioned first, followed by the system requirements to function with the system.

- The product design was created with the needs in mind.

- Following the general design is the full product design, which covers the system, hardware, software, etc.

- After design, the project development team is in charge of initiating the actual product execution.

- Following implementation, the entire product is tested by the testing team.

c. V-model

- The framework known as the V-model describes every stage of the software development life cycle, from requirements definition to maintenance. The V-model states that testing procedures are integrated into each stage of the software development life cycle.

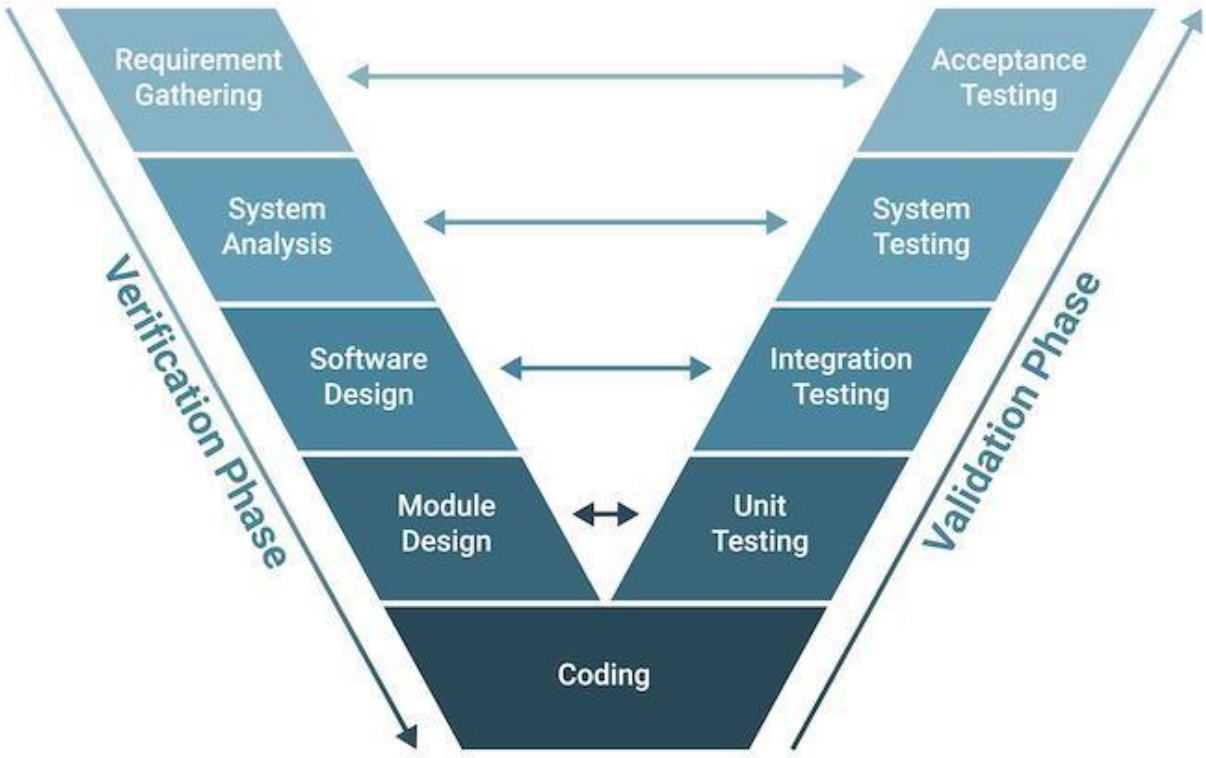


Figure 38: V-model.

- Model V test levels used:

- Component Test: This test ascertains if every software component used in the product is performing as planned. Every component can be tested independently.

- Integration testing: This kind of testing looks at the interactions between different system components, such as the hardware, operating system, file system, and interfaces.

- System Test: This test covers a wide range of systems. assesses the system or product in light of the requirements. Acceptance Testing: This method determines whether or not the system will be accepted by testing business procedures, user needs, and requirements.

d. Iterative Development Model

Iteration is a whole development cycle that culminates in the release of an executable product; in other words, it is a portion of the final product that is still in the development stage that has developed over time into the final product. This is the iterative development model's life cycle.

Lean unified process, agile development, and fast application development are examples of iterative development methodologies.

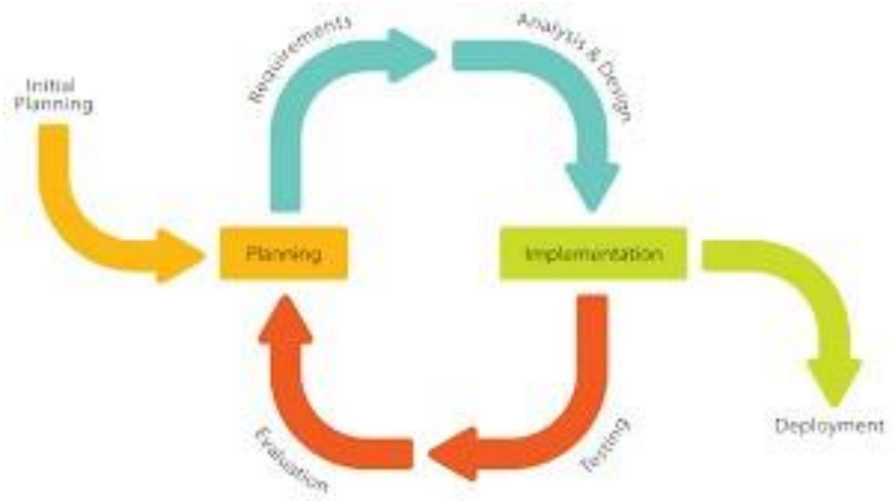


Figure 39: Iterative Development Model

Software development methodologies based on iterative incremental development, where self-organizing crossfunctional teams work together to evolve requirements and solutions, are collectively referred to as agile development methodologies. While there are a number of agile methods available for software development, Scrum and extreme programming, or XP, are the most widely utilized.

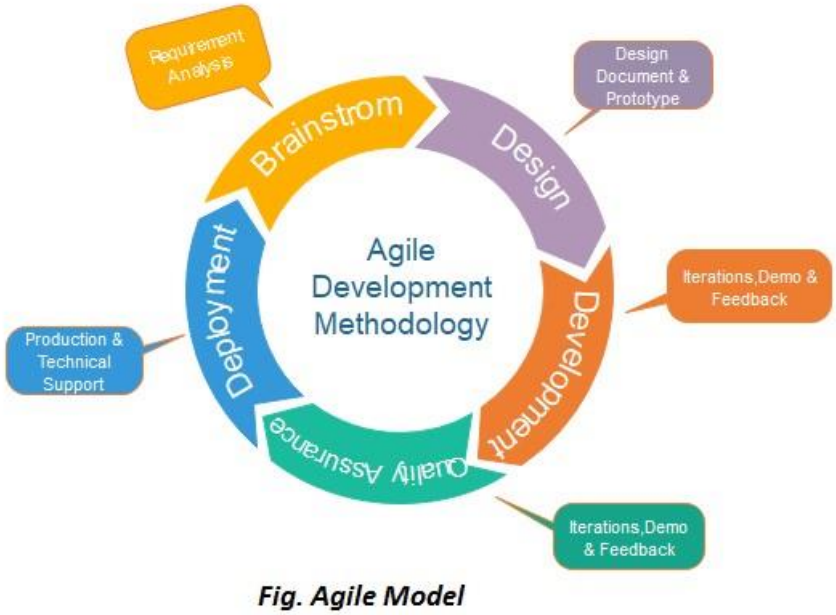


Figure 40: Agile development model

- Agile development advantages:

- It highlights the excellent quality and functionality of the code.
- Incorporate testing at the beginning of the life cycle.
- Simple to produce.
- Business stakeholders must help testers in order for them to test the product in compliance with the requirements.

e. Model applied – Waterfall model.

The waterfall model is a traditional paradigm that builds systems in a sequential and linear fashion throughout the system development life cycle. Because the model proceeds methodically downhill from one phase to the next, it is known as a waterfall model. This model is broken down into discrete phases, where the output from one phase becomes the input for the next. Phases do not run concurrently; one must be finished before moving on to the next.

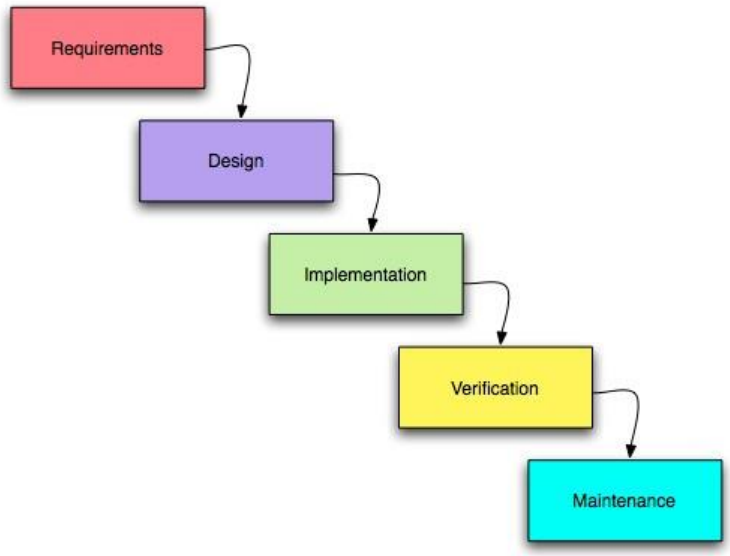


Figure 41: Step in waterfall model.

- Pros:

- Follows a precise and unambiguous structure: A precise and unambiguous framework is created using the waterfall technique. It emphasizes how important teams and project managers are at every level. Teams using this approach must define the roles of all members prior to beginning a project. This level of clarity is necessary for complicated projects to be properly planned, executed, and managed. Since everyone is aware of their responsibilities at each level, they can all work effectively to complete the project.

- Transfers information efficiently: The waterfall method is often very meticulous. Teams and project managers frequently check in on each other's work in between phases. To demonstrate that they're prepared to go on to the next phase, they could disclose this information along with their completion status. Stakeholders can also use this data to assess the project's progress and take appropriate action.

- Simplifies project management: The project management process can be made simpler with the use of the waterfall technique. This method might be easy to use if the team and project manager have decided on the project's basic structure. It will be simple for stakeholders to comprehend each of the model's phases. To successfully finish their project tasks, team members must be able to comprehend, analyze, and manage their work.

- Cons:

- Minimal room for changes or revisions: The waterfall methodology necessitates that the project team follow specific procedures at every stage. It might not be able to alter or modify itself once each stage is finished. Only when a stage is nearing completion are adjustments feasible. Adjusting might not be so simple if the project team follows every procedure and an unanticipated change appears after the project is finished.

- Testing for delays: Testing could be put off until the very end of the project if the waterfall technique is used. This tactic could be dangerous since it forces teams and project managers to wait to find out if their behavior is appropriate. If adjustments are required, the project's completion date could be extended because it might take some time to locate and deal with the problem's root cause.

- Choosing the project's architecture might be a time-consuming process: For some projects, developing exact requirements can be difficult and time-consuming. When certain project components look dubious, other project management techniques can be more suitable. A comprehensive design may necessitate a large time and financial commitment.

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Index of comments

1.1 1. What is good

You can Explore a business-related problem and produce a well-defined Problem Definition Statement supported by a set of user and system requirements. (P1)

You can Determine any areas of risk related to the successful completion of your application. (P2)

You can Research the use of software development tools and techniques and identify any that have been selected for the development of this application. (P3)

2. What is not good

- Some small mistakes in UC diagram

- You should add category creation in Employer

- ERD, Class diagram should be done better