ASSIGNMENT 1

Qualification	**BTEC Level 5 HND Diploma in Computing**		
Unit number and title	Unit 30: Application Development		
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Student declaration

I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice.

Student's signature	hoang

Grading grid

P1	P2	P3	M1	M2	D1
✓	✓	✓	✗	✗	✗

❒ **Summative Feedback:**		❒ **Resubmission Feedback:**
2.1		
Grade:	**Assessor Signature:**	**Date:**
Lecturer Signature:		

Table of Content

1. Introduction

Document Purpose

The aim of the Specification of Software Requirements (SRS) document is to define in detail and build a continuous learning environment within FPT Corporation. It is essential in the design, construction and development of a web-based system that will manage training for the company's internal training program. It will explain the purpose and features of the system, its interfaces, what the system will do, the constraints it has to operate with, and how the system

will respond to external stimuli. Besides, it defines how our customers, groups, and audiences view the product and its features. It also defines the design constraints to be taken into account when designing the system and other considerations needed to provide a complete and detailed overview of the specifications for software. The Specification of Software Specifications (SRS) collects the complete requirements for software for a system or part of a system. SRS captures and describes the desired end product behavior in many cases. Some of the non-functional requirements in this document were taken from the scoping documentation and can still be refined. The criteria listed in this document are taken from the FPT Continuing Learning Environment Vision Document.

Product Scope

Scope

FPT wants to build a continuous learning environment within the corporation. The scope of the project is the implementation of a web-based system to manage the training activities for the internal training program of the organization. It is possible to use this method to handle student accounts, manage teachers, manage course categories, manage courses, manage topics, assign courses to courses, assign trainers to topic, appoint trainers for the course. This system is used exclusively for FPT Education and the employees of FPT Company can use this system as trainers, trainers, trainees and system administrators.

Benefit of Product

Our products offer certain benefits and may improve in the future as follows:

- The system is a continuous learning environment within FPT Education Group
- The online training online programs can be easily implemented and managed.
- This is a system exclusively for students and staff in the FPT system, providing a high level of safety and security.
- It is a convenient application with user-friendly interface in FPT education system.

Above are some of the above benefits we bring about the best and simplest user experience.

Intended Audience and Document Overview

Intended Audience

The project is a product for the FPT education management system and is used in a university environment with all the given requirements. The product was built by the Passtiction student group of the University of GreenWich. Under the mentor's guidance, the project is built and perfected step by step. The project's products are very useful for university staffs, trainers and students. This document is read by developers, users , and document writers.

The table below describes the different types of readers targeted by the project.

Reader	Describe
User	This document is intended for users, including trainees, trainers, trainers, and managers of FPT Education. They make sure that this document meets the user's needs well, gives the user a basic introduction to the system, a detailed description of the goals and how to build the system.
Professor/ Mentor	They understand the project well, give instructions, give suggestions and advise students to best complete the project. They also check out the project for students.

Developer/ Student/ Document writers	Their task is to read and understand the project's requirements, give directions to solve problems that exist in the requirements. Analyze the tools and technologies for project implementation, while working on the project, clarify the problem, and report back in detail and carefully.

Document Overview

A general overview, including the personality traits of user of this project, the device hardware, the product data and the functional specifications, is given for the remainder of this document. The general project details are discussed in Part 2 of this paper. Part 3 describes the functional requirements, requirements for details, and assumptions that are made while designing the HR management website of FPT Education. It also provides users with views on the product. Section 3 also discusses the specific product requirements, and discusses the external interface requirements, and describes in detail the system user's functional requirements.

Recommended for readers:

- Capable of reading comprehension or proficiency in English.
- Readers are officers, employees and students of FPT education system.
- Document readers should read the sections sequentially and refer to the annexes to the sections of the document.
- Ask readers not to bring documents out for bad purposes such as stealing ideas, making copies,...

Definitions, Acronyms and Abbreviations

This section of the document presents all the terms necessary to correctly interpret the SRS, including all definitions, abbreviations and abbreviations. The following separate glossary, abbreviations and abbreviations used in the document are provided in an alphabetical order.

Definitions,Abbreviations	Meaning/ Stand for	Desciption
API	Application Program Interface	is a computing interface which defines interactions between multiple software intermediaries. It defines the kinds of calls or requests that can be made, how to make them, the data formats that should be used, the conventions to follow, etc
ERD	Entities Relationship Diagram	stands for Entities Relationship Diagram which is a diagram, shows the relationships of entity sets stored in a database.
Function Requirement	Function Requirement	these are requirements describing what the system must do. Usually, the function request will specify the behaviors or functions the system will do.
MongoDB	MongoDB	MongoDB is a general-purpose, document-based, distributed database built for modern application developers and for the cloud era.

MVC	Model - View – Controller	is a software design pattern commonly used for developing user interfaces that divide the related program logic into three interconnected elements.
Nodejs	Nodejs	As an asynchronous event-driven JavaScript runtime, Node.js is designed to build scalable network applications.
Non-function Requirement	Non-function Requirement	the criteria that a software system needs to achieve when it is executed.
UI	User Interface	is the point of interaction between humans and computers and communicating in a device. This can include the display, keyboard, mouse, and desktop interface. It is also how a user interacts with an application or a website.
UML	Unified Modeling Language	is a modeling language consisting of graphic symbols that object-oriented methods use to design information systems quickly.
Use Case Diagram	Use Case Diagram	is a technique used to describe the functional requirements.
UX	User Experience	design is the process design teams use to create products that provide meaningful and relevant experiences to users.

Vue	Vue	is a progressive framework for building user interfaces. The core library is focused on the view layer only, and is easy to pick up and integrate with other libraries or existing projects.

Document Conventions

In general, this document complies with IEEE format requirements. Use 12-size Calibri font throughout the document for the text. Use italics for comments, photo titles, and tables. Document text has a single spacing and a 1.5 margin. Bookmarks are indicated on each portion of the plate. For the headings

and subsections are patterned.

References and Acknowledgments

References

List of documents and web addresses that SRS refers to:

1. *https://dzone.com/articles/how-to-write-the-system-requirements-specification*
2. *https://www.perforce.com/blog/alm/how-write-software-requirements-specificationsrsdocument*
3. *https://ecomputernotes.com/software-engineering/softwarerequirement*

Document list and web address referring to the definition, abbreviation:

1. *https://www.techopedia.com/dictionary*
2. *https://geekflare.com/tech-abbreviations/*

Acknowledgments

The Passtinction Group is a group of students from the University of Greenwich. We could not complete the project without the guidance and guidance of our teachers. First of all, Passtinction would like to thank the instructors and teachers of the FPT education system, who helped us come up with ideas, gave us useful advice, suggestions and give We specify the software requirements throughout the project.

We sincerely thank the FPT education organization for giving us the opportunity to carry out projects, creating the motivation for us to develop and create.

While working on a project, team members always strive to complete the job in the best way. The group has had the opportunity to learn, experience, and work together seriously and professionally. This was a challenge for Passtinction, also a learning experience for all team members.

3 Overall Description

Product Overview

Product origin

In this section, we will specify the context and origin of the product in this SRS. With technology increasingly developing like a storm today, FPT hopes to build a continuous learning environment in the whole corporation. It is necessary to develop a web-based system that manages the "Training" activity for the company's internal training program. This system can be used to manage student accounts, manage teachers, manage course categories, manage courses, manage topics, assign topics to courses, assign trainers to one subject, assign instructors to the course. This system is used by employees of FPT education system. The system clearly divides the four roles of the system, which are: system administrator, training staff, trainer, and trainee.

General diagram

Based on the requirements of the project, we build ERD diagrams including 8 main tables and 3 sub tables to represent relationships between entities with many - many relationships.

The main panels include: User, Trainer, Staff, Trainee, Trainer, Course, Topic, Role, CourseCategory.

The sub tables include: Trainers_have_topics, Trainees_have_courses, Course_hava_topics.

- The User table represents the role of the admin, storing the user's confidential information such as ID, Email, Password, RoleID.
- Staff table stores staff training information such as ID, name, DOB, phone.
- Table Trainee stores basic information of trainee such as ID, name, DOB, Course, TOEIC_score, ...
- The Trainer table stores basic trainer information such as ID, name, phone, DOB workplace, email,

  ...
- The Course table stores basic information of the couse such as ID, name, desciption, category.
- The Topic table stores the topic's information such as ID and desciption, name.
- The CategoryCourse table stores all topic information such as ID and desciption, name.
- The Roles table stores the possible IDs and roles of each user.

Relationship between entities:

- Each User has its own role, so the relationship between the User table and Role is a one to one relationship.
- In the system there are many users with the role of staff, so the relationship between the staff table and the user is one to one relationship.

- Likewise, in the system there are also other roles trainee and staff, where the relationship between trainee and user is a single many relationship, the relationship between the trainer table and the user is one to many relationship.
- A course can have many topics, a topic can have many courses, so the relationship between the topic table and the course is a many to many relationship. That we need a courses_have_topics sub-table that demonstrates two one-to-many relationships.
- The relationship between the course table and the course_have_topic table is one to many.
- The relationship between the topic table and the course_have_topic table is one to many.
- A category course can contain many courses, so the relationship between category and course is one to many relatioship.
- A trainer can teach many topics, a topic can be taught by many trainers, so the relationship between the trainer table and the topic is a many to many relationship. That is, we need a trainer_have_topics sub-table that shows two one-to-many relationships.
- The relationship between the trainer table and the trainers_have_topic table is one to many.
- The relationship between the topic table and the trainers_have_topic table is one to many.
- Similar between the course table and trainee. A trainee can study many courses, one course can be learned by many trainees, so the relationship between the trainee table and the course is many to many. That is, we need a trainees_have_course sub-table that shows two relationships one to many.
- The relationship between the trainee table and the trainees_have_courses table is a big one.
- The relationship between the course table and the trainees_have_course table is one to many.

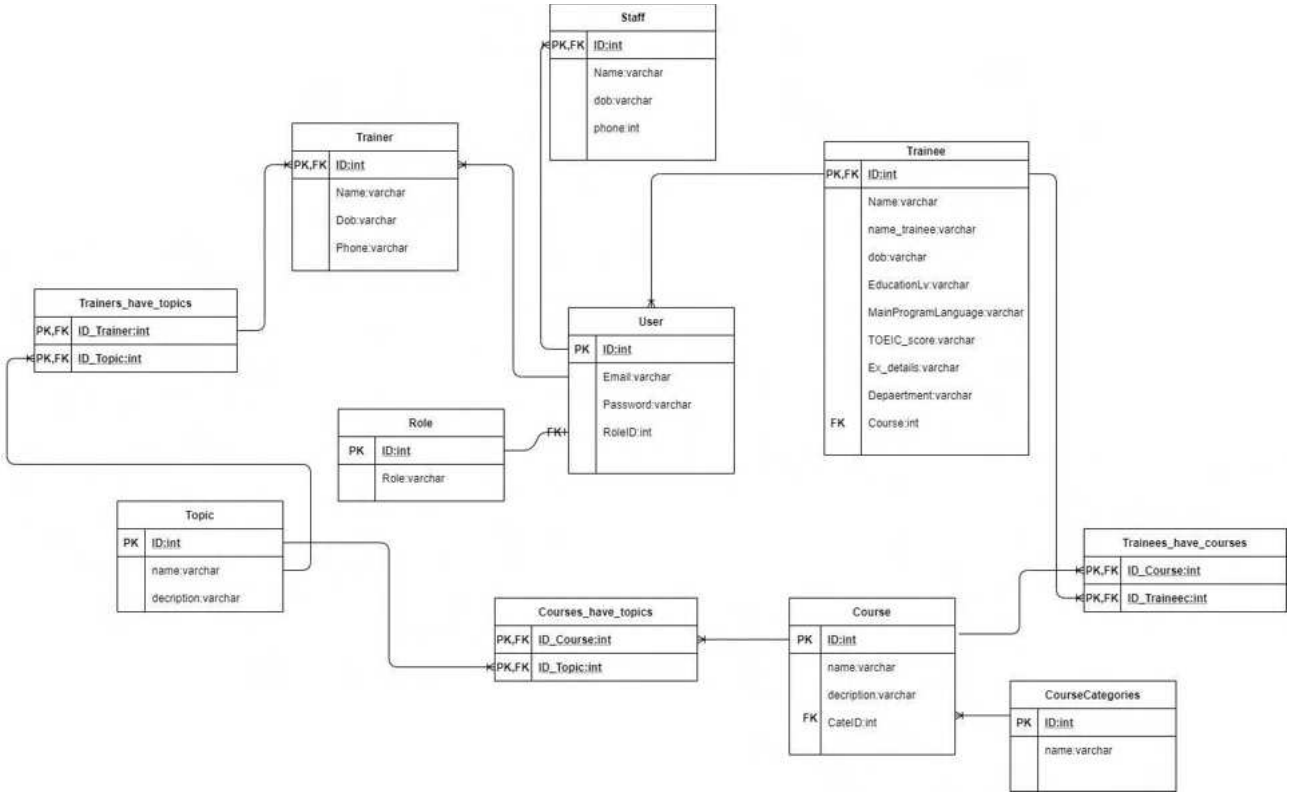


Figure 1: ERD diagram

Product Functionality

The web system consists of two main parts - a database management system that the center uploads, which manages users' data. The rest are interfaces that allow users to provide data and interact with the system. This is the human resource management web system of FPT education system, we are divided into 4 main roles: system administrator, training staff, trainer and trainee. Each role in the system has certain rights in the system. Each account that is logged into the system is given a specific role.

Below is the use case that provides the functionality of each role in the system.

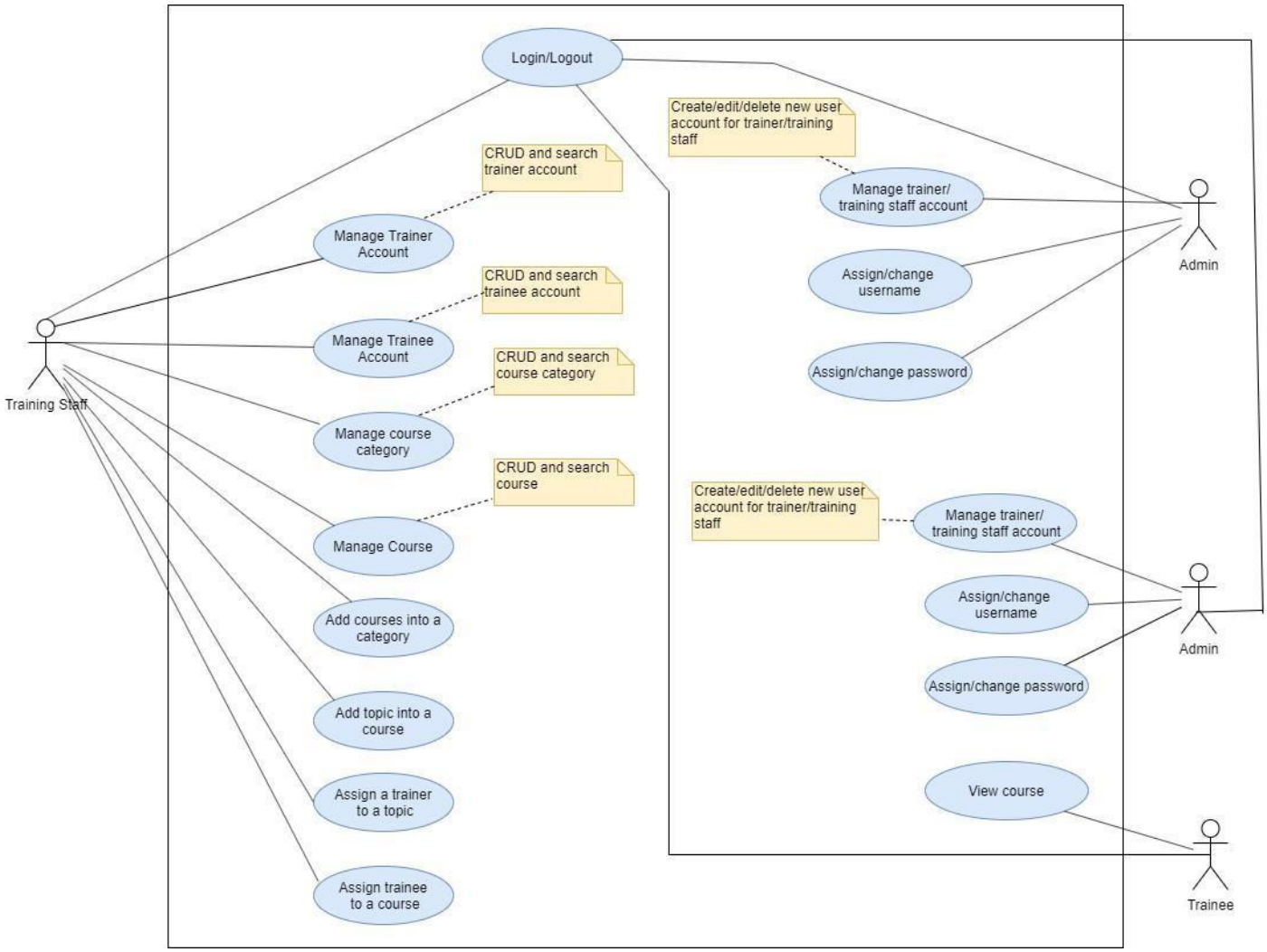


Figure 2: Use Case Diagram

Role of Admin

- Admin can log in to the system through the first page of the website system
- In addition, you can manage actions such as adding, modifying, deleting new user accounts for trainers/trainers and assigning/changing username and password (if the user is existing).

Below is the use case that provides the functionality of administrator'role in the system.

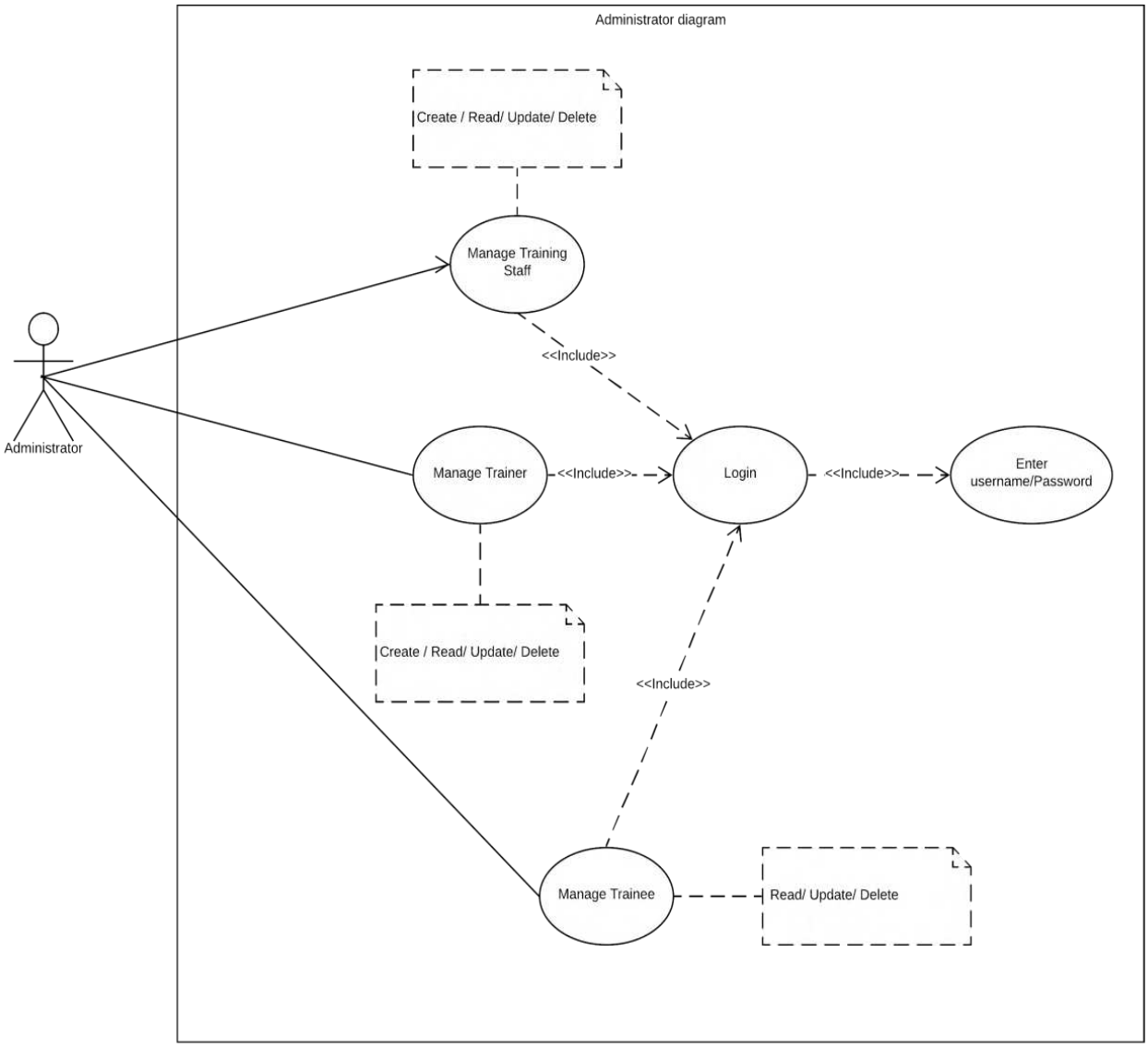


Figure 3: Use case administrator's role

A training staff's role

- An administrator registered account can create a student account by entering details such as student name, student account, age, date of birth, education level. , the main programming language, etc.
- Training staff can manage student accounts including actions such as adding, modifying, deleting, viewing and searching all information of the student account stored on the system.

- Training staff can manage course categories and perform actions such as adding, modifying and deleting, and searching course categories.
- In addition training staff can manage courses and perform actions such as add, edit, delete, tattoo and search for courses.
- Subjects can be added to courses, courses can be added, and categories.
- Training staff have the right to manage trainer records such as adding, editing, and deleting instructor information.
- Training staff can assign instructors to a topic.
- Training staff can add trainees to a course.

Below is the use case that provides the functionality of training staff'role in the system.

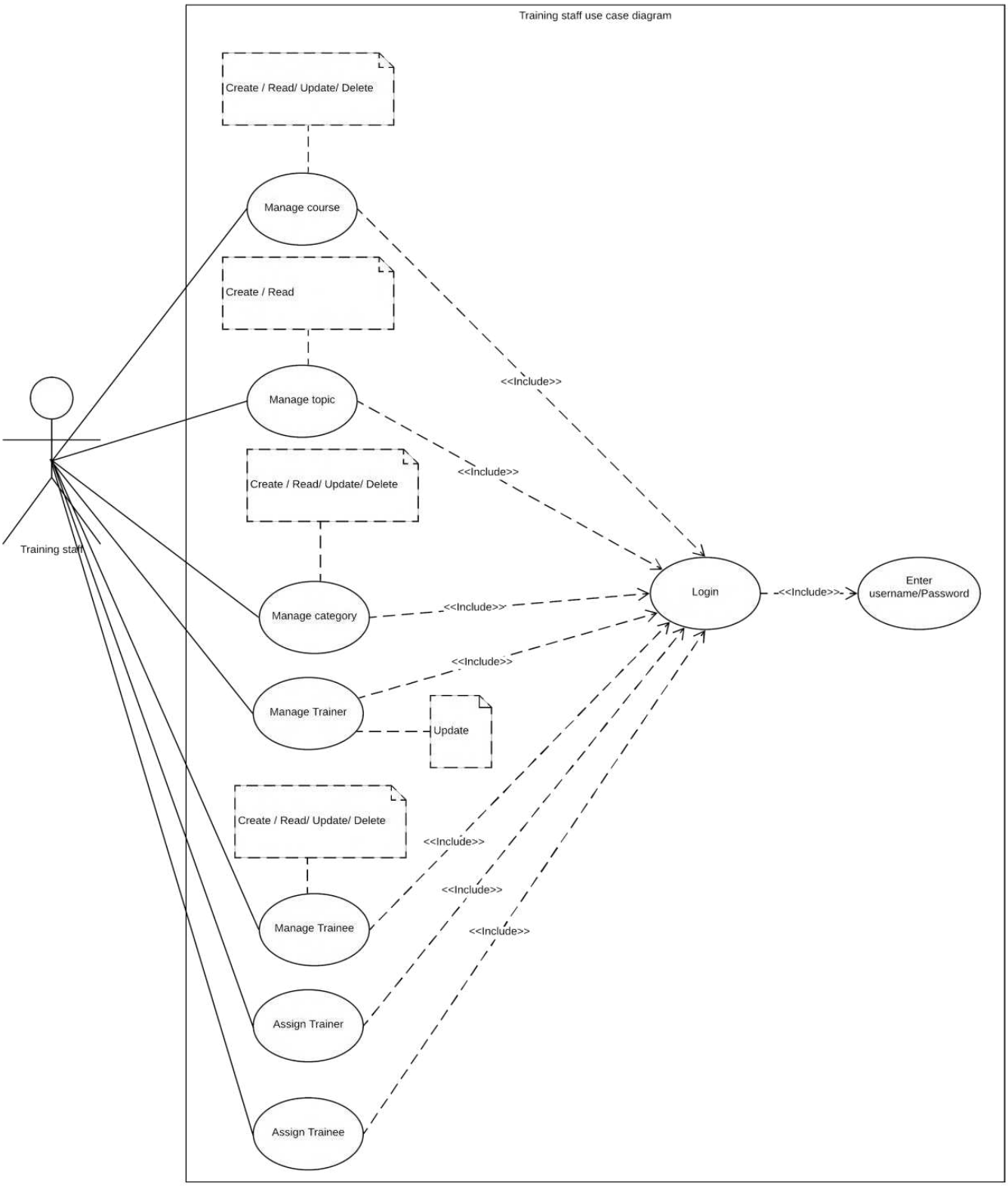


Figure 4: User case training staff's role

A trainer's role

- The trainer who has been registered by the administrator can log in and update his profile on the same system, such as the name of the trainer, external or internal form, school, job, telephone, and e-mail address.
- A trainer can view courses that have a subject to which they are allocated.

Below is the use case that provides the functionality of trainer'role in the system.

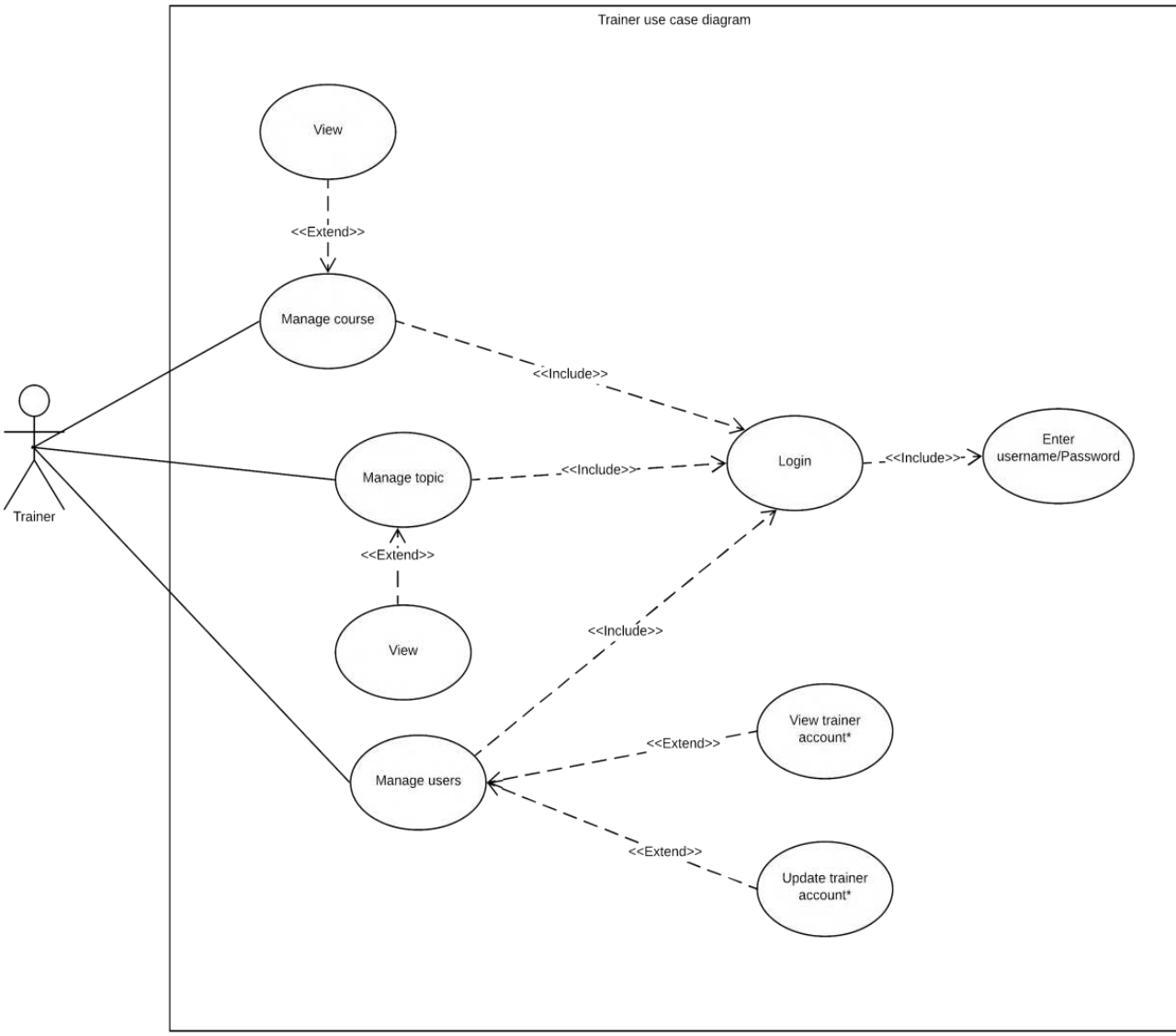


Figure 5: Use case trainer's role

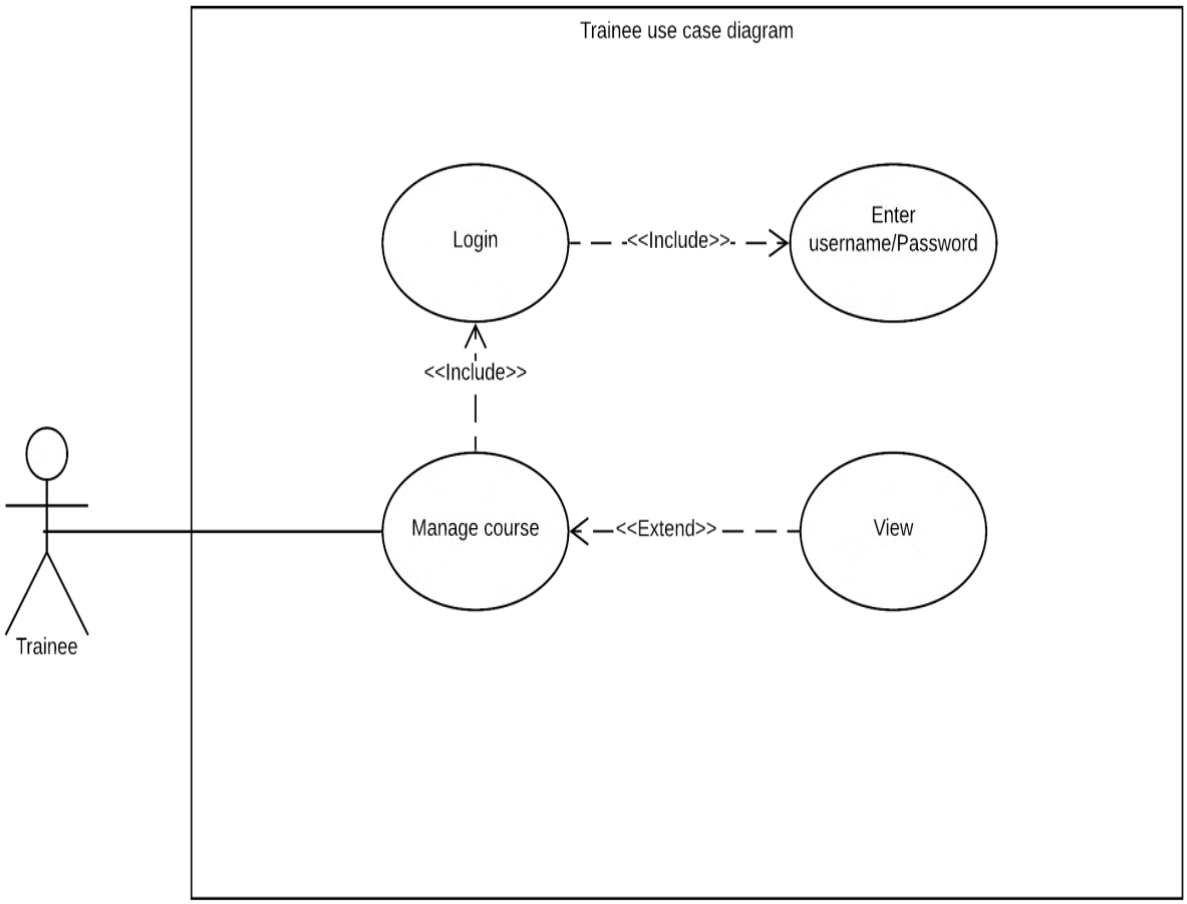


Figure 6: Use case trainee's role

4 Determine risks related to the successful completion of application

Risks identification

Risk identification is the first step to do in risk management. It is the process of listing the project's possible risks and their characteristics. Risk can prevent people, programs or businesses ... from achieving the goals.

When developing the system, we identified the risks we could face such as: scope risk, experience and knowledge risks, lack of time, security and lack of cost to implement. From the risks that we have identified, we propose corresponding measures to deal with the risks.

Identify risks and measures to deal with risks.

Scope risks

Scoping the project is one of the first steps to implementing a project. However, this step can potentially risk project implementation due to errors in project requirement analysis. In this project, there can be risks from scoping the project that we do not fully and properly understand all of the requirements of the corporation. In addition, project requirements have not been prioritized. Therefore, there may be have small risks in the next steps. (webarxsecurity, 2016)

Solution for this risk: We need to analyze the corporate requirements carefully, and arrange the tasks in a logical way

Experience and knowledge risks

The risk of knowledge and experience is an unavoidable risk when letting a team with young employees do the project. This risk is directly related to the project implementation capacity.

Solution for this risk: overcome the gaps in knowledge by learning while working, learning from

their predecessors and team members working on the project. Experience can be gathered throughout the life of the research and project. (webarxsecurity, 2016)

Lack of time

The time spent on this project is limited and there may also be problems due to lack of experience and understanding. Therefore, lack of time is also a risk that we can face. When facing the danger of lack of time, the project progress cannot be guaranteed. In addition, when the work is completed under time pressure, the quality of the product is also difficult to perfect.

Solution for this risk: The only way to limit the time risk is to divide the work in the most reasonable way.

In addition, each team member must also complete tasks on time to ensure the progress of the project.

Security risks

Security is always a risk of every product, every system. Systems with low levels of security can be hacked and cause problems for corporations. System data such as information about courses, lecturers, students ... are important things that need to be protected in the corporation. Therefore, security risks need to be considered and prioritized as much as possible.

Solution for this risk: When designing the system, make sure to always use security services, design a website securely, and use hosting safely. Besides, it is always checking the input data and creating a set of security policies for future system users.

Design and Implementation Constraints

Hardware Requirement

According to (Commerce, 2014), the hardware and software demands for the model applications are listed in this section. The following table lists the web server's minimum and suggested hardware specifications.

Item	**Web server (minimal)**	**Web server (recommended)**	**Hybrid Web & Database SHybrid Web & Database Servererver (minimal)**	**Hybrid Web Hybrid Web & Database Server (recommended)**

Processor (GHz CPU)	2 GHz	4 GHz	4 GHz	8 GHz
RAM (GB)	2 GB	4 GB	4 GB	8 GB
HDD	Website data is recommended for 40 GB of free space or more (non-system drive is preferred)			
	For software that is specified in the software specifications (system drive), GB of free space or more is recommended.			
Recommended Configuration for Microsoft Azure VM	Basic Small VM	Basic Medium VM	Basic Medium VM	Basic Large VM

Above are the minimum and recommended information on Server. The hardware must be able to store data for a minimum of 1000 users. When using a physical server we need to consider dividing the environment into more than one server. For example, use a few machines as load balancers, a few as web nodes, and another two as the redundant database node. This can be difficult to do on a budget with physical hardware but ensures system continuity. However, in addition to storage through physical servers, we can store data online via cloud server to ensure there is no shortage of space during storage, or buy easy storage packages and without installation time and construction costs. For online data backup, we require all user data to be backed up weekly.

Network requirement

Model-driven apps are intended to function best through networks that have the following components:

- Bandwidth of over 50 KBps (400 kbps)

- Latency below 150 ms

On the network, in order to ensure optimum reliability and availability, the application server and database server must be balanced at the application load level.

Software Requirement

Below we will introduce the software we use during project development:

Backup Software: The backup of data and applications is handled by completely supported backup software.

Web Browser: To introduce the thin client architecture, common supported web browsers will be used to support external interface specifications. HTTP is a TCP / IP protocol suite (the underlying protocols for the Internet) web protocol. The principal distribution protocol for the application will be the internet.

Google Chrome, Microsoft Edge: These browsers, backed by a wide community of millions of

extensions, are today's most popular, high-performance, fast and stable browsers. Therefore, we used it in the process of planning and reviewing the project.

POSTMAN: It is a forum for collaboration to create an API. The functionality of Postman simplifies every step of creating an API and simplifies collaboration so that better APIs can be built faster. Our website uses APIs to connect and support customers, so POSTMAN is the right option for us.

Ngrok: Over secure tunnels, Ngrok exposes local servers to the public internet behind NATs and firewalls. Our team uses Ngrok because it can easily create services that react to webhooks, team shared account access, support for WebSocket, fast & secure, simple https, authenticated access and virtual host sites.

MongoDB Server and Atlas MongoDB Online: MongoDB is a database of documents designed on a scaleout architecture that has become popular with developers of all types who use agile methodologies to create scalable applications.

- A powerful way to store and retrieve data that enables developers to move rapidly is the document data model.
- The horizontal, scale-out architecture of MongoDB can accommodate enormous amounts of both data and traffic.
- For developers who are able to install MongoDB and start writing code immediately, MongoDB has a great user interface.
- MongoDB can be used by anyone anywhere.
- MongoDB has been designed for people who need to develop rapidly and scale elegantly to create internet and business applications. We are therefore considering using the MongoDB service for our project.

Heroku: Heroku is a Platform as a Service (PaaS) container-based cloud. To deploy, manage, and scale modern apps, developers use Heroku. The Heroku platform is sleek, scalable, and easy to use, offering developers the easiest way to market their games. Therefore, we decided to deploy our project using Heroku.

GitHub: GitHub is an open-source hosting repository service, kind of like a code cloud. In a number of different programming languages, it hosts your source code projects and keeps track of the different modifications made to each iteration. Other users of GitHub can check your code and suggest

modifications.

Our team uses GitHub because of its open-source advantages, tracking improvements across versions, community-reviewed code, creating and implementing a management strategy

The Visual Code IDE: It is a lightweight but powerful source code editor which is available for Windows , macOS and Linux and runs on your desktop. It provides a built-in JavaScript, TypeScript and Node.js support and also has a rich ecosystem of extensions (such as C++, C # , Java, Python , PHP, Go) and runtimes (such as .NET and Unity) for other languages.

Program Language: HTML 5, CSS, JavaScript, Bootstrap, Vuejs, Nodejs…

Assumptions and Dependencies

It is expected that during some of its completion phases, student data will be provided to the project. Before the test data is used for presentations to produce presentations. It assumes that the user is familiar with internet surfing as well as the controlling of the mouse and keyboard.

Since the application is a web-based software, an internet browser is required. It is assumed that the user has enough knowledge of Windows or IOS operating, and the devices with a good and stable internet connection.

More than that, the web system is built on the English language, assuming the user has the ability to read and understand the English language to be able to use the product.

System notifications will be emailed to users. Assuming that the user's mail is still active, the user can receive system information sent by mail.

5 Specific Requirements

External Interface Requirements

User Interface

This app is aimed at users who are students, coaches and operator. So we need to build the interface for 2 main objects, 1 is admin - content creator and manager. 2 is a Viewer consisting of a learning person and a coach.

Users need an easy-to-see and logical interface, which makes management easier. The components need a clean and easy-to-use layout.

5.1.1.1 Login Page

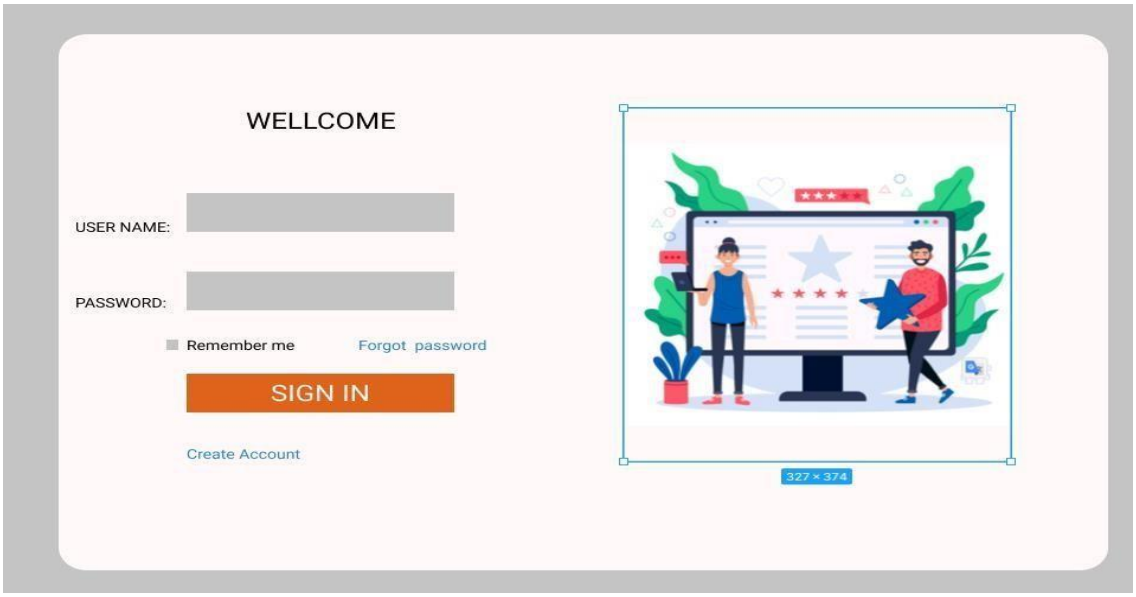


Figure 6. Login page

Login page is shared for all users. The layout is simple and effective.

Layout of a website

This is also an important part of the interface design. Yes, I have to make the user feel most comfortable. For admin interface convenience and ease of use (UX) must put on top. So we decided to have more navigation bars to be able to arrange more convenient functions for users.

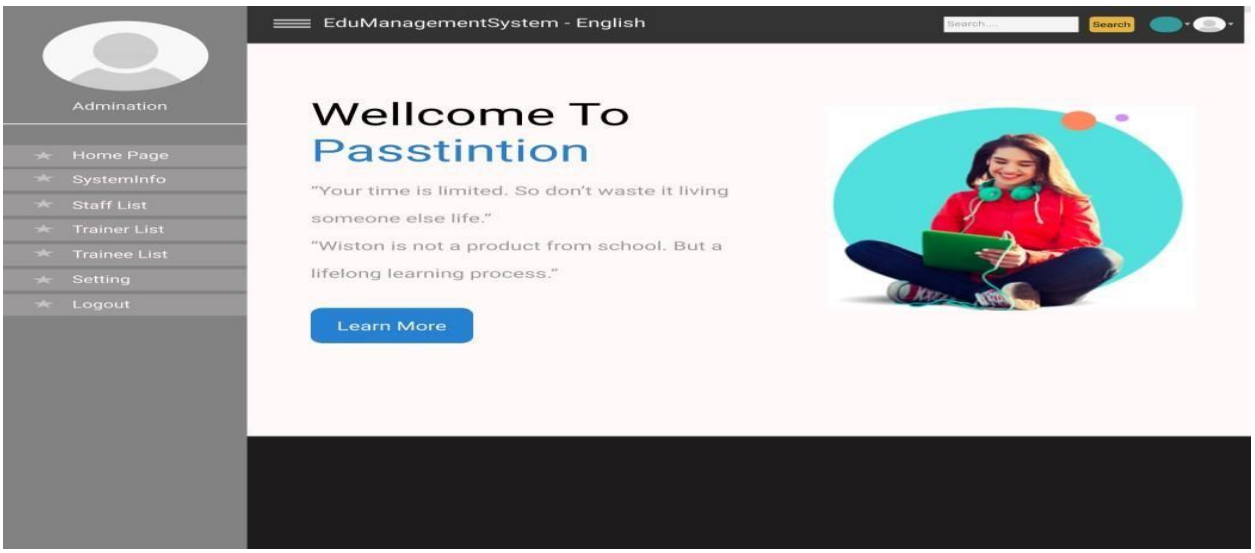


Figure 7 hone page

This is the layout we decided to build. Consists of 2 main parts. Part 1 is the navbar on the left so users can navigate more easily. Part 2 is the main content display. In the main content of the basic layout there is header, body, footer. Header is a navbar, body is the content display, footer is the place to display them the extra content and additional navigation link.

The composition of the site required for người quản lý- Admin,Staff

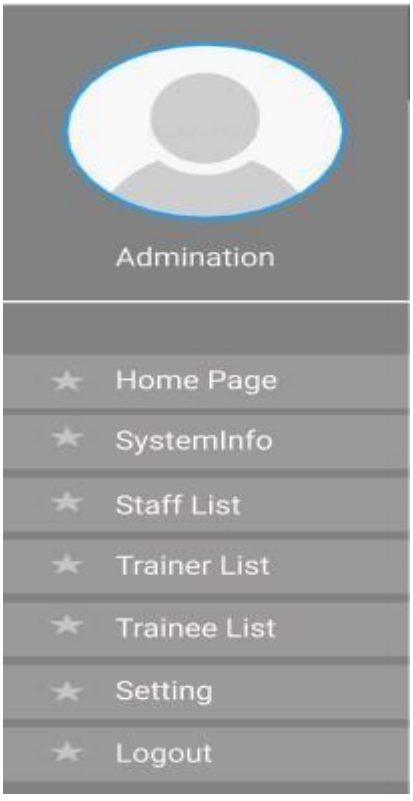
For users who are Admin, the interface does not need to be too colored but the navigation components and tools must be fully easy to see for managers to easily manipulate.

Navbar

With admin pages, we use 2 Navbar bars. 1 Bar at the top of the site, 1 bar is on the left.

For navbar at the top of us to support components such as, change the language, manage personal profile, search section and name of the page.

Figure 8. Top navbar



The second Navbar is on the right side of the page, which is also an important component for the Admin website. Users will be easier to view information and navigate.

At this top bar we arrange the names of admins and their avatars.

This is followed by buttons that link to pages. It's easier for people to navigate.

Figure 9 Navbar on the left

The main information display

We've also figured out which part of the layout of the site.This is the biggest part.

Figure 10. Main content

Homepage

This is the welcome page when the user logins in.

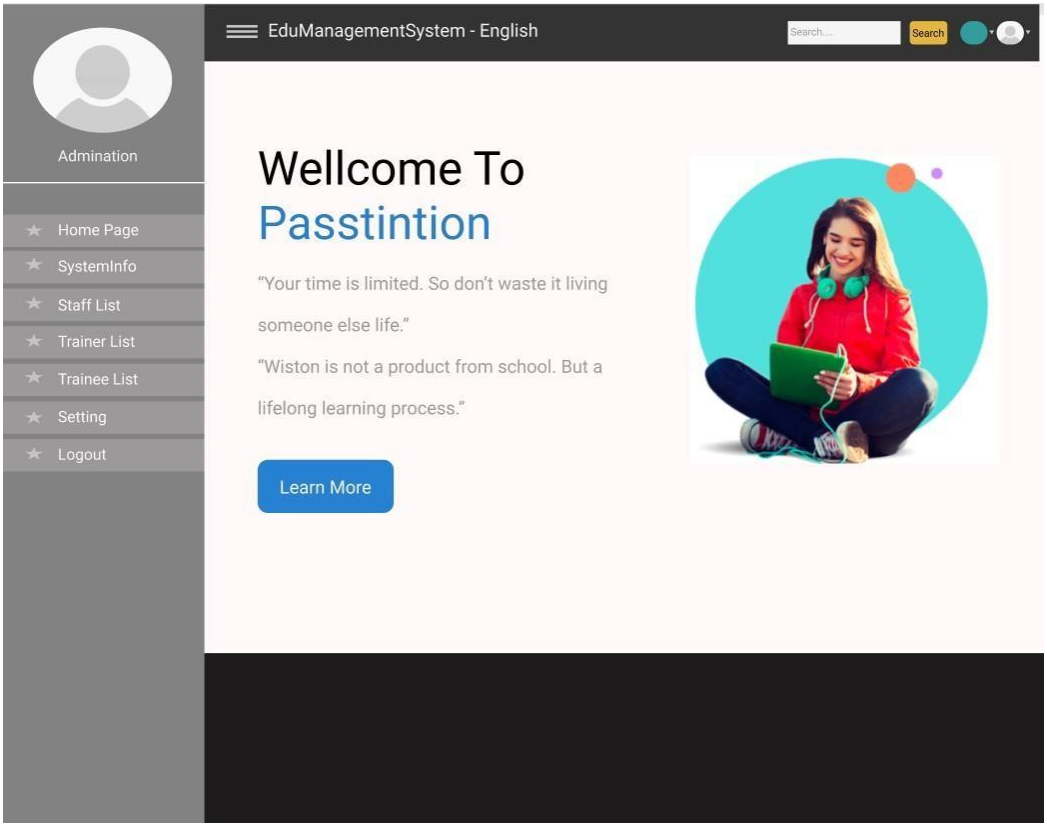


Figure 11. Homepage Admin

System Info

This is a statistical page as a chart so that Admin can be more easily managed. This section also has two sub-pages: the overview page and the Individual page.

Overall pages

This page has 2 charts, 1 line chart for Trainer and Trainee number statistics, 1 fan chart showing student's aniticipation graph.

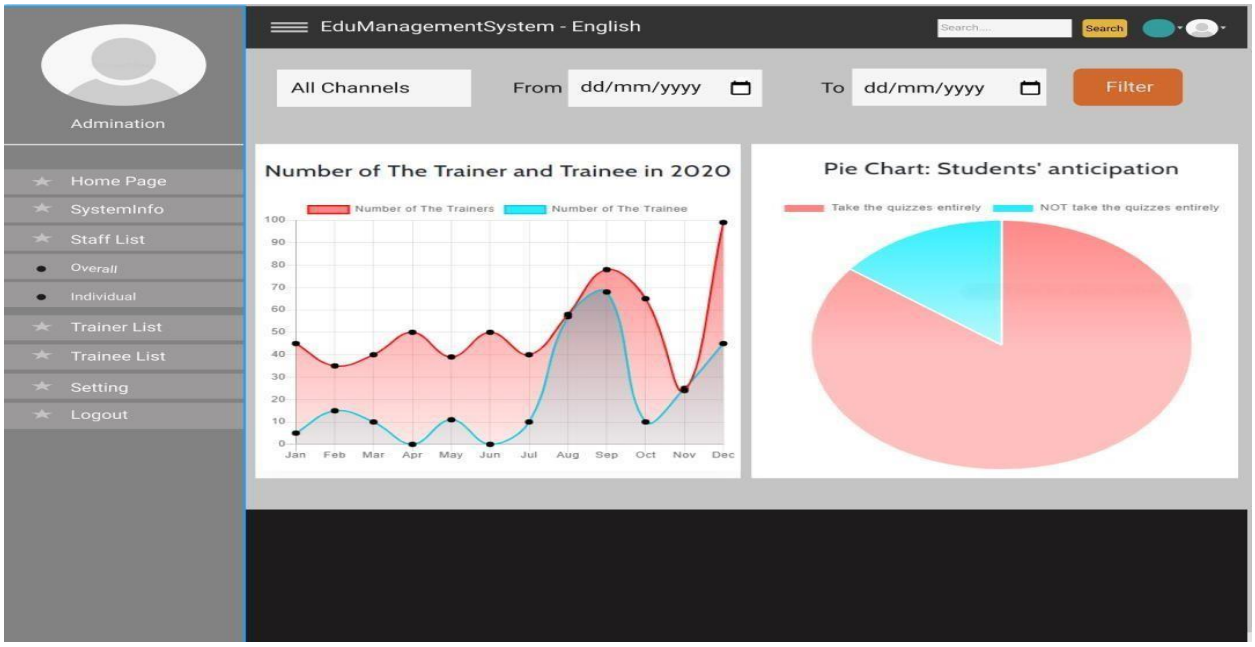


Figure 12. Overall page

Staff List ,Trainer List , Trainee List page

These 3 pages have the same design because only user stats are statistical so the only difference of these pages is its figures and parameters. The main content component of these pages is the statistics table of the number of users and its information.

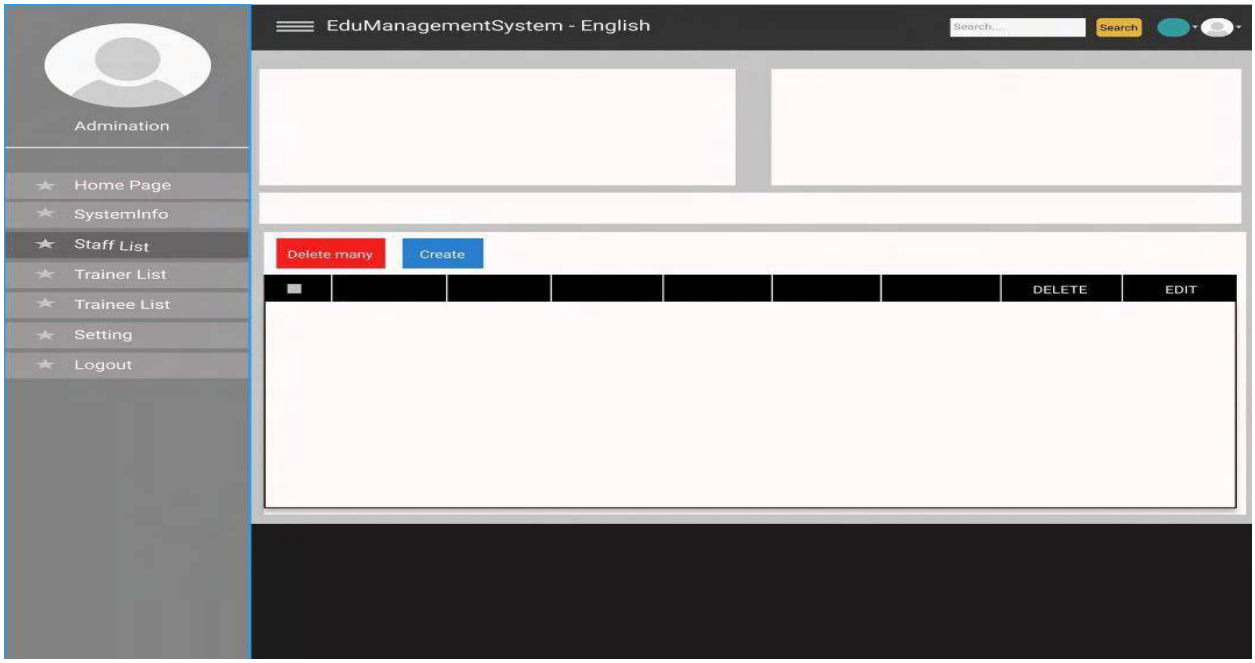


Figure 13 Staff List ,Trainer List , Trainee List page

Course page

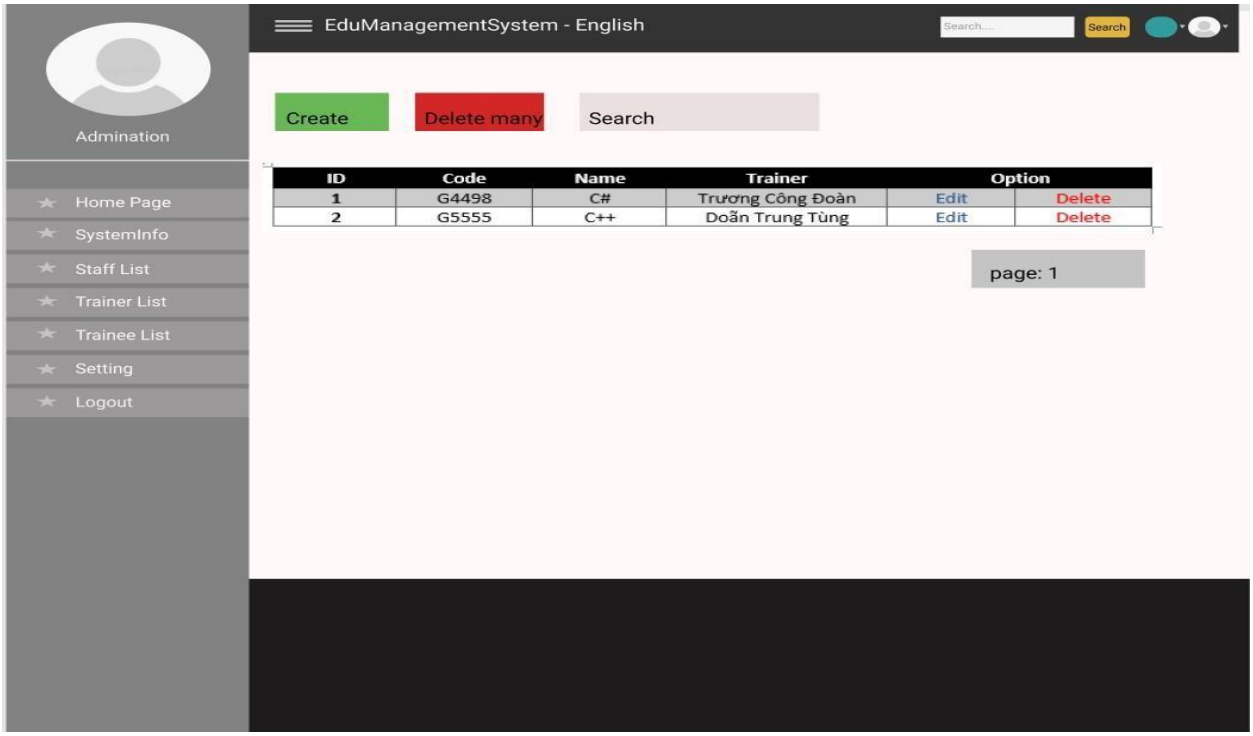


Figure 14 Course page

This page arranges the course for trainer.

Create Course pop up

Because the web is written in Single page Application (SPA). The SPA will load a single HTML page, then based on the user's request, the SPA will continue to load other HTML in the same page so use pop ups for functions that will optimize more effectively for the user experience.

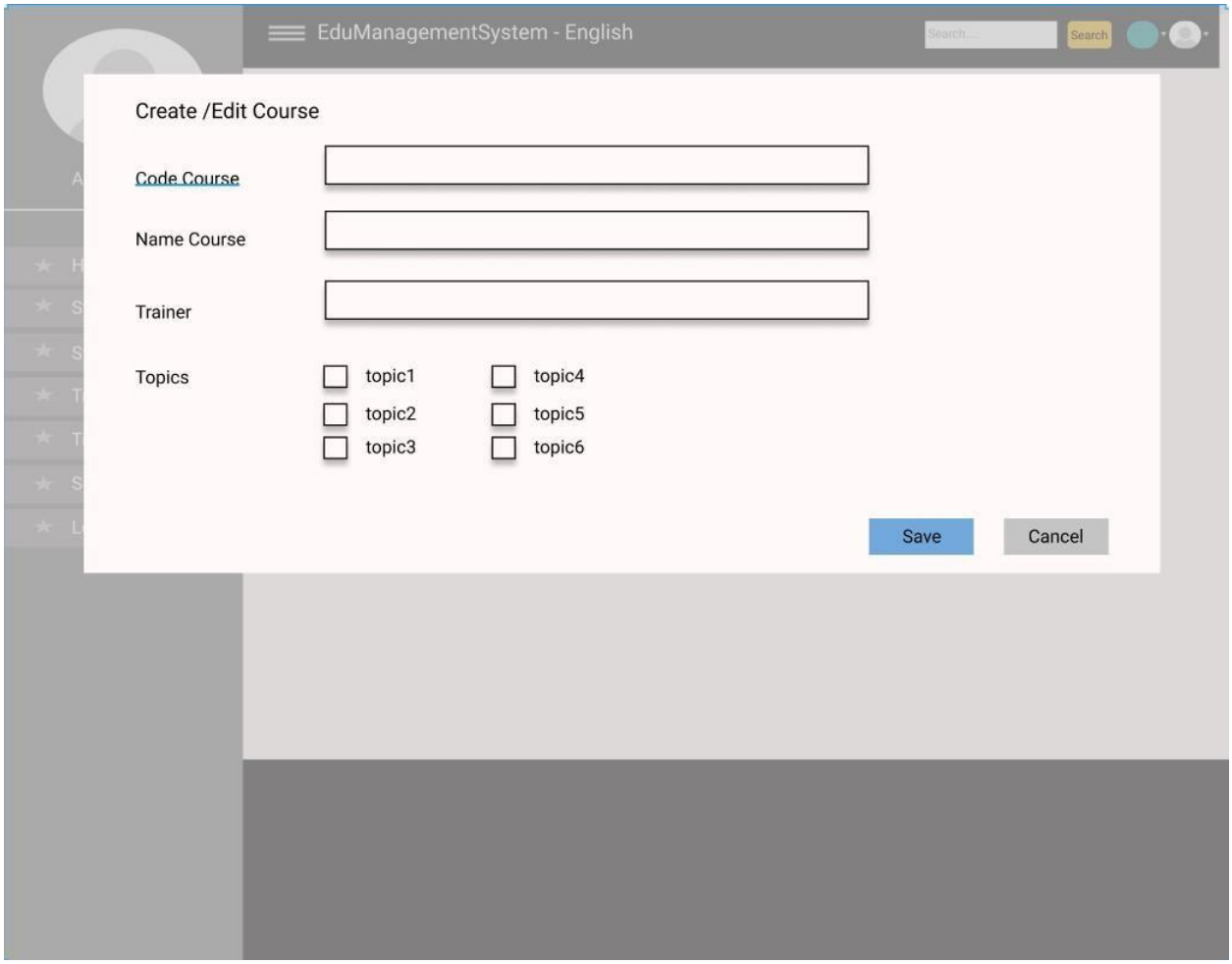


Figure 15 Pop up create course

5.1.1.8 Topic page

Pages for creating and managing topics

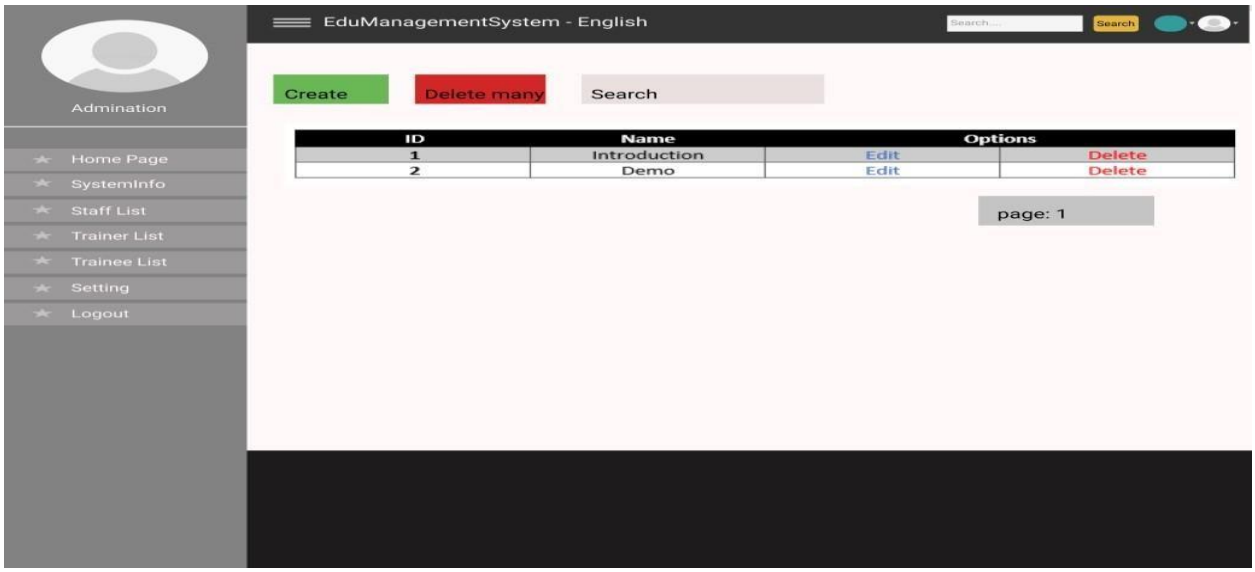


Figure 16 Topic page

Popup create Topic

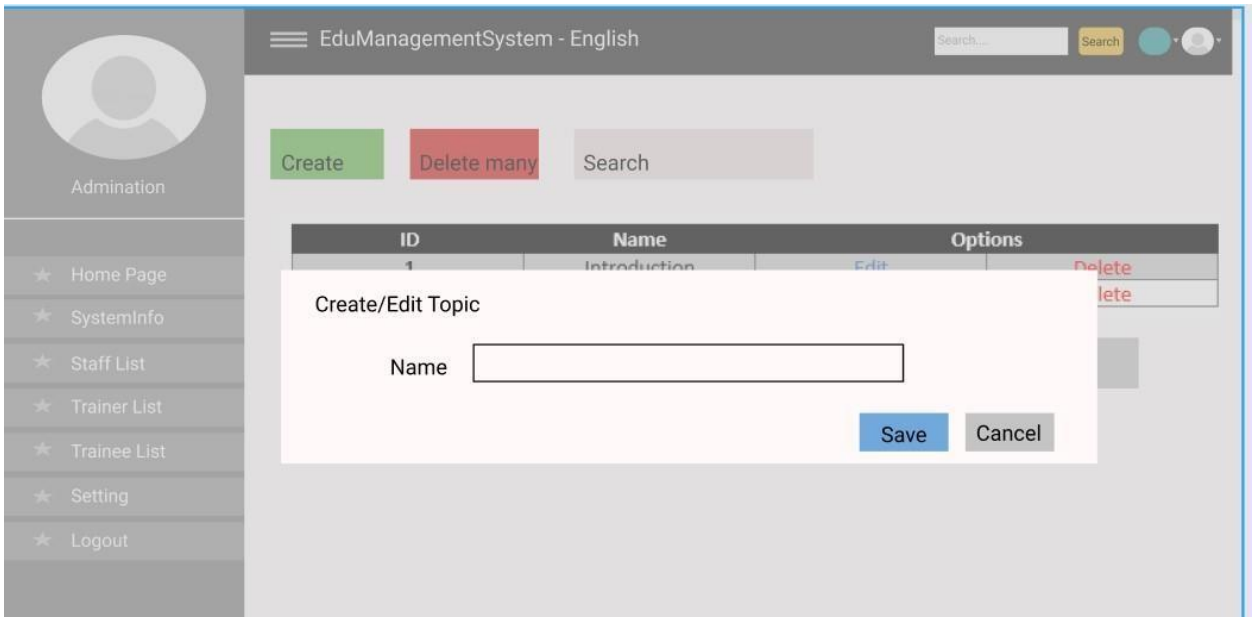


Figure 17 Popup create Topic

Profile page

This is a user information management page. Consisting of 2 main components, 1 is a sub-component on the left that displays avatars, usernames, and their roles. 2 is the main component on the right that displays all user information.

Figure 18 Profile page

Trainer view course

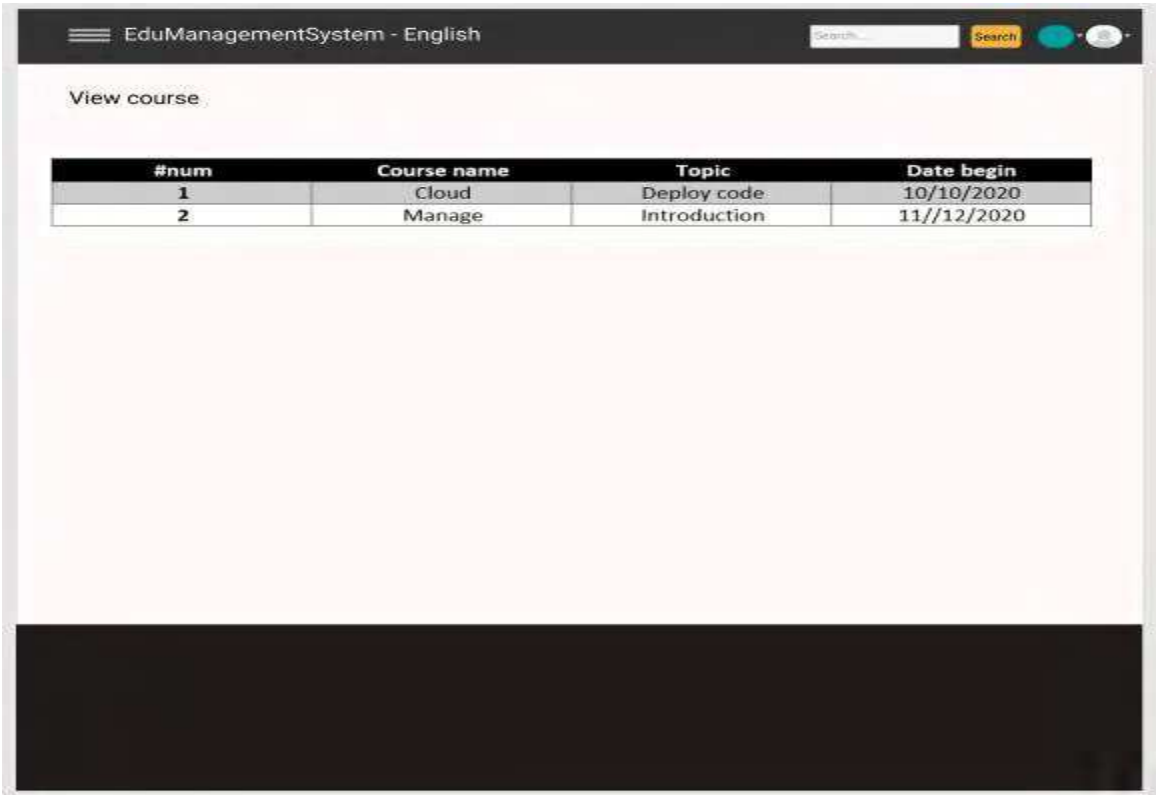


Figure 19 View Course - Trainer

Hardware Interfaces

Terminal

Supported devices use that software that PC, mobile . The software is a website where all information is uploaded on web browsers installed in computers and phones and other hardware that supports the connection of data from the server . We can therefore list the relationships between software product and the hardware elements of the system .

The software is written as a web application - a computer program that uses web browsers and web technology to perform tasks over the Internet. Cho nên nó hỗ trợ những thiết bị đầu cuối như PC , laptop,smartphone .

For PCs – machines running windows 7 or later, Linux, IOS with web browsers such as chrome, fire fox, chromium + , Opera can access the website on the condition that it is connected to the Internet.

For Smart phone, Tablet runs android operating system, IOS and has browser, with Internet connection can access the website.

The app does not run on mobile wearable devices such as smart watches, phones without operating systems or phones in older generations such as nokia 1200.

These are terminal hardware, followed by hardware related to the app run section.

Server

In order to make the website public on the Internet, we need a server that holds code and databases. Servers typically run in a client-server model, the server (server) is a computer program operating to serve requests from other applications and customers. Therefore, the server executes multiple functions on behalf of the client.Clients typically connect to a server over a network but can run on the same computer. In Internet Protocol (IP) network infrastructure, a server is a program that acts as a socket (listening protocol) listener.

Software Interfaces

- Terminals such as PCs, Laptops need operating systems such as Window, IOS, Linux to be able to launch web browsers. Web browsers such as Chrome, Mivrosoft Edge, FireFox are software that can run web applications.
- Similar to PCs, smart phones and tablets use Android operating systems version 4.0 and IOS to be able to run web browsers and access web sites.

- The platfrom to develop this website is Window. MongoDB is the database we choice.
- Development-language : HTML,JS,CSS,Vue -> There are a common language to deverlop website and its have alots opensource.
- Development-software: Visual Studio Code ->This is a ERD developed by Microsoft and it very fit with window plafrom .

This section will describe the necessary functions of the software

No.	Requirement	Priority[1]
1.0	Content Types	
1.01	• The PASSTINTION PROJECT must back the creation and utilization of content sorts. The current set of substance sorts that are made and utilized, in both English and Vietnamese, and must be backed, incorporates:URLs • Links • Pages • Images • Common page – top left and bottom • Events • Embedded code (gadgets) • Fixed and Variable Page Components	**3**
1.02	The PASSTINTION PROJECT must back the creation and utilization of settled page component substance sorts. Settled page component substance sorts are common route things on pages; they are fixed for a page layout.	**3**

1.03	The PASSTINTION PROJECT must promote the development and use of content styles for variable page components. Relevant sections of a website containing a mixture of links and text are variable website components. These components should be interchangeable and can be put anywhere on the website (in the right nav or in the main area of content).	**3**
1.04	The PASSTINTION PROJECT shall facilitate the development and use of content styles for fixed and variable page elements on the same web page.	**3**
1.05	In order to fulfill comply with section 508, the PASSTINTION PROJECT must promote the ability to enter relevant metadata and values for each content category.	**3**
1.06	The PASSTINTION PROJECT would encourage the opportunity to revise current categories of content and generate new types of content for Internet phenomena that do not occur at present.	**3**
1.07	The PASSTINTION PROJECT would facilitate the allocation of individual content elements to different pages and modules, e.g. the allocation of individual connections to multiple pages at various positions on the pages.	**3**

1.08	Without needing to open and manipulate each of the pages and their elements, the PASSTINTION PROJECT would help this task.	**3**
1.09	The PASSTINTION PROJECT must assist approved users to determine whether metadata values are entered through the keyboard input or the managed vocabulary words dropdown list.	**1**
2.0	URLs	

2.01	The PASSTINTION PROJECT would have URLs in the website that have several linked links.	**3**
2.02	A validity check for URLs must be sponsored by the PASSTINTION PROJECT upon entry, but if this check fails, it does not preclude the user from saving the URL.	**3**
2.03	The PASSTINTION PROJECT periodically changes the 'most revised date' of the website when it edits the URL found on the website.	**2**
2.04	The PASSTINTION PROJECT would help the breaking of URLs into internal (website) and external site references. .	**1**
2.05	Editing an existing URL should result in an immediate republication without permission on any sites containing links that use the URL.	**3**
3.0	Links	
3.01	In order to be able to build connections in the content management application, the PASSTINTION PROJECT must support an authorised user. Multiple connections can have a URL. A link is what you see shown on the website for the web user to click on, and the URL is where they will be taken when they click the link. The PASSTINTION PROJECT shall support the creation of several links associated with the same URL by an authenticated user in order to define the alternative link text and other attributes.	**3**
3.02	The framework has to provide the content manager the right to connect a file to a connect. If the file is an image, the image should be shown next to the link or, as defined by the HTML templates, instead of the hyperlink text. Images can be made clickable for users so that they are redirected to the URL stated in the link when they click on the image.If the file is not an image but any other format (pdf, etc...), the user will be taken to the file defined for uploading or displaying by clicking on a connection.	**3**

3.03	The system can show all the current link titles for that URL when constructing or modifying a link and when the user looks for a URL to be connected with the link.	**2**

3.04	After being updated or added / removed from a published page, links should be published automatically: When creating or modifying a link, and the website owner is the content manager who makes or updates the link, the warning process is bypassed. This note would contain the page in question and the name of the connection that was	**3**
	changed, as well as the name of the person who made the change and the date / time of the change.	
4.0	Page Types, Templates	
4.01	To create webpages, the PASSTINTION PROJECT must use website templates.	**3**
4.02	The PASSTINTION PROJECT shall assist registered users in the development, alteration, registration, maintenance and deployment of page templates and styles to individual pages containing and displaying content created and maintained in the content management system.	**3**
4.03	The PASSTINTION PROJECT would respect the right of registered users to pick page styles and templates from a list while designing pages.	**3**
4.04	In order to distinguish page templates and styles, the PASSTINTION PROJECT must facilitate the development, adjustment, positioning and management of various page modules and component styles.	**3**
5.0	Pages (webpages)	
5.01	The PASSTINTION PROJECT would assist an registered user by using page styles and templates to be able to build new pages on the framework. A website is a specific instance of a type of document. It refers to a text that would be accessible to a	**3**

	user-selected internal URL by a visitor to the website of the department.	
5.02	For all pages of the internet, the PASSTINTION PROJECT must support the identification of owners.	**3**
5.03	The PASSTINTION PROJECT must have an automated, default 'owner' page assignment based on username login, with an override option.	**2**
5.04	The PASSTINTION PROJECT would help approved users so that they can post web pages at will without going through the usual approval process.	**3**
5.05	In order to be able to access a full list of sites, the PASSTINTION PROJECT would support users.	**1**[2]
5.06	For all webpages created, the PASSTINTION PROJECT must provide for the generation of human-friendly internal URLs.	**3**
5.07	The warning process is bypassed when modifying a page and the content manager modifying the page is the page owner. If the web editing content manager is not the owner of the web, a notice must be sent to the owner of the page by e-mail describing which user has updated the page and when the change was made. The website should not be immediately released by generating or modifying an unpublished website (the page 's building metadata property is set to "yes") before the building metadata property is set to "no." You must accept all page updates. Note: This restriction only applies to direct page editing (such as editing the headline of a page) and does not extend	**3**

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	to modifications to elements, links or URLs that can impact a page indirectly.	

5.08	Until posting a page, the PASSTINTION PROJECT shall apply the following validation guidelines. If all of the above rules are broken, the document must be returned to the owner of the document with a notice stating which infringement law has been broken and what measures must be taken to address the problem before the page can be released.	**3**
5.09	Before it can be written, any page must have at least one item on it.	**3**
5.10	A special friendly URL must be allocated to any website before it can be written.	**3**
6.0	Components	
6.01	A PASSTINTION PROJECT must support a multi-component page that is positioned on a page in the order and position identified by the content manager. Components are areas containing a series of hyperlinks on a page that share a similar classification, an individual connection, text , image or other HTML with a predefined look and feel.	**3**
6.02	The PASSTINTION PROJECT will encourage the presence of an entity that is defined by: • The sort of page that the item appears on; • The position on the website the item appears on; • The part content; and • The part form.	**3**
6.03	The PASSTINTION PROJECT will endorse title types to be designated for components by the material contributor. .	**3**
6.04	The PASSTINTION PROJECT will endorse the following section title style definition: the title is made in the HTML distinguishing style, as defined by the template page. And, if the page is a Table of Contents page, in the Table of Contents package, the title must be included in the Table of Contents.	**3**

6.05	The PASSTINTION PROJECT will support at least three (3) description styles available for links created in the component: secret (not shown), right (descriptions are shown to the right of the link text, followed by a '-'), and below (descriptions are shown below the link text).	**3**
6.06	The PASSTINTION PROJECT will support at least two (2) translation types available for links created in the component: secret (not shown), noticeable (translations are shown below the link text and explanations of the links above).	**3**
6.07	The PASSTINTION PROJECT supports a text entry area where it is possible to enter HTML or text to be viewed in the component. This field represents the definition of that variable.	**3**

6.08	The PASSTINTION PROJECT would support the use of photos, i.e. a related file that will be presented as defined in the HTML templates for such product forms. .	**3**
6.09	The PASSTINTION PROJECT will support the use of “more” links, that is, an associated link that will be displayed for certain types of components as described in the HTML templates.	**3**
6.10	The PASSTINTION PROJECT will encourage the reuse of components on numerous websites.	**2**
6.11	The notification process is bypassed when editing content and the content manager editing the article is the article owner, and the page with the change is automatically republished. If the content manager editing the component on a website is not the owner of the website, the page may also be automatically republished, but with an e-mail notice to the owner of the page explaining which person updated the component, on which page the component is shown, and when the modification was made. The website can not be immediately released by generating or modifying components on an unpublished	**3**

	website (the page's building metadata property is set to 'yes') before the building metadata property is set to 'no'.	
7.	Standard Navigational and Fixed Page Components	
7.01	ıign, modification, maintenance and registration of navigational and fixed page components for the modification and maintenance of page templates and nust be assisted by PASSTINTION PROJECT. The existing ɔn contains:Banner {with and without Search box} ✦ Bottom Nav ✦ LeftNav-{Multiple instances with numerous links; ✦ depending on the page case, it can be switched "on" or "off"} TopNav ✦ Channels (the rollover effect tab images) ✦ Footer ✦ Box Services ✦ GovDelivery button {each instance has a distinctive ✦ identifier}	**3**
7.02	PASSTINTION PROJECT would promote the use and re-use of these modules and components across several pages, especially for the creation of page templates and forms.	**3**
8.0	Variable Page Components	
8.01	PASSTINTION PROJECT shall promote the ability of all page styles and models to make content boxes / areas that could include connections, graphics or other file types.	**3**

8.02	When setting the properties for a component, the PASSTINTION PROJECT will show the links to be shown in the component (links with the corresponding classification) in order to be shown on the final page (alphabetical if this is	
	the sort order, the manual sort order defined if this is the sort order, etc.).	
9.0	Full Website	
9.01	PASSTINTION PROJECT would enable content contributors to be willing to publish the entire website on request.	**3**
9.02	PASSTINTION PROJECT would support human-readable URLs that can be used as navigation aids for end-users.	**3**
9.03	The PASSTINTION PROJECT shall help the workflow.	**3**
9.04	The PASSTINTION PROJECT must promote the association of all page-level material to a workflow, so that the copy editor can be checked before release.	**3**
9.05	PASSTINTION PROJECT must help the approved user in order to create new workflows and change current workflows in the graphical user interface.	**2**
9.06	PASSTINTION PROJECT would endorse automated backup every day.	**3**
9.07	The PASSTINTION PROJECT would assist the in-house administrator in order to be able to add and delete users and change their permissions in the PASSTINTION PROJECT and reset users' passwords, and to do so via a graphical user interface.	**3**
9.08	PASSTINTION PROJECT shall facilitate the development and alteration of user functions, content and authorizations. The current collection of user functions and material and approval approvals include, in descending order,: administrator, material contributors, and copy editors.	**3**

9.09	PASSTINTION PROJECT would promote the capacity of the company to build 508 and WCAG 2.0 compatible websites.	**3**
9.10	PASSTINTION PROJECT would support spacer images (transparent and used for page layout architectural purposes only) with an alt tag having a null(“”) value only.	**3**
9.11	PASSTINTION PROJECT shall help generation and show to internal users only the following reports: • A complete list of all sites released by the PASSTINTION PROJECT • A complete list of all live links published by the PASSTINTION PROJECT • The A-to-Z index with all unique ties to the A-to-Z headers in each segment. • Both websites, with the owners of the website listed • None of the URLs The user requesting the generation of the report shall be granted the right to select which metadata fields will be shown (and the content shown in the filtered files) in the files.	**2**
9.12	The PASSTINTION PROJECT must support multi-lingual capabilities.	**3**
9.13	The PASSTINTION PROJECT must be user-friendly and have an intuitive graphical user interface.	**3**

9.14	The corresponding website must be open to the public 99.999% of the time (not counting scheduled maintenance windows).	**3**
10.	Content Search Function	
10.01	The PASSTINTION PROJECT should provide a single centralized search framework for all searchable areas.	**3**

10.02	PASSTINTION PROJECT must provide the ability to specify multiple operands and search operators, and must provide the ability to specify the operands between search parameters. .	**3**
10.03	The PASSTINTION PROJECT can provide simpler search parameters (using keyword object, title, classification, URL or ID number) or the option to customize search screens with simpler search parameters, without operands, e.g. equal to, less than, etc.	**3**
10.04	PASSTINTION PROJECT shall help the right of users to browse by language.	**3**
10.05	The PASSTINTION PROJECT would help users' right to scan Spanish language content.	**3**
10.06	PASSTINTION PROJECT will have a search interface that allows users to search for Spanish language content without using html object references.	**3**
10.07	The PASSTINTION PROJECT search feature will not be case sensitive, nor will diacritical marks be retrieved when looking for information, e.g. when looking for Espanol, Espanol, Espanol and Espanol, should all yield the same results.	**3**
10.08	The PASSTINTION PROJECT will include the functionality for all available content operations (delete, publish, etc.) to be available from the search results screen so that these activities can be done on the basis of the content discovered during the search.	**3**
10.09	The PASSTINTION PROJECT will have configurable search results screens so that metadata can be inserted or omitted from the search results page.	**2**
10.10	The PASSTINTION PROJECT search gui must be open to the keyboard. Specifically, users must be able to tab to the next area of entry.	**2**

10.11	PASSTINTION PROJECT shall provide search features in such a manner that the order of the search words entered by users does not matter. For example , searching for "house white" could return "house white."	**2**
10.12	When looking for photos and connections, the PASSTINTION PROJECT will display a preview of the image on the results page.	**1**
10.13	When looking for connections, the PASSTINTION PROJECT will show the corresponding URL in the output.	**2**
10.14	When looking for information, inside the search results, the PASSTINTION PROJECT must provide the user with a	**3**
	numerical count of the returned items, the title of the object, the definition of the object (if applicable) and the search results elements.	
10.15	The PASSTINTION PROJECT must help the user to be able to click on the search results feature, and the answer should be to start the editing process if the user is allowed to change the piece.	**3**
10.16	When searching for URLs, the PASSTINTION PROJECT must provide the option to view all relevant link titles for each URL in the results.	**2**
10.17	The PASSTINTION PROJECT would help the hunt for substrings.	**3**
10.18	When looking for connections, the PASSTINTION PROJECT must show the URL used by the returned connections as one of the findings.	**2**
11.0	Overall PASSTINTION PROJECT Functionality	
11.01	When searching content in a repository, the PASSTINTION PROJECT would encourage the user to choose how the content is sorted.	**2**

11.02	PASSTINTION PROJECT shall have sorting options that include metadata objects which shall include title, date of creation which date of change.	**3**
11.03	PASSTINTION PROJECT would provide a way for machine users to see what is already written and what is pending release.	**2**
11.04	The PASSTINTION PROJECT will have features so that the language is chosen automatically (with an override option) depending on the user logging in. That is, each user should be able to connect to the default language that is then chosen as the default content metadata option.	**2**
11.05	The PASSTINTION PROJECT shall allow the entry of Spanish diacritical marks using Windows alt-number keypad combinations and/or the normal Microsoft Word system for the use of the control key, apostrophe and vowel or the letter n .	**3**
11.06	PASSTINTION PROJECT would allow the editing of existing HTML templates and the development of new ones by registered users. .	**3**
11.07	PASSTINTION PROJECT would provide content participants with the opportunity to create a web-shared widget / gadget from a collection of links aligned with a classification based on HTML templates.	**3**
11.08	PASSTINTION PROJECT can help content contributors to be able to apply widgets / gadgets from other websites to this framework and their websites.	**3**
11.09	PASSTINTION PROJECT would have the opportunity for gadgets / widgets to be spread across (appears on) several websites.	**3**

11.10	PASSTINTION PROJECT shall provide users with the right to access the past of any information object or file.	**1**

11.11	The PASSTINTION PROJECT must be sponsored by content contributors 24 x 7 x 365, be available through the internet and should not require any external program installs on the contributors' PCs.	**3**
11.12	PASSTINTION PROJECT must maintain an audit record of all content updates (including additions, adjustments, and deletions) so that management can evaluate what prompted any particular improvements to the website to occur and help in troubleshooting efforts.	**1**
12.0	Managing Pages, Components, Classifications	
12.01	The PASSTINTION PROJECT would provide the features for the page form to be updated after a page has been created.	**3**
12.02	The PASSTINTION PROJECT shall provide default ownerrelated metadata (e.g., Author, Modifier, etc.) to the current user logging in, and the PASSTINTION PROJECT shall provide the meaning for the owner of the page to be modified by the user logging in through the drop down menu.	**2**
12.03	PASSTINTION PROJECT will have the opportunity to produce an RSS feed from any collection of traditional classification links.	**2**
12.04	The PASSTINTION PROJECT will have the potential for page owners to view the page utilities or not for each page.	**1**
12.06	PASSTINTION PROJECT shall provide methods for the aggregation and syndication of content. {Syndicating – RSS feeds, widgets; aggregating – taking external content and placing auto-collections on the pages.}	**3**
13.0	Display of Content (in Preview)	
13.01	The PASSTINTION PROJECT preview feature would allow content managers to perform in-context editing.	**2**
14.0	Website Publishing	

14.01	From the moment the user releases a piece of content, it can be shown to the public in less than 30 minutes. PASSTINTION PROJECT shall allow approved users to determine the date of publication by the calendar date and 1⁄2 hour..	**3**

14.02	If a page is freshly created, the option to submit a page to the copy editor for review and approval before publishing should be defaulted to yes. Otherwise, the preference should be set to no by default.	**1**
15.0	Archiving	
15.01	PASSTINTION PROJECT must support content contributors in order to be able to specify a link, page or URL archive date down to the calendar date and 1⁄2 hour. The default date / time specification of the archive should be "never." (Archiving means that the content exists inside the PASSTINTION PROJECT, but is no longer shown on the website visitor.)	**3**
15.02	PASSTINTION PROJECT would help content authors in order to be able to store pages in a system database with metadata attributes and link names. The default value of the archive should be "never."	**2**
15.03	Archiving material does not have a negative impact on the success of PASSTINTION PROJECT.	**2**
15.04	Archiving a website is not intended to store all material on that website. .	**2**
15.05	PASSTINTION PROJECT would provide accessibility for the disabled, and thus not written, with individual links on an individual website.	**3**
15.06	PASSTINTION PROJECT can provide functionality for archiving external links and URLs and their attributes forever.	**3**

15.07	For links, archiving a connection will entail deleting any instance of a connection through the pages, and the usual link update notification procedure will be followed.	**1**
15.08	For internal URLs, archiving will include the discovery of the affected pages, the removal of the pages from the website, all links to the indexed list, the alteration of the published date of the pages and the automated publishing of the pages.	**1**
15.09	For external URLs, archiving will include finding the links and pages impacted, deleting links from the pages, updating the date of publication of the pages and automatically publishing the pages.	**1**
15.10	PASSTINTION PROJECT can have UN-archive sites, links and URLs with features.	**3**[3]
15.11	The PASSTINTION PROJECT would encourage the user to opt to view archived objects in the search results, and if so, they will be flagged.	**1**
15.12	PASSTINTION PROJECT shall enable content participants to be able to plan the removal of a piece of content or a form of content from the show to the website user by the calendar day and by the half-hour clock.	**2**
15.13	If a piece of material is expected to be deleted in the future, the administrators of the pages that have the contents on the page that are being archived will be informed via e-mail until the archiving is complete.	**3**
16.0	Cascade Delete	
16.01	PASSTINTION PROJECT must enable the material contributor to the cascade to remove the URL from the PASSTINTION PROJECT. That is, anytime a user cascade deletes a URL, the PASSTINTION PROJECT will have an impact statement that shows links (and the sites on which such links appear) that use the URL (including cached links and sites).The	**3**

	PASSTINTION PROJECT would then inquire whether or not the material contributor will like to continue with the	
	deletion. If the content contributor chooses yes, the PASSTINTION PROJECT will uninstall the URL and the related links. In addition, the pages containing the links will be republished without any workflow notifications.	
16.02	The PASSTINTION PROJECT must enable the material contributor to the cascade to remove a page from the PASSTINTION PROJECT. That is, anytime a user cascade deletes a website, the PASSTINTION PROJECT can include an impact statement that shows links (including cached links) that connect to the website (and the pages on which those links appear). The PASSTINTION PROJECT would then inquire whether the material contributor wants to continue with the deletion or not. If the content contributor chooses yes, the PASSTINTION PROJECT will delete the website (and any related elements that do not appear on any other website) and the related links to the page, as well as the internal URL used for the page. In addition, the pages containing the links to the page will be republished without any workflow notifications.	**3**
16.03	When deleting a connection, the PASSTINTION PROJECT must verify if the URL used by the connection is used by some other link. If no other link uses the URL, then the results of this review must be provided to the user with the ability to uninstall both the link and the URL. In this case, any pages connected to it should be reprinted without any workflow alerts after the connection has been erased.	**3**

16.04	When deleting a connection, the PASSTINTION PROJECT must verify if the URL used by the connection is used by some other link. If no other link uses the URL, then the results of this review must be provided to the user with the ability to uninstall both the link and the URL. In this case, any pages connected to it should be reprinted without any workflow alerts after the connection has been erased.	**3**

Ranking of priority functions

Priority Score

Nice to have	1
Want to have	2
Must have	3

Other Non-functional Requirements

Performance Requirements

System performance is very important. It affects the experience of all system users. After consulting with some clients in the FPT education system, here are some requirements for the system's performance:

- Continuity: system performance affects the continuity of teaching and learning. To ensure that continuity, the system must ensure continuous and effective working 24/24, 7 days a week.
- The system must be light enough to be accessed from low-tech devices but still be fast enough to not compromise the user experience.
- The system performance should be able to withstand 1000 online accounts at the same time.

- The system response time must be low, instantaneous with each user request.

Safety and Security Requirements

Security is always a risk of every product, every system. Systems with low levels of security can be hacked and cause problems for corporations. System data such as information about courses, lecturers, students ... are important things that need to be protected in the corporation.

Security policy:

- Always back-up the data.
- Scan your website for vulnerabilities often.
- Keep everything up to date.
- Take a very strict password strategy in place.

After consulting with some clients in the FPT education system, here are some requirements for the system's security:

- The passwords of all accounts have to be encrypted.
- When an error occurs on the system, it only provides error messages to the user, don't provides error details for the user.
- Only allow system access using internal school accounts.

Software Quality Attributes

To understand the consistency of the software landscape, it is important to address the commonly asked question: what is it? Quality? Quality? If the definition of consistency is known, it is easier to consider the various quality systems. It's available on the market. As follows, and before we embark on a quality quagmire, we're going to spend some time

figuring out the question: what is quality? As several influential scholars and analysts have given an answer to this issue.Query, we do not have the ambition to have yet another response, but we will rather answer the question by Research the responses that some of the most influential gurus in the quality control world have given.Through knowing about those who have been down this road before us, we will recognise why there are two main camps.Discuss the significance and concept of (software) quality.

1) Conformity with the specification: quality specified as a matter of goods and services for which it is measurable;Characteristics follow the standard – that is, the compliance with the standard specified in advance.

2) Consumer needs: consistency that is calculated regardless of all observable

characteristics. That's true,Quality is characterized as the capacity of goods or services to satisfy the standards of the customer – whether explicit or not.

Name	**Feature**
Testability	+ Having 98% unit test coverage back and front end + Continually check the code and check fix errors and check in loops until the test c resolved.
	+ Check security and traffic regularly to detect security vulnerabilities .
Modifiability	+ Upgrading all-third party libraries and frameworks to be the newest major version no in 15 days since their release date.For libraries that do not need to be updated, if the u may be error due to config code in the source with the new library version. + Having all infrastructure in code to make it simple changes to provisioning and deploy processes + Program code may meet new version updates for the future
Analysability	+ All pages of website loading time should be less than 200ms + Validate in all inputs so that the data is clean before being saved to the database. + Every user's click in the system must be strictly followed in a third party tool
Functionality	+ A set of attributes that relate to the existence of a set of functions and their spe properties. The functions are those that satisfy stated or implied needs.

Replaceability	+ The characteristics of software that contribute to the ability and commitment to use the place of use.Other functionality has been listed in the software environment. backend can always be updated to release new versions

6 . Design Tool

UML Definition

Definition

According to (Jesús García-Molina, Ana Moreira, and Gustavo Rossi, 2004), UML (Unified Modeling Language) could be a dialect for indicating, visualizing, building, and documentation of program systems.

UML gives the opportunity to type in framework plan, counting concepts such as commerce forms and framework functions.

Specifically, it is valuable for explanatory dialects, database mappings, and reusable computer program components. UML was developed by Rational Rose and several collaborating groups, which quickly became one of the standard languages for building object-oriented software systems (Object-Oriented).

UML gives a set of extension mechanisms to address this issue, which enable the customization and extension of its very own syntax and semantics in order to adapt to sure software domains.

UML provides users with a ready-to-use and meaningful visual modeling language:

- Allows the development and exchange of models with multiple meanings.
- Provides extensibility and specialization to expand core concepts.
- Independent of a specific programming language and development processes.
- Provides a foundation for modeling language understanding.

- Encourage and support the development of object-oriented tools.
- Supports high-level development concepts such as collaboration, framework, pattern and component.
- Integrate best with practice.

Therefore, we determined the use of UML to describe the behaviors and constructions in my project. UML is linked to object-oriented sketch and analysis. UML makes use of elements and forms of linking between them to shape a diagram. UML diagrams can be divided into two types:

- **Structure Diagram**: Describes components of the structure. Some shape graph such as Component diagram, Class design and Deployment diagram...
- **Behavior Diagram:** Describe the aspects of gadget behavior such as Use case diagram, Activity diagram, Sequence diagram...

Example of using selected UML tool.

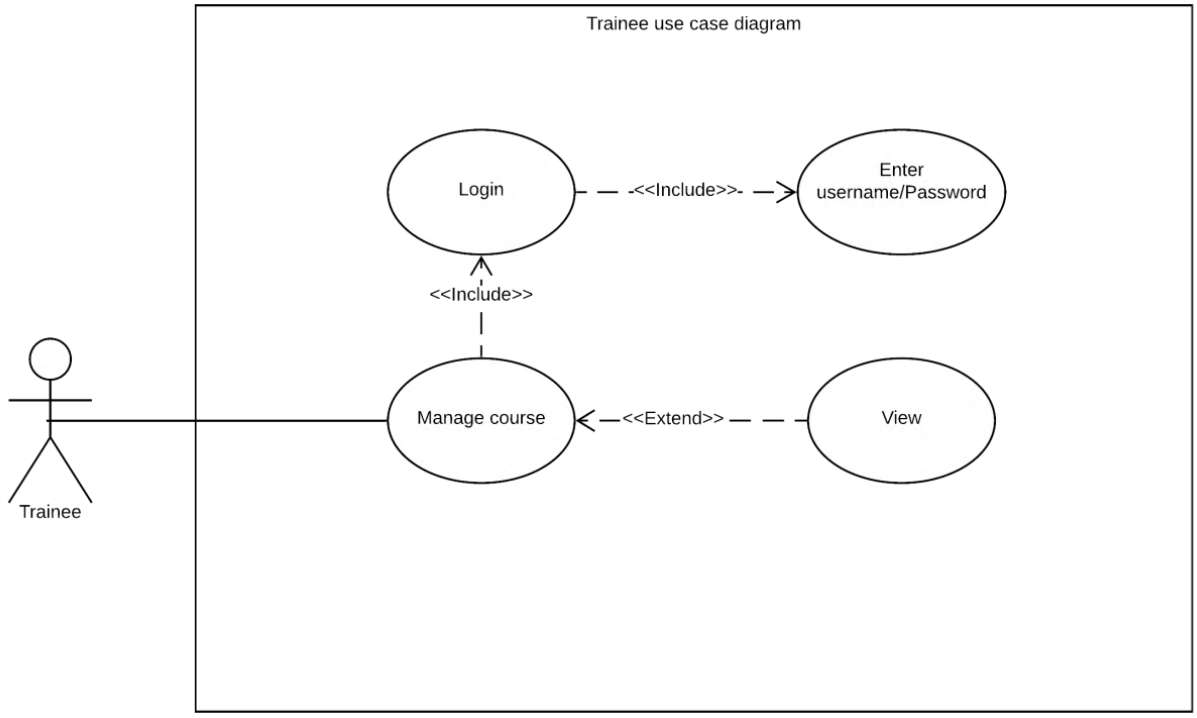


Figure 20. Example of using Draw.io to design UML.

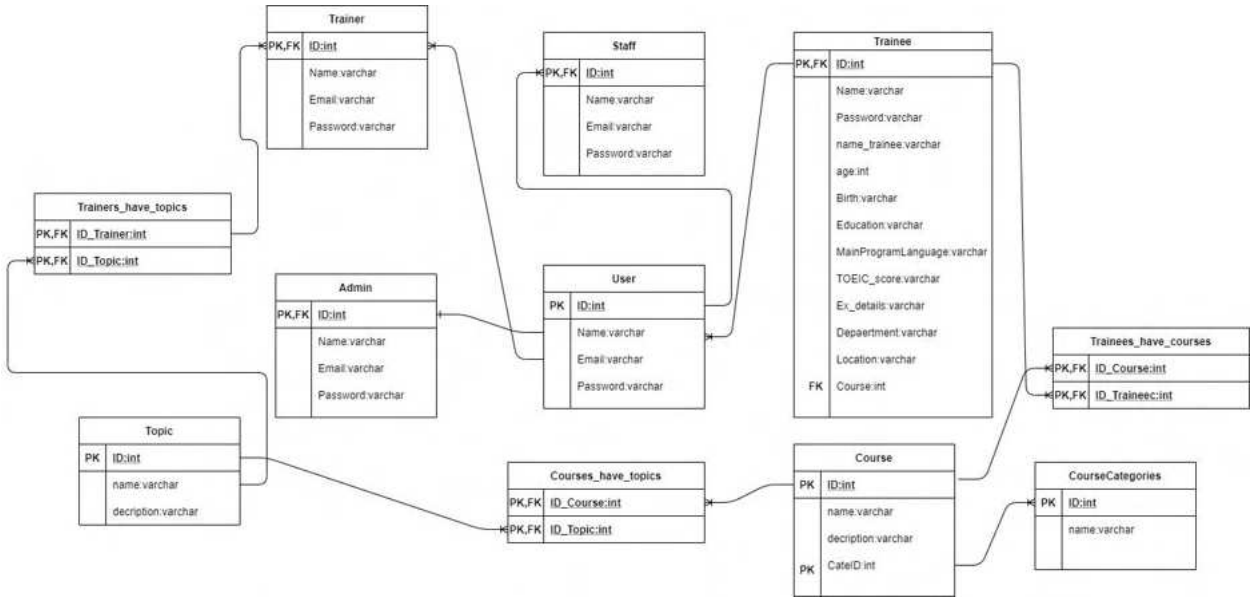


Figure 21. Using Draw.io to design ERD.

Chosen design tools and justify.

UML Tools

According to (Lena Khaled, Department of Software Engineering, Zarqa Private University, Amman, Jordan, 2009), following is the comparison between few UML tools:

TOOLS	Evaluate	Free	Features
Visual Paradigm	✦ Tailored for engine software projects. ✦ Model enterprise statistics system and improvement processes.	✓	✦ Support for BPMN, UML, ERD, DFD, SysML. ✦ Total instrument like for prepare investigation, framework plan, database plan, etc.

			✦ Offers client story highlight to capture and keep up user's needs.
	✦ It totally bolsters UML2 and BPMN2, and gives expansions (modules) for SysML modeling, TOGAF modeling, Java (code era, roundtrip & switch)	✓	✦ Modelio offers an XMI import/export highlight that empowers you to trade UML2 models between different devices. ✦ You can expand Modelio for any dialect, technique or modeling procedure.

			✦ It offers coordinates back of the Python scripting dialect.

 Draw.IO	✦ Draw.IO could be a free online UML tool. ✦ It permits clients to make and oversee the drawing effectively these devices. ✦ A part of the wide and early share accessible with this tool.	✓	✦ No constrain on the number of sizes. ✦ Templates are show in program plan itself. ✦ Allows you to spare the demonstrate in your favored location.

	An open source computer program modeling instrument. It gives eleven sorts of chart. StartUML 2 is consistent with UML 2.x versions.	✓	✦ Allows you to form Obje3ct, Utilize case, Arrangement, Seque3nce, Communication, Movement, and profile Diagram. ✦ Allows you to find and introduce thirdparty extensions. ✦ Work with same UX in numerous stages counting macOS, Windows, and Linux. ✦ No constrain for utilizing this commercial computer program for evaluation.

	✦ Very advanced		

	editor with tons of features. ✦ Including venture administration, scrum. ✦ Extended route between connected diagram/elements. ✦ GUI not as great as Visual Worldview, lost essential features.	✕	✦ Helps you for viable venture management. ✦ Highperformance demonstrate repository. ✦ Offers End-toend traceability. ✦ Powerful report generation.
	✦ ✦ Makes visual program plan down to earth for any project. Can be created utilizing Java, C++, C#, or Visual Basic.	✕	✦ Intuitive Visual Modeling for all UML Diagrams. ✦ Helper windows permit you to construct your wanted models. ✦ It permits you to include hyperlinks to any component in any UML diagram.

			✦ You can dole out a component to the particular layer, and layers can be bolted to avoid changes.
astah	✦ Modeling Instrument - Astah Proficient, Astah UML and Astah Community.	✓	✦ Faster to form UML compares with Exceed expectations or non-UML-specific drawing tools. ✦ Visualize necessities and useful prerequisites, all the relations between them and to other show elements. ✦ Merge, elite control, duplicate & glue support.
edraw	✦ Drawing graphs is simple (with mouse). Overhaul 2019: UML moreover backed	✗	✦ You can make a flowchart, intellect outline, UML, electrical charts, arrange graphs, etc.

			✦ It gives a userfriendly interface
			comparative to MS Word. ✦ Edraw Max makes a difference you to share plans anytime, anywhere. ✦ This apparatus gives 280+ most recent flowchart and chart solutions.
gliffy a Rogue Wave company	✦ Gliffy may be a free online drawing instrument which gives back for drawing UML charts. ✦ It is one of the foremost broadly utilized online diagramming application.	✓	✦ Allows you to draw a graph with ease. ✦ It offers the control of visual communication and collaboration. ✦ Fast and viable integration with Jira and Confluence.

			✦ Strong bolsters for BPMP prepare models

Table 1. A Comparison between UML Tools. (Garg, 2020)

Inconclusion, our gather concurred to utilize Drawio since Draw.io doesn't ought to be introduced, doesn't depend on costly drawing program (Microsoft Vision). Moreover, able to effortlessly share graph records with other group individuals, they don't require specialized computer program to perused, fair open the browser is sufficient, our group can indeed work with the record within the same time, all changes are synchronized.

This apparatus makes a difference we make charts and other visuals with a part more ease than on the off chance that we were utilizing vector program. When utilized with Google Drive, Draw.io has great bolster for real-time collaboration so that more than one individual can work on a graph at the same time. Since numerous diagramming apps, such as Microsoft Paradigm, can be costly, the free Draw.io may be a fine alternative in case we as it were requiring this kind of program each so often.

In the other hand, Draw.io is a very powerful diagramming tool, supports many shapes, runs online without installation but is free and unlimited number of charts like many other web-based drawing tools.

User Interface Design Tools

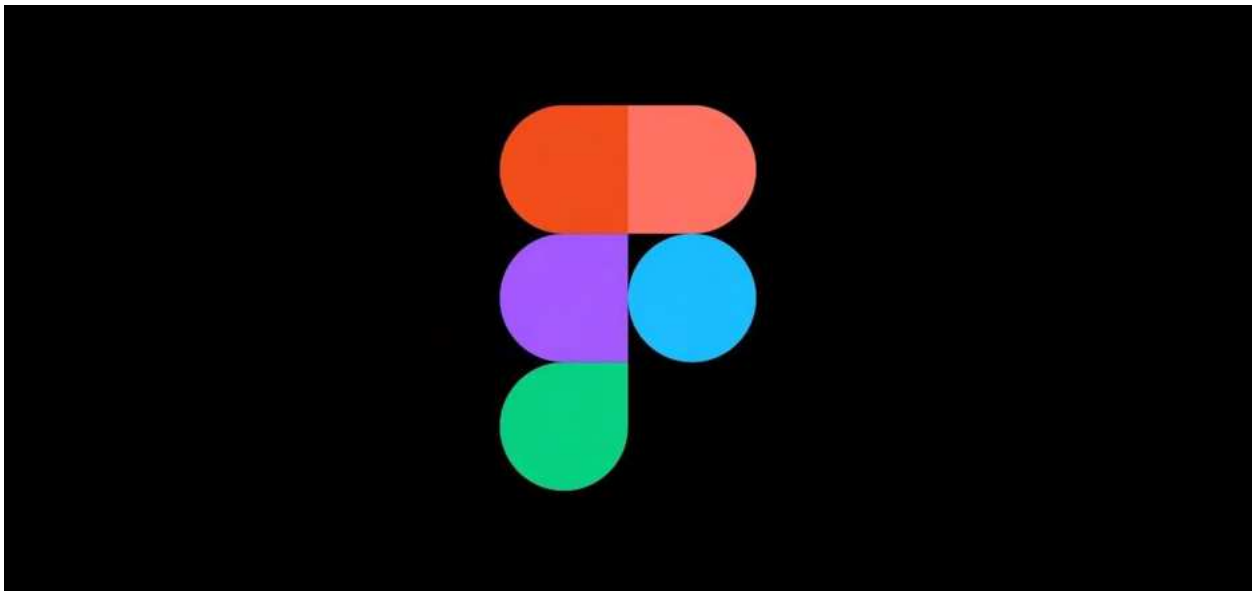


Figure 22. Figma. (Figma, 2020)

Figma may be a web-based plan apparatus with real-time collaboration. It's like Make Freehand but with all the highlights of Portray (and more). It works in web browsers, and there are moreover local apps that let you work offline.

Because Figma could be a "web-based" plan instrument, subsequently it's brought these taking after advantages:

- There's no program to download, introduce, and ceaselessly update.
- There's no have to be spare and organize your records. Your work is naturally saved to a shared space within the cloud.
- One URL gets to be the source of truth that everybody gets to see. Which means…
- There is no got to persistently transfer, match up, and organize PNGs in different places.

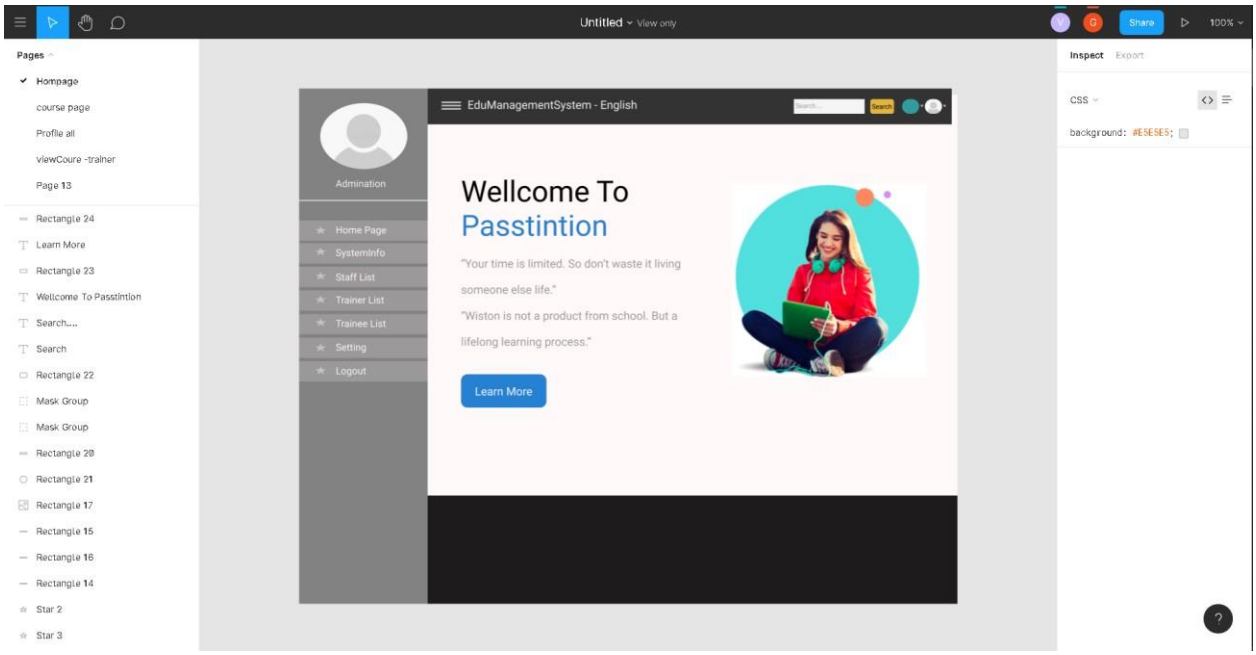


Figure 23. Figma interface to build up UI (User Interface).

Our group choosing Figma to plan our UI (Client Interface) since it's free, simple to utilize, ready to emphasize way quicker with real-time collaboration, our plan handle gets to be more comprehensive and consistent. Besides, our move from plan to code is likely to be quicker and steadier and the plan frameworks will be more adaptable and less demanding to plan with, which implies we'll spare time and pick up consistency over ventures.

Searching Tools

✞ Sci-Hub

Figure 24. Sci-Hub. (Sci-Hub, 2020)

Sci-Hub could be a shadow library site that gives free get to to millions of investigate papers and books, without respect to copyright, by bypassing publishers' paywalls in different ways. Sci-Hub was established by Alexandra Erbakan in 2011 in Kazakhstan in reaction to the tall fetched of inquire about papers behind paywalls. The location is broadly utilized around the world. In September 2019, the site's proprietors said that it served around 400,000 demands per day. The number of articles claimed is regularly upgraded on the site's domestic page, being over 81 million in April 2020.

Sci-Hub and Erbakan were sued twice for copyright encroachment within the Joined together States in 2015 and 2017, and misplaced both cases by default, driving to misfortune of a few of its Web space names. The location has cycled through diverse space names since at that point.

Sci-Hub has been commended by a few within the logical, scholarly, and distributing communities for giving get to information produced by the logical community. Others have criticized it for abusing copyright, debilitating the financial practicality of distributers, possibly compromising universities organize security, and jeopardizing true blue get to papers by college staff. In June 2020, a consider found that articles downloaded from Sci-Hub were cited 1.72 times more than papers not downloaded from Sci-Hub.

In the project’s process, we need to read and research many documents, some of them need paid for read and gain full access. Therefore, we choose to use Sci-Hub as a searching tool to find the documents that we really necessary for our project.

✞ Google Scholars

Figure 25. Google Scholar. (Google, 2020).

Google Researcher gives a straightforward way to broadly hunt for academic writing. From one put, you'll be able look over numerous disciplines and sources: articles, theses, books, abstracts and court suppositions, from scholarly distributers, proficient social orders, online storehouses, colleges and other web locales. Google Researcher makes a difference you discover pertinent work over the world of insightful investigate.

Highlights of Google Scholar:

- ✦ Search all insightful writing from one helpful place.
- ✦ Explore related works, citations, creators, and publications.
- ✦ Locate the total archive through your library or on the web.
- ✦ Keep up with later advancements in any region of research.
- ✦ Check who's citing your distributions, make a open creator profile.

Since our team working in university environment, all of our references need to be professional and exactly. Therefore, Google Scholars is a very helpful and efficient tool for us to ensure our citation always in the right form.

7 Development tools and techniques

Cloud provider

List some clound provider

Cloud computing is the provision of computing power, database storage, applications and other IT resources through the cloud service platform on the Internet.

Cloud computing provides a simple way to access various servers, storage, databases, and application services over the Internet.

Amazon:

Amazon Web Services provides a wide range of global cloud-based products: on-demand, accessible in seconds, pay-for-price: computing , storage, databases, analytics, networking, mobile devices, developer tools, Business management tools, IoT, security, and enterprise applications. Amazon Web Services (AWS) started offering IT infrastructure services to companies such as web services in 2006- now widely referred to as cloud computing. Today, AWS offers a highly reliable, low-cost, cloud-based cloud service. (Amazon, 2020)

Heroku:

Heroku is a Cloud Platform based on a Containerized Service (PaaS). To deploy, manage, and scale modern apps, developers use Heroku. The Heroku platform is elegant, versatile, and easy to use, offering the easiest way for developers to market their games. Heroku is completely controlled, enabling developers to concentrate openly on their core product without being diverted from maintenance of the server, hardware, or infrastructure. Multi-cell services, instruments, workflows, and assistance are provided by the Heroku experience-all (Heroku, 2020).

Azure:

Azure is a forum for cloud computing and an online interface that lets you access and track Microsoft's cloud services and tools. Based on the specifications, these facilities and tools include saving and transforming the data. An working internet link and the ability to login to the Azure portal are all you need to get access to these sites and services. It was released significantly later than its major rival, AWS, on February 1, 2010Multiple programming languages are provided by Azure, including Java, Node Js, and C #. There are 42 Azure datacenters, the largest number of datacenters for any cloud network, located all over the world. Furthermore, Azure expects to launch 12 new data centers, which will eventually raise the number of data centers to 54. (Simplilearn, 2020).

Google Cloud:

The Google cloud portal is a tool by which users can conveniently access the Google-designed cloud systems and other computing resources. A broad variety of resources are provided in the framework and can be used in multiple sectors of cloud computing, such as storage and application creation. The Google cloud interface can be used by anybody and used according to their needs. First created on October 6, 2011, the Google Cloud Platform has a 13 percent market share. It has turned out to be one of the best providers for cloud computing and the most profitable. What makes the Google Cloud Platform so popular is the vast variety of optimizations and other benefits (Ritika, 2018).

Comparation

Parameter	Heroku	AWS	Azure	Google cloud
Owner	Salesforce	Amazon	Microsoft	Google
Age	9 Years	11 Years	10 Years	6 Years
Type of Service	Paas	Iaas, Paas, Saas	Saas, Paas	Iaas, Paas, Saas
Pricing	Heroku costs $0.05 per hour	$0.013 per hour	On-demand reserved spot.	Per-minute basis
Languages	Node.js, Java, Ruby, PHP, Python, Go, Scala, Clojure	.NET, Ruby, Nodejs, Go, Docker, PHP, Python	.NET, Python, Node.js, Java	C#, Go, Java, Node.js, PHP, Python, Ruby

Complexity	It's software some time too simple, even for professional developers.	Not easy for beginners	Not easy for beginners	Not easy for beginners
Tools for Management and Monitoring	• Heroku command Line • Heroku Appication Metrics • Heroku connect • Heroku status	AWS Management Console AWS Command Line Interface (AWS CLI).	Azure PowerShell, Azure command-line interface(CLI)	• Google Cloud Marketplace • Private Catalog • Google Cloud Console • Cloud Shell • Cloud APIs
Rapid deployment	Heroku offers you a ready-to-use environment which allows you to push your code and make a few configuration	The deployment process of AWS service is quite hard.	The deployment process of Azure service is quite hard.	The deployment process of Google cloud service is quite hard.
Need DevOps Engineer	Not at all	Must	Must	Must
Development of server	The creation of a server is a simple process.	The creation of a server is a relatively complicated process.	The creation of a server is a relatively complicated process.	The creation of a server is a relatively complicated process.
Security	The Heroku platform is designed to protect customers from threats by	Security is provided using defined roles with	Provides security by offering permissions on	Google uses several layers of encryption to protect customer

	applying security controls at every layer from physical to application, isolating customer applications and data, etc. with the ability to rapidly deploy security updates without customer interaction or service disruptions.	permission control features.	the whole account.	data in Google Cloud Platform products. Google Cloud Platform encrypts stored customer content without the need for a customer to take any action, using one or more encryption mechanisms.

Select cloud service

To deploy a web application on the internet, we chose Heroku because:

This is a little, small-scale project for us. And most notably, we are students in project creation who need a cloud service that is free or low-cost. We choose heroku through our study, because heroku offers a free server portal that enables us to deploy web applications to the internet quickly and openly. In addition, 5000 lines of database data are also supported for free by heroku.

User-Friendly App: Heroku has proved to be an adaptable app since its first use, even for those who are not completely proficient in configuring cloud software. You can execute tasks such as managing, installing, and monitoring metrics without significant hassle with a well-defined dashboard. Tool UX needs use without issues from both technical personnel and end users.

No Technology Needed: As a cloud-based container-based platform, it allows multiple programming languages, numerous add-ons, and provides the platform 's implementation, enabling developers to easily focus on their project without caring about technology specifics such as the version of the operating system required or configured for installation or even how to customize it.

Great Community: Relative to other giants, including Azure and AWS, the Heroku community is still thin. It is not the amount that makes the instrument, though, but the consistency and the culture, and if it is disclosure and sharing, all the donors to the instrument are involved in it. Believe it, build or only use a lesson in their day.

The CLI: To help us navigate and monitor our applications on it, Heroku has an Awesome Command Line Gui. When using them, commands such as heroku and ps heroku diary would be your best friend. It's very easy to update and begin to play with it.

Multi-Language Support: In terms of language support, Heroku just doesn't do well. The Heroku framework currently supports more than eight languages, including such languages as Node, Java , and Python, from scratch.

A variety of databases and data warehouses are supported: Heroku enables users to select between several databases and data stores depending on the particular needs of different applications (Mysql, SQL server, Mongodb ...)

Deploy from various sources: A git-based implementation is Heroku 's primary alternative. Any time you push any code into the key, you can "link" your software directly from GitHub and make a default implementation (Heroku, 2020).

Development languages

List some programming languages

PHP

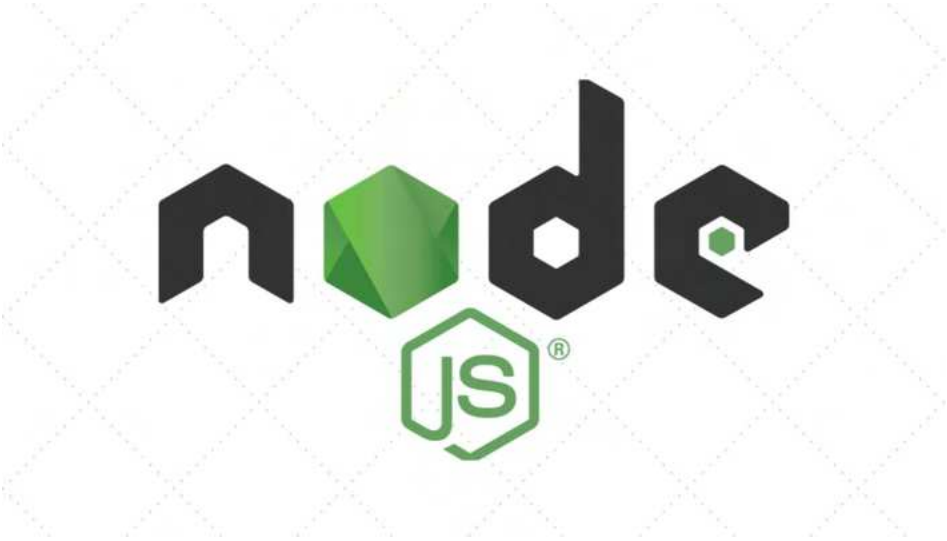
When more and more people figured out how useful it was, PHP began out as a small open source project that grew. Back in 1994, Rasmus Lerdorf unleashed the first PHP update.

- A variety of common databases, including MySQL, PostgreSQL, Oracle, Sybase, Informix and Microsoft SQL Server, are integrated with it.
- In its implementation, PHP is pleasantly zippy, particularly when compiled on the Unix side as an Apache module. When started, the MySQL server performs even very complicated queries in record-setting time with enormous result sets.
- A significant range of major protocols, such as POP3, IMAP and LDAP, are supported by PHP. Support for Java and distributed object architectures (COM and CORBA) has been introduced to PHP4, rendering n-tier growth an opportunity for the first time.
- PHP forgives: The grammar of PHP seeks to be as forgiving as possible.
- The Syntax for PHP is C-Like.

Common uses of PHP

- PHP executes system functionality, i.e. it can build, open, read , write, and close them from files on a system.
- PHP can manage formats, i.e. extract data from folders, save data to a file, send data to the user via email, return data.
- You add , delete, and change elements via PHP inside your database.
- Access variables for cookies and set cookies.
- You may use PHP to prevent users from accessing those pages on your website.
- It is capable of encrypting data (tutorialspoint, 2020).

Node:



To make it easier to create fast and scalable network applications, Node.js is a framework based on Chrome's JavaScript runtime. Node.js makes it lightweight and flexible with an event-driven, non-blocking I / O architecture, suitable for real-time systems that use a lot of data running on distributed computers.

Below are some of the main features for software architects that make Node.js the top choice:

- Asynchronous and event-driven-All Node.js library APIs are non-blocking, i.e. asynchronous. This basically ensures that when the API returns the data, a server running on Node.js never waits. After calling it, the server goes to the next API, and the Node.js Event Management Code lets the server get the API response from the previous request.
- Very Soon-The Node.js library, based on the Google Chrome V8 JavaScript engine, runs code very quickly.
- Single threaded yet extremely extensible-A single threaded paradigm of an event loop is used by Node.js. Compared to conventional servers that produce small streams to handle requests, the event mechanism lets the server react in a non-blocking way and renders the server highly scalable. A single threaded program is used by Node.js, and a related program can serve a much greater number of requests than standard servers such as the Apache HTTP Server.
- No padding-Node.js apps never buffer any material. Such apps literally export data in batches.
- License-Under the MIT license, Node.js is issued.

.NET

According to NGWS, the .NET Architecture is a software development tool introduced by Microsoft in the late 1990s. Microsoft released the first version of the .NET Framework, known as the .NET Framework 1.0.0, on February 13, 2002.

It is a virtual machine that offers a generic platform to run an application that is built in multiple languages, such as C #, VB.NET, Visual Basic, etc. It is also used to build an application or utility accessible in the

Microsoft environment that is form-based, console-based, electronic, and web-based. In comparison, the .NET framework, close to the Java language, is a pure object oriented framework. But it's not a platform like Java that's autonomous. Therefore, the program operates only on the Windows platform.

The key purpose of this framework is to build an application that can be run on a server running Windows.

4.8 js is the latest edition of the .Net application. (tutorialspoint, 2020).

Pros and Cons

According to (phpbabu, 2020), (Sidharth Jain, 2020), (Francesco, 2020)

Languages	Pros	Cons

PHP	• Open Source • Open Source • Speed: Since it does not use a lot of machine energy, it is surprisingly efficient. • Ease of use: It uses C-like notation, so it is easy to understand and easy to script the website for those who are familiar with C. • • Secure: Since many developers maintain it, bugs are easily discovered and patched, making it a secure piece of software. • Effective support for libraries: Functional plugins can be conveniently found if you need a PDF, table, etc. • Designed in modules for client links • Wide funding for neighbourhoods • Security: It gives protection that can deter malicious attacks. This can be changed, for instance, in the .ini format. • A lot of individuals know the PHP vocabulary. • The future is bright: While PHP is well known, there are no limitations to its potential for the future.	• • Security: Anyone will access the source code because it is open source. In the source code, if there is a flaw, people will use it to find its vulnerabilities. • Not perfect for large applications: for programming large applications, it will be hard to use it. Since programming languages are not extremely scalable, it would be difficult to sustain large applications produced out of a programming language. • • Weak type: Implied conversion can surprise and lead to unintended errors by sloppy programmers. Array and hash table uncertainty. It's sluggish, and maybe quicker. Normally, there are many ways to accomplish a mission. It hadn't been knocked hard. Curly braces are used to view it. • Weak methods of error handling: The system has weak methods of error handling. For developers, it is not a satisfactory option. Hence, you will have to get past it as a trained PHP creator.

		• Huge numbers of applications can not be addressed by PHP: a vast variety of applications can not be supported by the technology. Since it is not modular, it is difficult to handle. It mimics the Java language characteristics.
Node.js	• Node.js gives straightforward extensibility. • Quick to read • As a programming language, Node.js is used • Gain of Fullstack JS • Popular for high performance delivery • Support from a strong and vibrant culture • The benefits of caching • Provides freedom of application creation • Get support for commonly-used instruments • Handling requests concurrently Node.js • is strongly modular. •	• The application programming interface (API) is not stable • Does not have a strong library support system • The programming model is asynchronous

.NET	• .NET is based on an Object-Oriented Module for Programming. • Support for Visual Studio IDE .NET • Design of cross-platforms(Windows, Linux, OSx, Mac ...) • Flexible deployment and easy maintenance • .NET Core serves a wide range of applications. • .NET Core Makes for Top App Output • Cost-Effective • Large Society •	• Object-Relational Support Minimal • Distributor Lock-in • Memory Leaks • • Difficulty transitioning to the heart of .NET

Select language

We choose Node.js to develop web application because:

- Quick paced: Armed with Google-powered V8 engines, NodeJs compiles javascript into a reasonably fast running native machine language.
- Creating a web application in real time-API: For app creation, we use APIs, so fast, real-time data transfers are necessary.
- Special code base: It's better said than done to send data between the server and the device for successful synchronization.
- Using JavaScript skills for developers: Any web developer has coded a bit of JavaScript, even if a jQuery plugin is hacked by JavaScript.
- Node JS is a free server system.
- It runs on Windows , Mac OS, Linux, etc.
- On the application, Node uses JavaScript
- Capability to keep data in your database in the native JSON (object notation) format
- Multiple modules (NPM, Grunt, etc.) and group supportive

- Single free codebase

Database servers

A database is a different program in which a set of data is stored. For building, accessing, controlling, scanning, and copying the data it contains, each database has one or more distinct APIs.

Other methods of data storage can also be used, such as files on the file system or massive memory hash tables, but for those types of programs, fetching and writing data would not be short and convenient. Uh. There.

Allows simple sharing: You can conveniently share it by separating it with Node.js powered by Node Package Manager or NPM.

List some databases

Mysql

MySQL is a cheap, easy-to-use RDBMS that many big and small corporations use. MySQL is produced, sold, and sponsored by a Swedish corporation named MySQL AB. For several good reasons, MySQL is becoming very popular.

- MySQL is licensed under an open source license. And you don't have to spend extra to use it.
- On its own right, MySQL is a very efficient program. It manages the most efficient and expensive database packages with a wide usable subset.
- MySQL uses the popular SQL data language as a basic type.
- MySQL runs on various operating systems and in many languages, including PHP, PERL, C , C++ , JAVA, etc.

- And with huge data sets, MySQL is very fast and performs well.
- MySQL, the highest ranked language for web creation, is very PHP friendly.

  Huge tables, up to 50 million rows or more in a table, support MySQL. The default file size limit for a table is 4 GB, but you can raise this limit to a possible limit of 8 million terabytes (TB) (if your operating system can support it).
- Customizable is MySQL. The GPL open source license enables programmers to change MySQL applications to suit their own individual environment (tutorialspoint, 2020).

SQL Server

Microsoft SQL Server is a Microsoft-designed Relational Database Management System (RDBMS). It is a highly versatile product that can be deployed on anything from a single desktop, to a high-powered cloud server network, and anything else in between. In order to compete with MySQL and Oracle databases, it is mainly designed and developed.

SQL Server is the world's # 1 most-used database, according to Microsoft.

SQL Server has grown to become a real business information platform since the introduction of SQL Server 1.0 in 1989. SQL Server has been much more than that, though its core role is that of an RDBMS. As well as a number of research and reporting methods, SQL Server 2016 provides built-in business intelligence tools. This is on top of the tools for database administration, such as building databases, backups, replication, security, and more.

SQL Server supports ANSI SQL, which is the standard SQL (Structured Query Language) language. However, SQL Server comes with its own implementation of the SQL language, T-SQL (Transact-SQL).

T-SQL is known as Transact-SQL, a Microsoft Property Language. It offers more variable declaration, exception handling, stored procedure, etc. capability.

The primary interface solution for SQL Server is the SQL Server Management Studio (SSMS), which supports both 32-bit and 64-bit environments (quackit, 2020).

Mongodb

MongoDB is a database that is text oriented. This implies that it does not use tables and rows to store its data, but rather JSON-like document sets. Such documents support embedded fields, so it is possible to store similar data within them.

MongoDB is a schema-less database as well, so before entering our data, we do not need to define the number or form of columns.

MongoDB is a NoSQL database containing data as pairs of key-values. It is an open-source document database that, along with data modeling and data management of large datasets in an enterprise application, provides high performance and scalability.

An Auto-Scaling function is also supported by MongoDB. Since MongoDB is a cross-platform database that can be set up on multiple platforms , such as Windows, Linux, etc. (M, 2020)

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Compare

According to (Kiss, 2020), (Fernigrini, 2020):

Database	Pros	Cons
Mysql	• MySQL is not as advanced as other frameworks for the maintenance of relational databases. • MySQL is (sort of) open source.	• There is more money and creativity in MySQL than ever before. • The products of MySQL remain powerful.
	• MySQL is operated by Oracle rather than community-driven, • Best of breeds in open source RDBMS databases. • Secondary database portability Oracle database without many diagram changes. IaaS balance. •	• MySQL is developed for a Network, Cloud, and Big Data emphasis. There are more projects in MySQL than • ever. Some restrictions on table and • schema size (unlike IBM DB2, Oracle DB, etc.). • Problems with some SQL operations (merge join, hash join, etc.) degrade the overall performance of queries. • Licensing from Oracle to use MySQL can be improved.

SQLserver	• User-friendly interface makes configuration very easy for us. • Optimal storage. No additional memory is required when changing our workstations or devices and allows us to easily manage data using an efficient and minimal troubleshooting. • Data recovery support allows us to retrieve data in the event of data corruption.	• According to the nature of our work, we need to use advanced features of the software, which is very expensive. • Hardware restriction. The hardware we are using must be changed when a newer version of Microsoft SQL is released, and in my opinion this is not a good attribute of the software. • Compatibility is limited. We don't have a Microsoft architecture so we have to invest more in software so it can sync with our platform.
MongoDb	• No schema remains. This is perfect for a document repository like MongoDB, if you have a compact schema. In RDBMSS, this is hard to do successfully, • Scale quickly. Using replica sets, scale read. Recording scales by sharding (automatic balance). Only get another computer started and go. More	• In MongoDB, the data size is normally larger, for instance. Each record has the name of the field deposited, • Less consistency (e.g. no JOIN) for queries
	• computers = more RAM for your workstation to be distributed. • Price. That depends on which RDBMS, of course, but MongoDB is free and can run on Linux, suitable for operating on a cheaper toolkit for commodities. Based on the value of the data, you can pick how much accuracy you want (e.g. faster performance = allow and forget to insert into MongoDB, slower performance = wait until the insertion is copied before going back to the buttons)	• No transfers are supported-such atomic operations are supported at the single paper level.

Select database

We choose MongoDB because:

- It's very easy to install and set up MongoDB, first and foremost.
- To build a database for our web application, we use the mongoose module. So Mongse is our favourite pick.
- A very simple characteristic of MongoDB is that it is a schema-less database. Schema moves are no longer available. Since MongoDB is schema-free, your schema is specified by your code.
- One of the most appealing benefits of MongoDB is the potential to model data based on paper. Since the way it holds information in the form of BSON (Binary JSON), ruby hash code, etc., allows to store information in a very rich way while being able to keep arrays and other documents as well.
- In facilitating complex requests, the document query language provided by MongoDB plays an important role.
- Due to the structure of the data in MongoDB (BSON format-key value pairs), complex concatenation is not necessary.

Software Models

List some software models

Waterfall model

According to (Denis, 2014), In the software development life cycle, the Waterfall model is an example of a sequential model. The project team continues sequentially from one process to the next with waterfall creation.

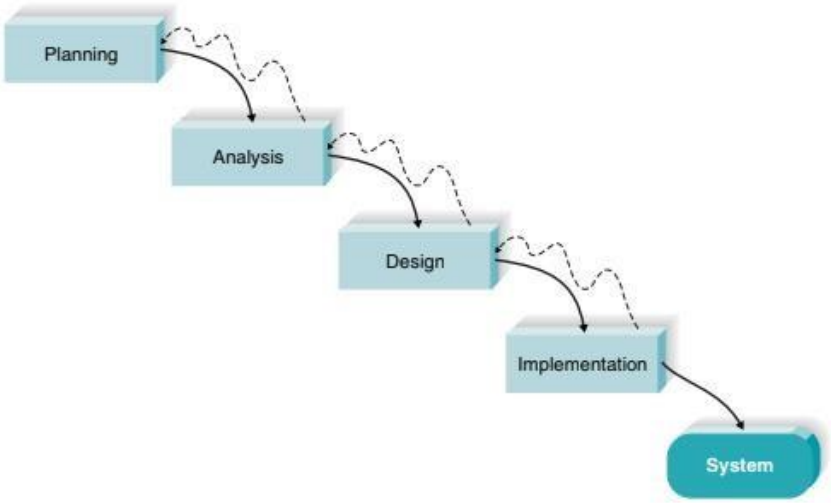

Figure 26: Waterfall Model

The process stops until the work generated in one stage is approved, and the next phase starts. It goes on in the same way as a waterfall as the project advances from phase to phase. It is impossible to do, but it is possible to go back to periods.

V-model

The V-model is another variation of waterfall development that pays more explicit attention to testing.

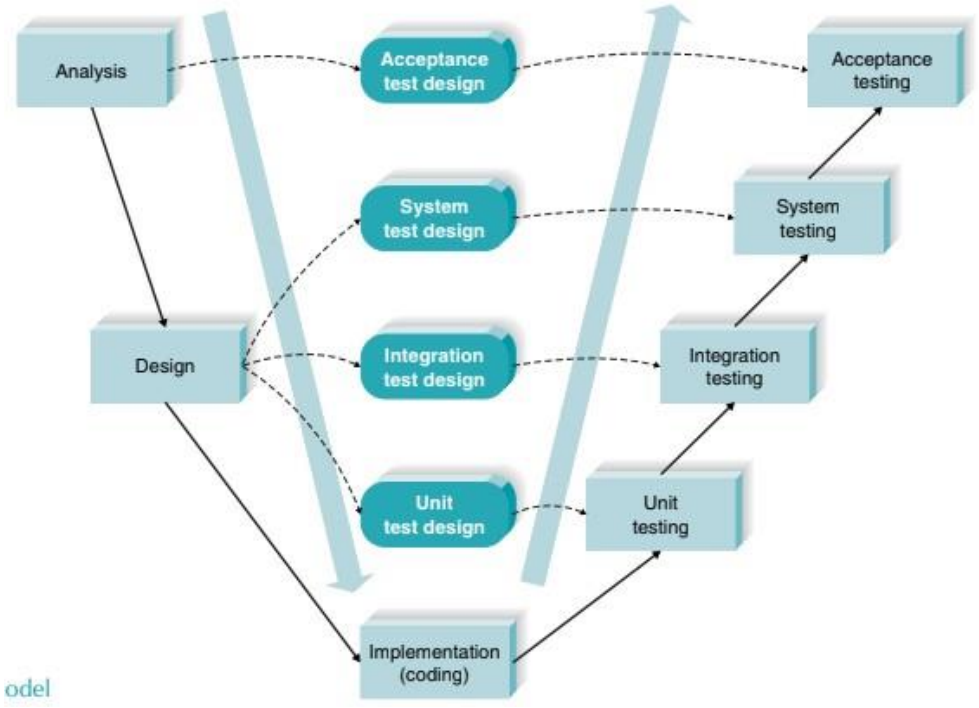

Figure 27: V-mode

The V-model, as seen in the diagram, contains 2 parts. The first section is the method of construction along the left-hand slope of the V. This part determines the elements of the design framework and specifications. The upward-sloping right side of the model is the second section. This section is part checking, integration testing, and, essentially, acceptance testing. Since specifications are specified and components are designed, testing is often defined for certain components.

Spiral model

The V-model, as seen in the diagram, contains 2 parts. The first section is the method of construction along the left-hand slope of the V. This part determines the elements of the design framework and specifications. The upward-sloping right side of the model is the second section. This section is part checking, integration testing, and, essentially, acceptance testing. Since specifications are specified and components are designed, testing is often defined for certain components.

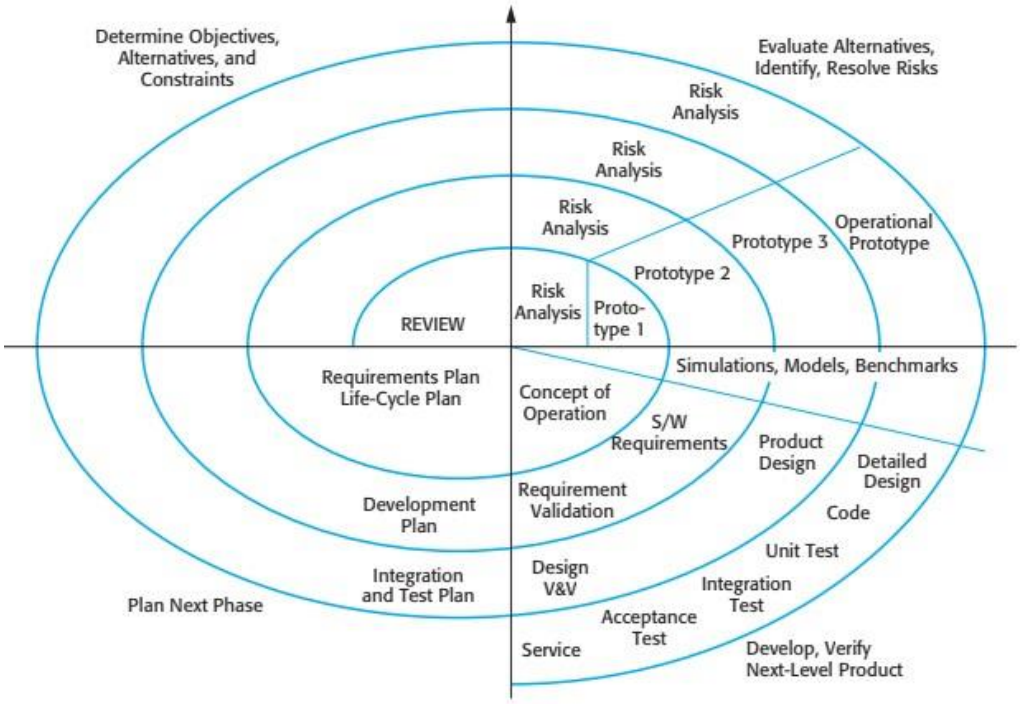

Figure 28: Spiral model

The software process is depicted in this figure as a spiral, rather than a series of operations with any backtracking from one task to another. Each spiral loop represents a step of the software process. The innermost loop may then be associated with system feasibility, the next loop with the concept of criteria, the next loop with system architecture, and so on. The spiral model blends fear of change with adaptation of change (Sommerville, 2011).

Prototyping model

A type of fast application creation (RAD) designed to address the limitations of the waterfall. The research, architecture, and installation phases are simultaneously conducted by a prototyping-based approach, and all three phases are conducted continuously in a loop before the framework is completed.

Common form of Model Prototype:

- Systym prototyping
- Throwaway prototyping

O System prototyping

In order to easily create a streamlined version of the proposed system and send it to consumers for review and input, system prototyping conducts the research, architecture, and implementation phases simultaneously. The first prototype in the diagram below is typically the first component of the device that is used. This is demonstrated to the participants, who have comments, and the project sponsor. These comments are used with a second version to be reanalysed, updated, and reimplemented, which includes a few more features. The process proceeds in a loop until the analysts, customers and supporters conclude that the prototype has adequate features for the enterprise to be implemented and used. (Denis, 2014).

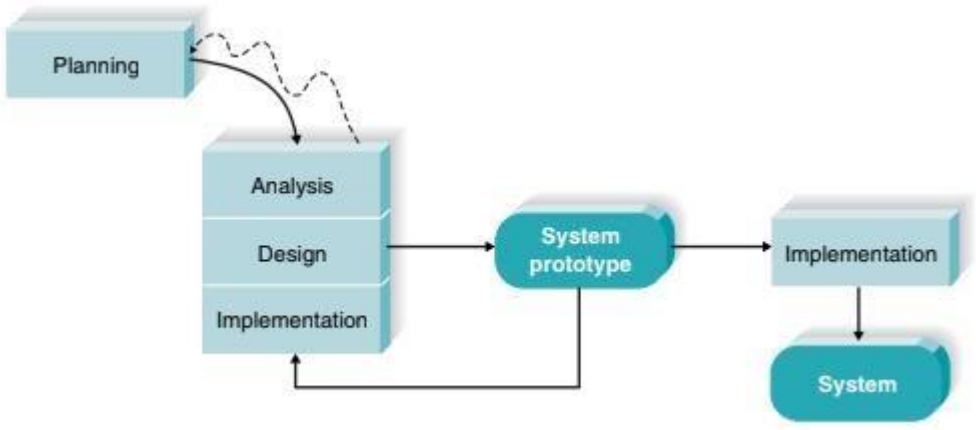

Figure 29: System prototyping

Throwaway prototyping

Throwaway prototyping requires the creation of prototypes, but uses the prototypes specifically as the real new device (as in device prototyping) to explore concept alternatives. Throwaway prototyping has a reasonably detailed review process in the figure below, which is used to capture specifications and to generate concepts for the concept of the method. Some functionality recommended by consumers, however, may not be fully known and may have complicated technological challenges that need to be dealt with. Each dilemma is evaluated by the study, design and development of a prototype design (Denis, 2014).

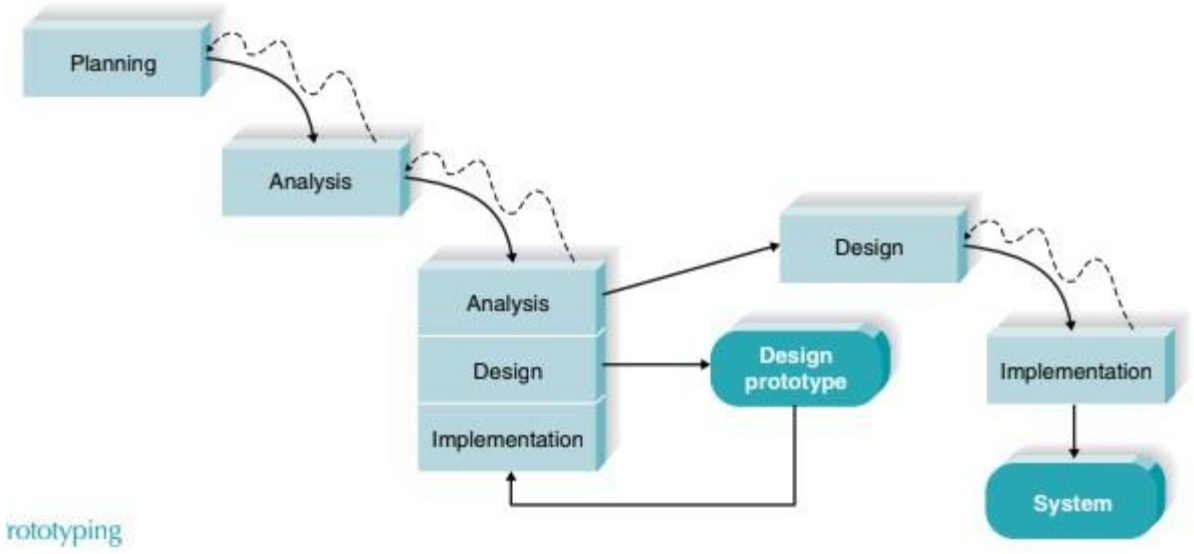

Figure 30: Throwaway prototyping

Compare

Based on the definitions and the way the models work. We provide a comparison table between software models as shown below:

Software model	Advantage	Disadvantage
Waterfall Model	Each process must be finished before the next production stage.	The error can only be corrected during the stage.
	Suitable for smaller projects where there are clearly defined specifications	It is not desirable for a complicated project where specifications always change.
	A quality assurance procedure (Verification and Validation) should be conducted before each stage is completed.	In the production process, testing time arrives very late.
	Elaborate reporting is carried out at any level of the production period of the program.	Developers and reviewers have invested a lot of time recording

	The project relies solely on the project team with minimal customer involvement.	Feedback from customers is not used in the current growth process.
	Some improvements to the program are made during the production process.	Simple changes or mistakes in the finished program will trigger a number of issues.
V- Model	This is a model that is strongly disciplined and stages are done one at a time.	This is a strongly disciplined model and one at a time, steps are completed.
	Works best for smaller projects where there are very best known criteria.	Works best when specifications are really well understood for smaller projects.
	Simple and intuitive to grasp and use	Simple and quick to comprehend and use
	Because of the rigidity of the model, it is easy to handle. There are unique deliverables and a review process for each step.	Thanks to the rigidity of the model, it is simple to handle. There are unique deliverables and a review process at each level.
	This model focuses on early life cycle testing and confirmation operations, thus raising the chance of producing a product that is errorfree and of high quality.	This model focuses on early life cycle verification and validation practices, thereby increasing the chance of building an errorfree and high-quality product.
	It helps project managers to specifically monitor development.	It helps project executives to reliably control development.
Spiral Model	Better chance of success: risks are identified and mitigated at each phase	Difficult if there is a software contract (flexibility and loosely defined deliverables will not be appropriate)

	Encourages reuse of existing solutions (alternatives)	Reliance on (the developers') risk control skills
	Allows software quality objectives to be incorporated into the process	To ensure efficient use of the model, further elaboration is required
	Treats maintenance in the same process as software development	
	Provides guidance on the best mix of existing models to a given project	
Prototyping Model	And before its implementation, greater user participation in the app. Useful when consumers have problems voicing specifications	Field (or feature) creep: unintended expansion of specifications due to increased comprehension by users
	Because the system's operating model is seen, users get a better idea of the system being built.	Chance of inadequate review of specifications due to too much reliance on the prototype.
	Time and cost are minimized since the faults can be found much sooner.	In prototypes and real systems, users may become frustrated.

	Faster input from consumers is available, leading to better solutions.	Inadequate knowledge of system specifications will result in weak system prototypes early on.
	It is easy to quickly find incomplete features, complicated or challenging tasks.	Developers can try to reuse the existing prototypes, even if it is not technically feasible, to construct the actual device.

Justify

We choose the waterfall model for a number of reasons. The first explanation is that the waterfall model is used for projects where, from the planning level, the specifications and processes will be right and where the assumptions will only change marginally during the process. Project Passtinction has an easy set of requirements from the FPT curriculum, a waterfall model that can accurately describe project requirements and implementation phases. Furthermore, the waterfall model provides a consistent hierarchical framework for construction programs in which the stages of execution of each project are explicitly distinguished from each other. When each stage ends with a milestone, it is easy to pursue the progress process without thinking about improvements in the execution of the project. The model focuses on recording phases in the process. Therefore, in the appropriate documentation or drafts, the acquired information is registered. According to Royce, the outcomes of and project phase can be automatically compared with previously planned documentation and checked-for example, following the development of a module, it is important to ensure that it satisfies the previously specified specifications, not only at the conclusion of the development period. As a result, all project implementation is recorded and compared with pre-prepared documents, developers can easily track the entire project implementation and make reviews. See whether the project is working to meet a need or progress. Then give directions, determine directions to solve, or promote the implementation of the project on schedule. Although the further refinement of the classical waterfall paradigm is assumed to be models such as spiral or V-pattern, principles such as intense scripting,

modular software development, or iterative prototyping have a slightly different approach which also provide greater flexibility in responding to recent developments and new demands.

The waterfall model can, in principle, establish the prerequisites for swift and cost-effective project implementation by diligent pre-planning. The advantages of the waterfall paradigm for its real application, however, are controversial. The project stage of software development, on the one hand, is hardly well described. Developers are also confronted with the fact that various components of an application are in different stages of development at the same time, especially in complex software projects. In the other hand, the waterfall model's linear series typically does not conform to the actual conditions.

The second explanation was that no changes to the waterfall model were currently planned during the process. So as it occurs abruptly, changes are made to the project 's strategy. However, a software project in which all the aspects of the implementation process have been established at the outset of the project can only be efficiently completed if a significant amount of time and expense is spent in analysis and generated from the outset. (IONOS, 2019).

Finally, other reason for us to choose the Waterfall model is because the Passtinction project is a small project. The waterfall model is suitable-if any-only for small software projects because of the strict sequential series of successive project steps, suitable for Passtinction project projects only. However, it can handle complex systems without difficulty with unfamiliar technology. Because the waterfall model enforces a consistent discipline to ensure its reliability and reliability are considered risky. Especially not limited to time, the company does not limit the short time to implement the project.

8 Conclusion

Basically, our group's report has been done quite well, the members of the group have all devoted themselves to completing the common work. We have completed the preparation for the website programming, the user interface (UI) design, the database design for the website, the functional requirements and the non-functional requirements were also considered to improve the website. effectively. In addition, we have selected the right tools and platforms for our website. Basically, we have prepared basically, fully for the next phase of the project.

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PURPOSE

The product defines how our customers, groups, and audiences view the product and its features as well as defines the design constraints to be taken into account when the aim of the Specification of Software Requirements (SRS) document is to define in detail and build a continuous learning environment within FPT Corporation. It will explain the purpose and features of the system, its interfaces, what the system will do, the constraints it has to operate with, and how the system will respond to external stimuli. designing the system and other considerations needed to provide a complete and detailed overview of the specifications for software.

PRODUCT SCOPE

The scope of the project is the implementation of a web-based system to manage the training activities for the internal training program of the organization. It is possible to use this method to handle accounts, manage trainers, manage course categories, manage courses, manage topics, assign courses to courses, assign trainers to topic, appoint trainers for the course.

BENEFIT OF PRODUCT

- The system is a continuous learning environment within FPT Education Group
- The online training online programs can be easily implemented and managed.
- This is a system exclusively for students and staff in the FPT system, providing a high level of safety and security.
- It is a convenient application with user-friendly interface in FPT education system.

INTENDED AUDIENCE

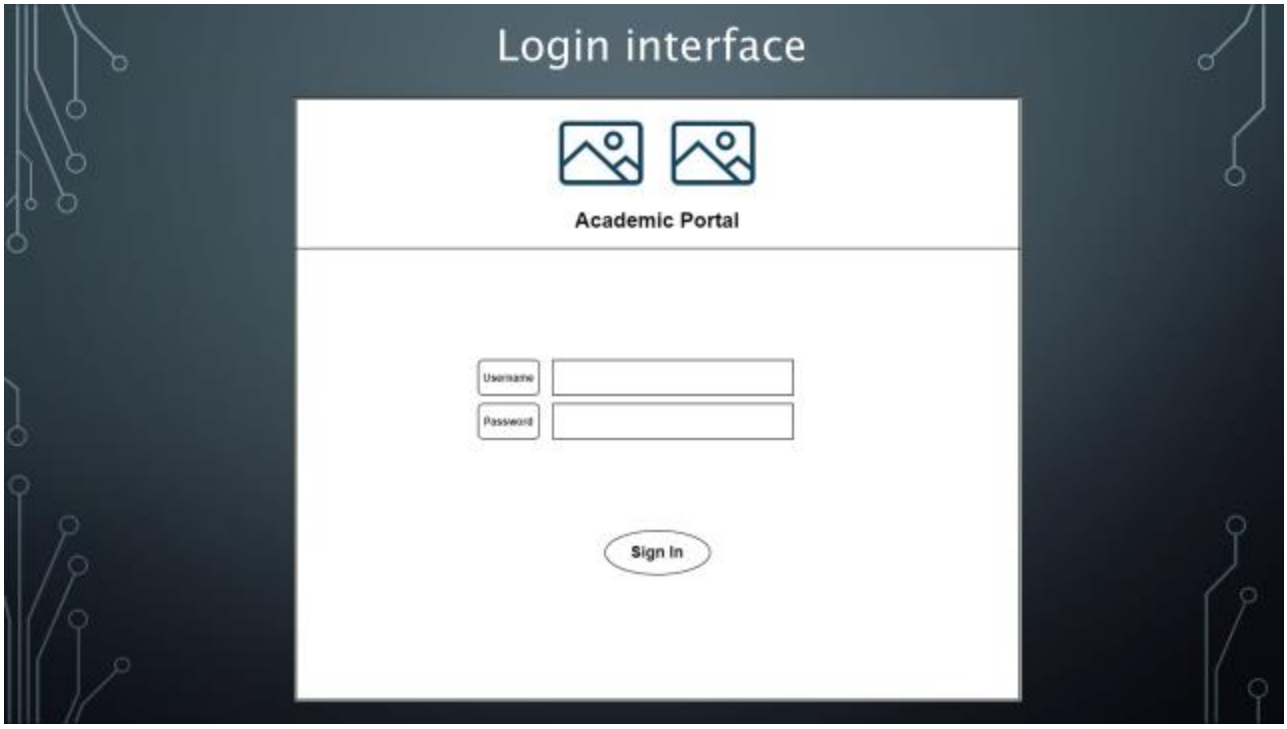
Reader	Describe
User	Gives the user a basic introduction to the system
Professor/ Mentor	They understand the project well, give instructions, give suggestions and advise students to best complete the project
Developer/ Student/ Document writers	Their task is to read and understand the project's requirements, give directions to solve problems that exist in the requirements

DOCUMENT OVERVIEW

A general overview, including the personality traits of user of this project, the device hardware, the product data and the functional specifications, is given for the remainder of this document. The general project details are discussed in Part 2 of this paper. Part 3 describes the functional requirements, requirements for details, and assumptions that are made while designing the HR management website of FPT Education. It also provides users with views on the product. Section 3 also discusses the specific product requirements, and discusses the external interface requirements, and describes in detail the system user's functional requirements.

PRODUCT ORIGIN

- In this section, we will specify the context and origin of the product in this SRS. This system is used by employees of FPT education system. The system clearly divides the four roles of the system, which are: system administrator, training staff, trainer, and trainee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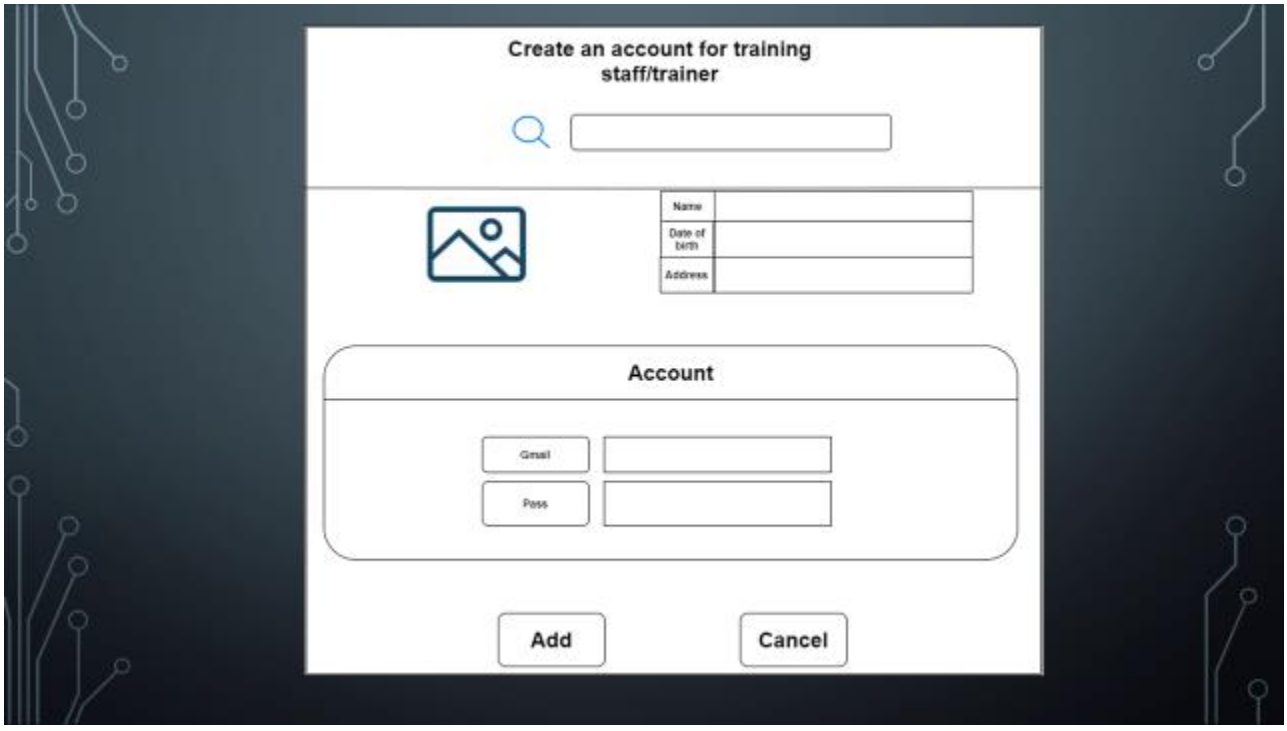
Academic Portal
Username
Password
Sign In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Address
Account
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Pass
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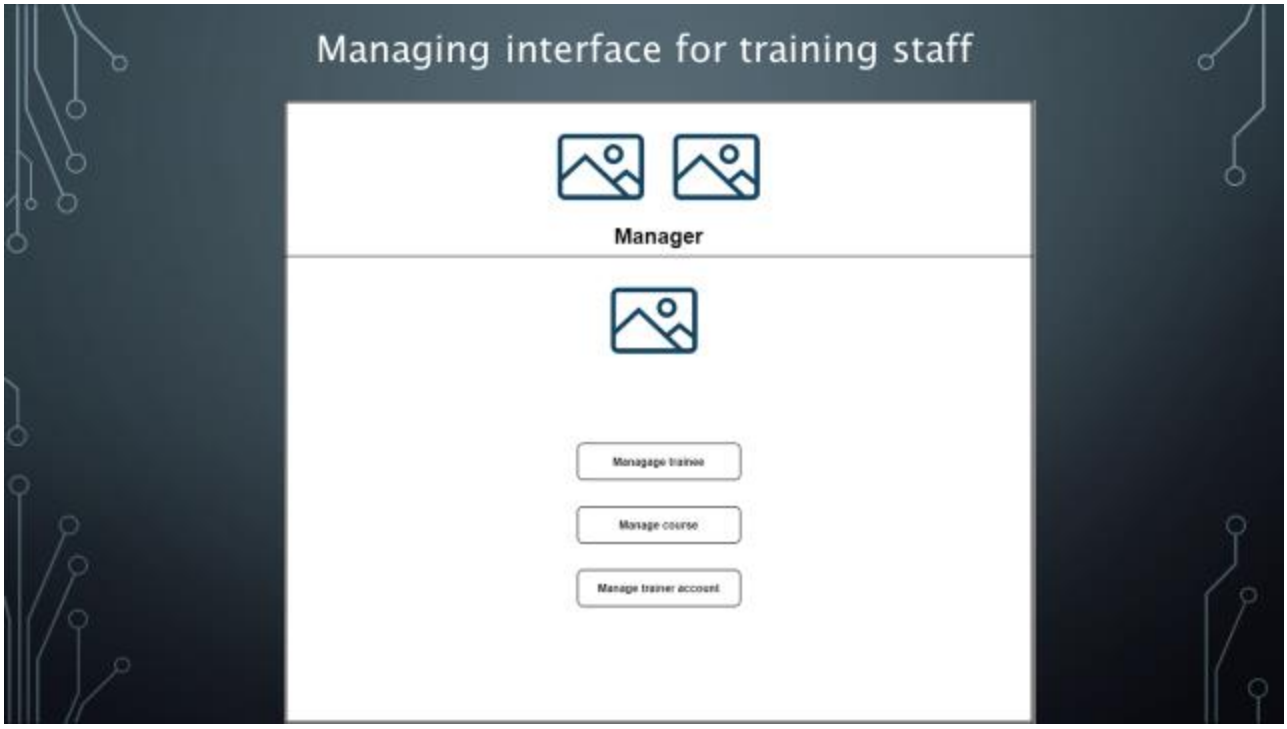
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Manager
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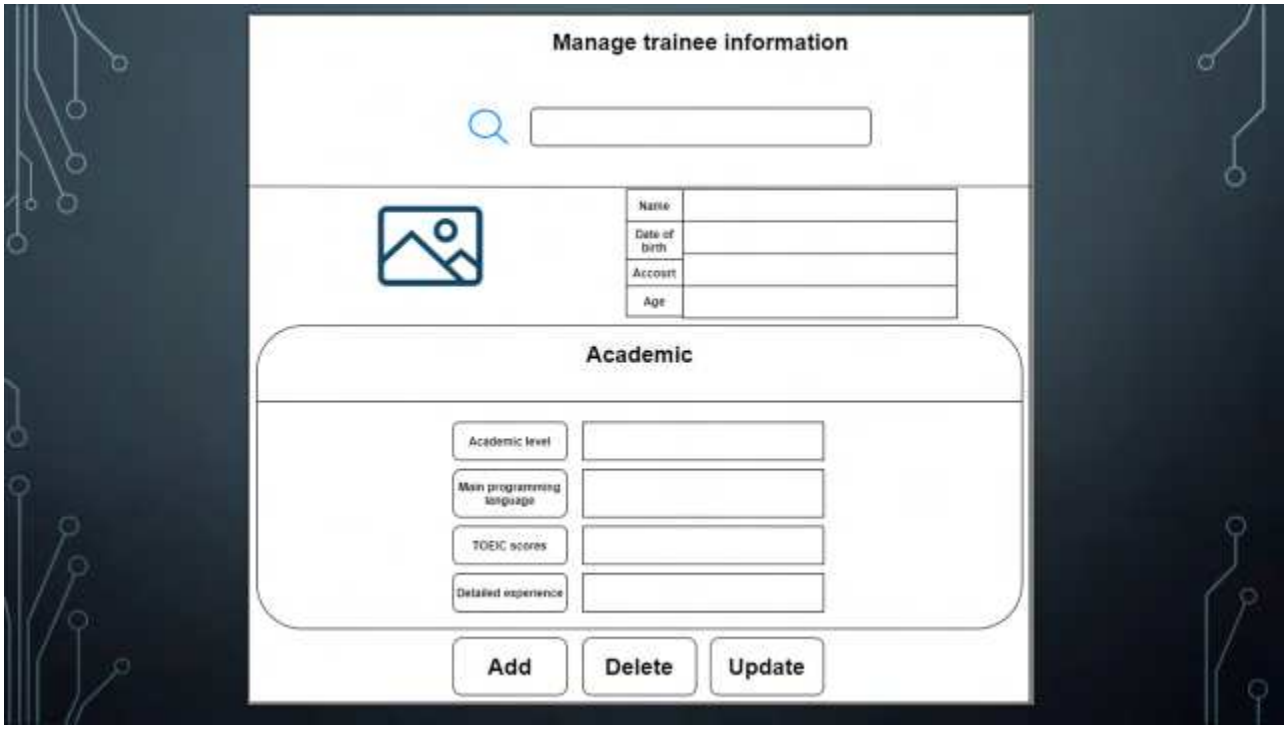
Manage course
Manage trainer account


Manage trainee information
Name
Date of birth
Account
Age
Academic
Academic level
Main programming language
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Detailed experience
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List of trainee
Search
Course name...
Student name
Programming language
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Acc1
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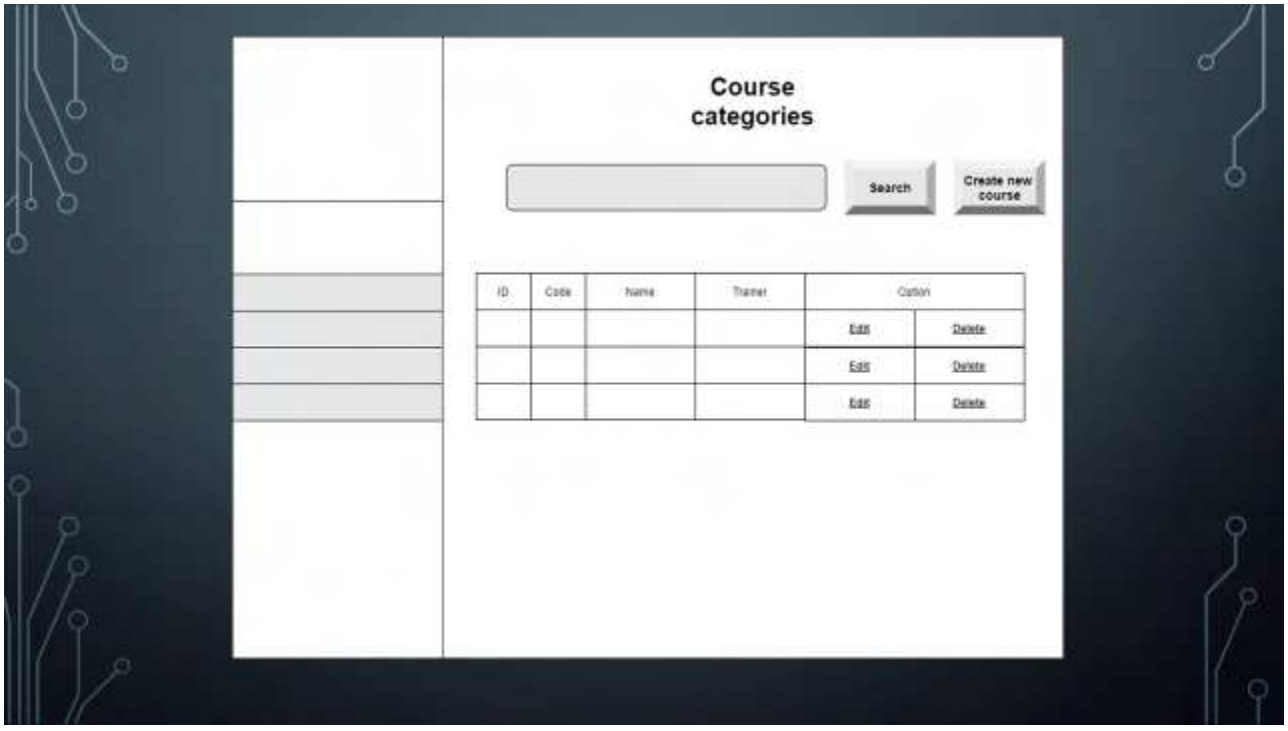
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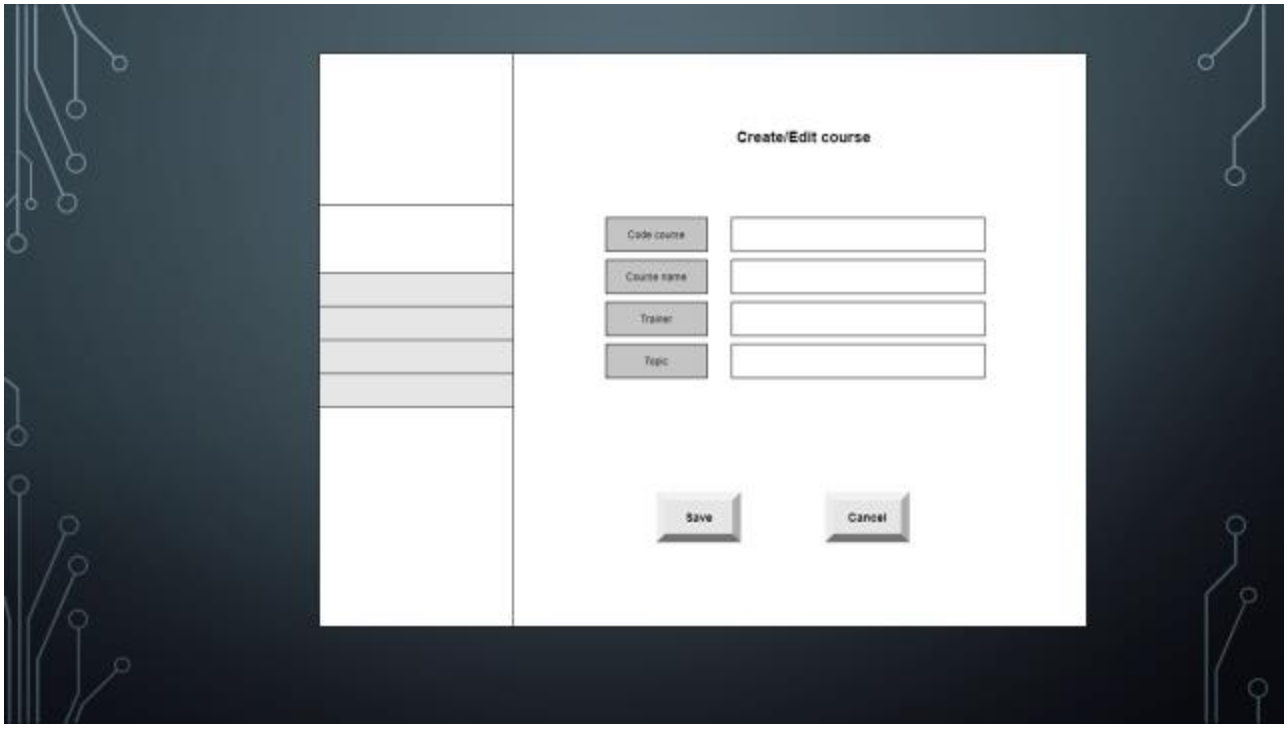
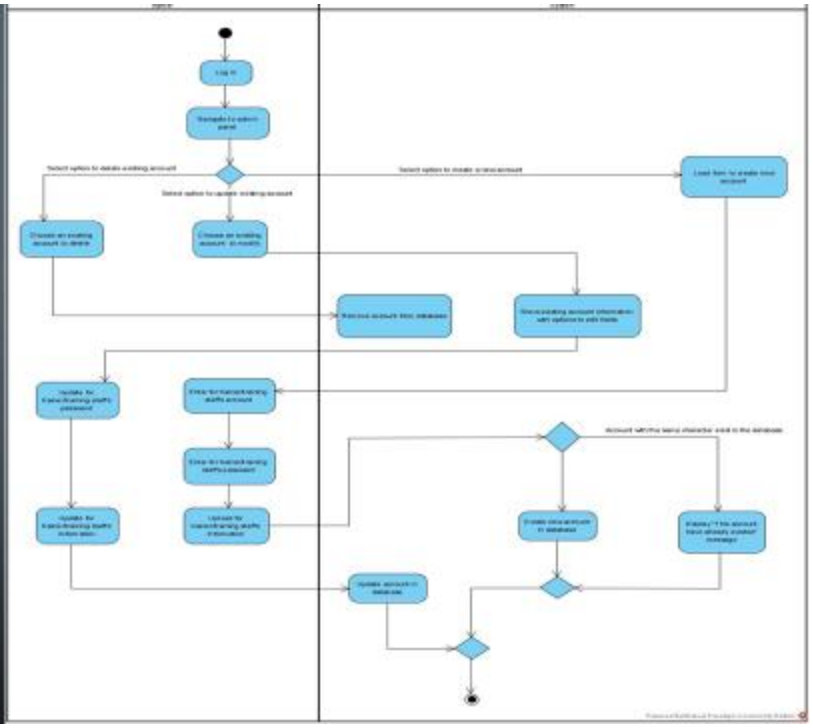
Search
Create new course
ID
Code
Name
Trainer
Option
Edit
Delete

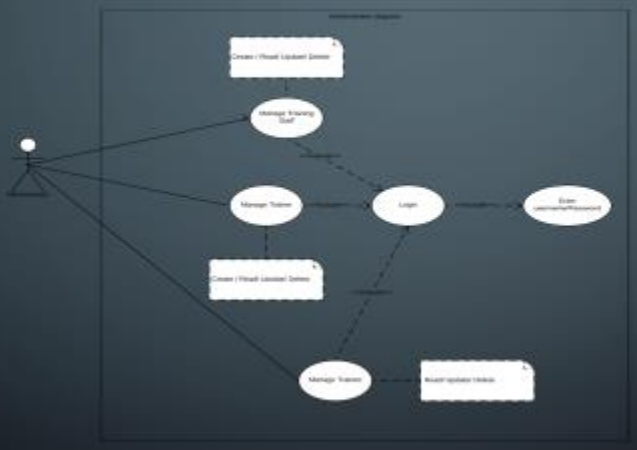

Create/Edit course
Code course
Course name
Trainer
Topic
Save
Cancel


Trainer account managing interface
User5505
Logout
User5505
View course assigned
Edit Profile
Name
Telephone
Email
Working Place
Education
Change profile Pic
Select file
Confirm

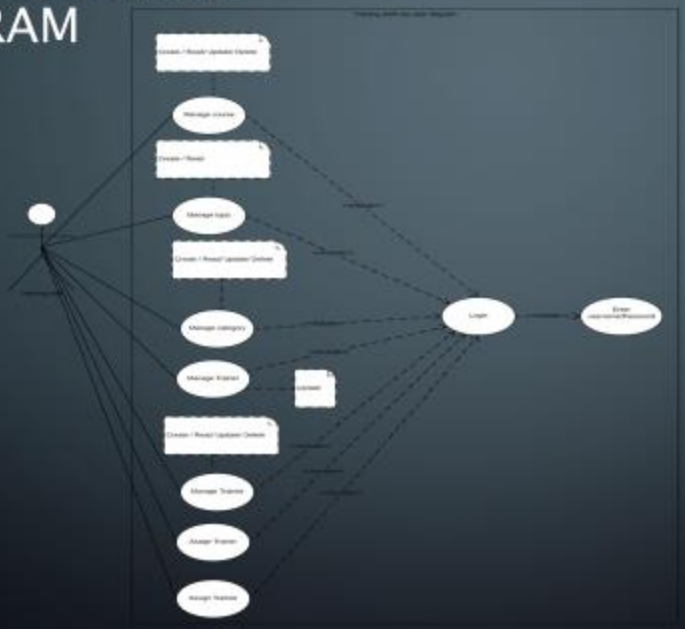
ACTIVITY DIAGRAM FOR CRUD TRAINING STAFF/ TRAINER ACCOUNT



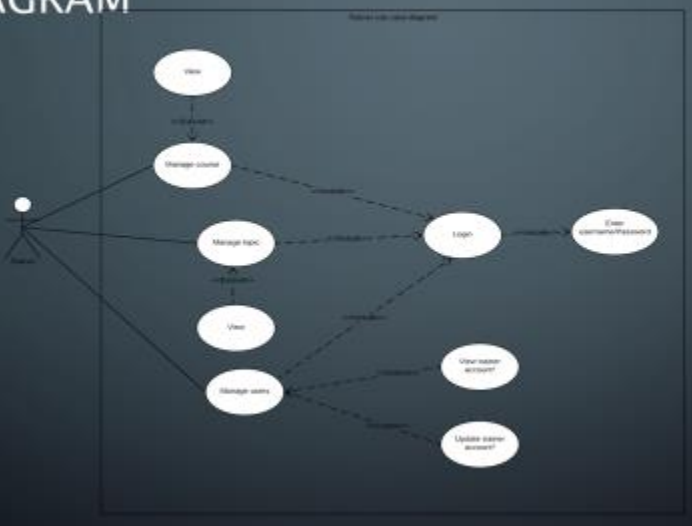
USE CASE ADMIN DIAGRAM



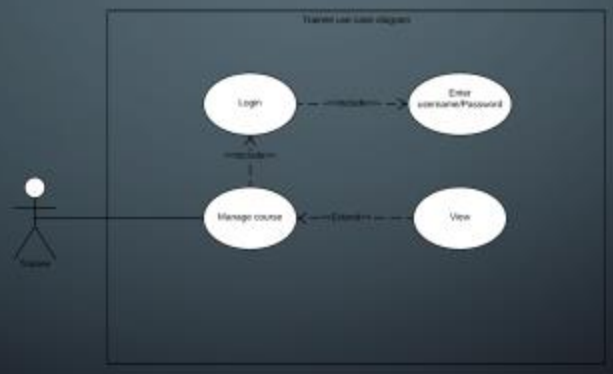
USE CASE STAFF DIAGRAM



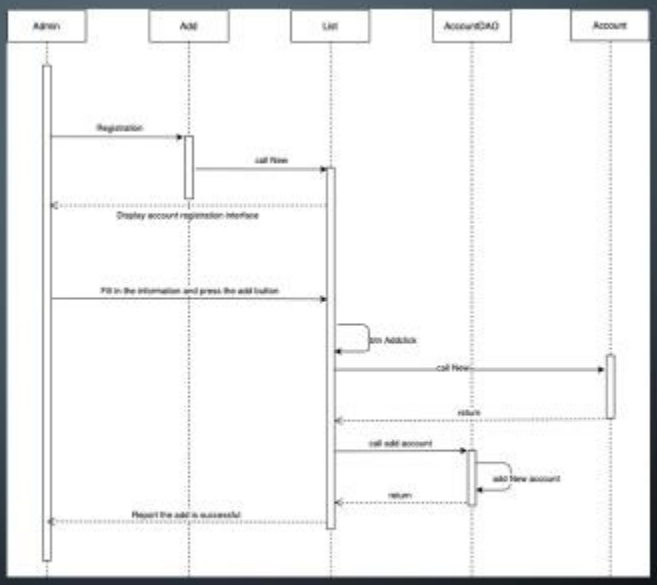
USE CASE TRAINER DIAGRAM



USE CASE TRAINEE



SEQUENCE DIAGRAM



CODING LANGUAGE

- There shouldn't be any second thoughts over JavaScript being regarded as one of the most popular and widely used client-side programming languages.
- It is basically employed as a web front-end development tool and proves to be more than a handy customer for the building of cross-development platforms.
- The simplest definition of Node.js is that it is a Javascript run-time environment that helps in the execution of JavaScript code server-side. It is an open-source cross-platform JavaScript that helps in the development of real-time network application

CODING LANGUAGE(2)

Node js benefit:

- Light weight: is accelerated by V8 JavaScript engine without any compromise on quality and security. The I/O model of Node.js app works without blocking thread, which makes the application scalable and lightweight.
- Efficient performance: Being single-threaded JavaScript runtime, Node.js works rapidly and flawlessly. It helps optimize the application data and reduces storage by making it work 20 times faster.
- Network application development: With built-in APIs of Node.js, a Node JS development company is empowered to build different types of chat server, web server and other network applications. The servers that can be developed include DNS Server, TCP Server, Jigsaw Server, HTTPS Server and more.

DATA-BASE SERVER

MongoDB is a document database built on a scale-out architecture that has become popular with developers of all kinds who are building scalable applications using agile methodologies. MongoDB was built for people who are building internet and business applications who need to evolve quickly and scale elegantly. If you are doing that, you should consider MongoDB

Companies and development teams of all sizes use MongoDB because:

- The document data model is a powerful way to store and retrieve data that allows developers to move fast.
- MongoDB's horizontal, scale-out architecture can support huge volumes of both data and traffic.
- MongoDB has a great user experience for developers who can install MongoDB and start writing code immediately.

MongoDB can be used everywhere by anyone:

- For free through the open source community edition
- In the largest data centers through the enterprise edition
- In any of the major public clouds through MongoDB Atlas

CODING ENVIRONMENT

- Open source: The fact that the VS Code is mostly open-source is an unprecedented advantage.
- Extensions: There are thousands of extensions in the VS Code marketplace with new ones coming seemingly every single day

FRAMEWORK AND PACKAGE

UML TOOL

- Our gather concurred to utilize Draw.io since Draw.io doesn't ought to be introduced, doesn't depend on costly drawing program (Microsoft Vision). Moreover, able to effortlessly share graph records with other group individuals, they don't require specialized computer program to perused, fair open the browser is sufficient, our group can indeed work with the record within the same time, all changes are synchronized.
- Furthermore, Draw.io is a very powerful diagramming tool, supports many shapes, runs online without installation but is free and unlimited number of charts like many other web-based drawing tools.

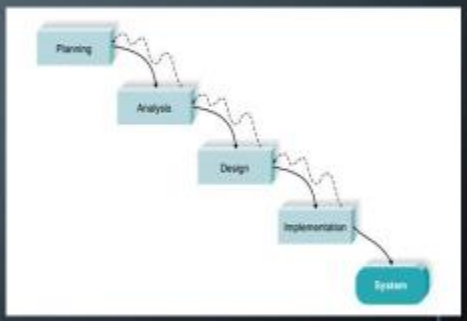
CLOUD PROVIDER

- This is a little, small-scale project for us
- User-Friendly App
- No Technology Needed
- Great Community
- The CLI
- Multi-Language Support
- Deploy from various sources

HEROKU

SOFTWARE MODEL – WATERFALL MODEL

- The waterfall model is used for projects where, from the planning level, the specifications and processes will be right and where the assumptions will only change marginally during the process.
- No changes to the waterfall model were currently planned during the process.
- The project is a small project
- A waterfall model that can accurately describe project requirements and implementation phases.
- Furthermore, the waterfall model provides a consistent hierarchical framework for construction programs in which the stages of execution of each project are explicitly distinguished from each other



RISKS IDENTIFICATION

- Risk identification is the first step to do in risk management. It is the process of listing the project's possible risks and their characteristics. Risk can prevent people, programs or businesses ... from achieving the goals.
- When developing the system, we identified the risks we could face such as: scope risk, experience and knowledge risks, lack of time, security and lack of cost to implement. From the risks that we have identified, we propose corresponding measures to deal with the risks.

SCOPE RISK

- In this project, there can be risks from scoping the project that we do not fully and properly understand all of the requirements of the corporation. In addition, project requirements have not been prioritised. Therefore, there may be have small risks in the next steps.
- Solution for this risk: We need to analyze the corporate requirements carefully, and arrange the tasks in a logical way

EXPERIENCE AND KNOWLEDGE RISK

- The risk of knowledge and experience is an unavoidable risk when letting a team with young employees do the project. This risk is directly related to the project implementation capacity.
- Solution for this risk: overcome the gaps in knowledge by learning while working, learning from their predecessors and team members working on the project. Experience can be gathered throughout the life of the research and project.

LACK OF TIME

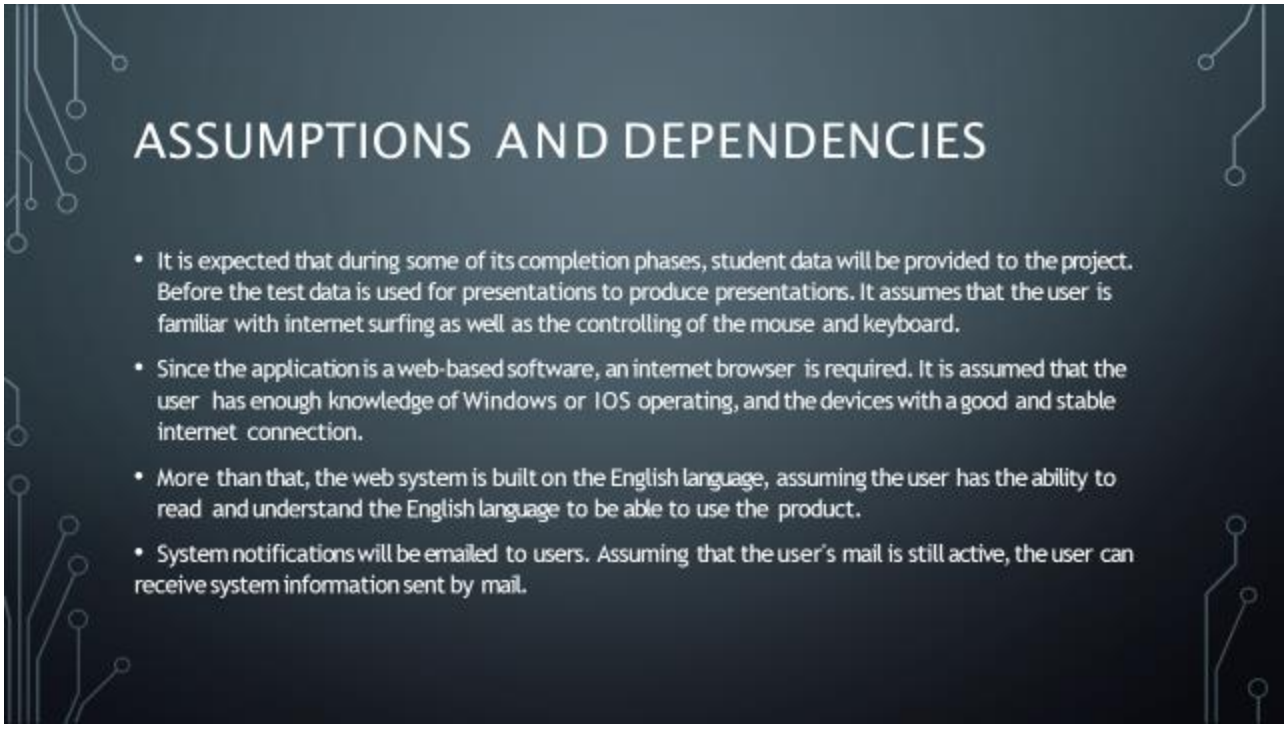
- The time spent on this project is limited and there may also be problems due to lack of experience and understanding. Therefore, lack of time is also a risk that we are facing. When facing the danger of lack of time, the project progress cannot be guaranteed. In addition, when the work is completed under time pressure, the quality of the product is also difficult to perfect.
- Solution for this risk: The only way to limit the time risk is to divide the work in the most reasonable way. In addition, each team member must also complete tasks on time to ensure the progress of the project

SECURITY RISK

- Security is always a risk of every product, every system. Systems with low levels of security can be hacked and cause problems for corporations. System data such as information about courses, lecturers, students ... are important things that need to be protected in the corporation. Therefore, security risks need to be considered and prioritized as much as possible.
- Solution for this risk: When designing the system, make sure to always use security services, design a website securely, and use hosting safely. Besides, it is always checking the input data and creating a set of security policies for future system users.

HARDWARE REQUIREMENT

Item	Web server (minimal)	Web server (recommended)	Hybrid Web & Database SHybrid Web & Database Servererver (minimal)	Hybrid Web Hybrid Web & Database Server (recommended)
Processor (GHz CPU)	2 GHz	4 GHz	4 GHz	8 GHz
RAM (GB)	2 GB	4 GB	4 GB	8 GB
HDD	Website data is recommended for 40 GB of free space or more (non-system drive is preferred) For software that is specified in the software specifications (system drive), GB of free space or more is recommended.			
Recommended Configuration for Microsoft Azure VM	Basic Small VM	Basic Medium VM	Basic Medium VM	Basic Large VM



Software Requirements Specification

for

Advanced FPT Learning system

Version <1.0>

Prepared by

Group Name: *<Group 01>*

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Instructor: Tran Quy Ban

Course: GCH0717

Lab Section: *<place your lab section here>*

Teaching Assistant: *Tran Quy Ban*

Date: 27-04

Contents

Revisions

Version	Primary Author(s)	Description of Version	Date Completed
Draft Type and Number	Full Name	Information about the revision. This table does not need to be filled in whenever a document is touched, only when the version is being upgraded.	00/00/00

1 Introduction (P1)

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

1.1 Document Purpose

This project demonstrates a web-based framework that handles the operation of "Training" for FPT Company's internal training program.
The project's goal is to create a system that can handle trainee accounts, trainers, course types, classes, and topics, as well as assign topics to courses, assign trainers to topics, and assign trainees to the HR department's course.
There are 4 main roles: **administrator**, **training staff**, **trainer**, and **trainee** with different functions.

1.2 Product Scope

The FPT Learning System is a program that allows you to control your employees, trainers, trainees, and courses. The framework aims to build a website that works well on both desktop and mobile devices in the future.

1.3 Intended Audience andDocument Overview

This report is working on the Application Development subject. Reports will be presented to the teacher in charge of the subject, Mr. Hoang Nhu Vinh and classmates.

The main focus of the report is the deployment functionality, the use case model

1.4 Definitions, Acronyms and Abbreviations

No.	Abbreviations/Terms	Explanation
1	SRS	Software Requirement Specification
2	MVC	Model-View-Controller
3	ERD	Entity Relationship Diagram
4	DFD	Data Flow Diagram
5	CRUD	Create-Read-Update-Delete
6	UC	Use Case
7	FLS	FPT Learning System

Table 1. Definition, Acronyms and Abbreviations table

1.5 Document Conventions

allpcworld. (n.d.). *allpcworld*. Retrieved from allpcworld: https://allpcworld.com/downloadbootstrap-studio-2-2-4-professional-free/

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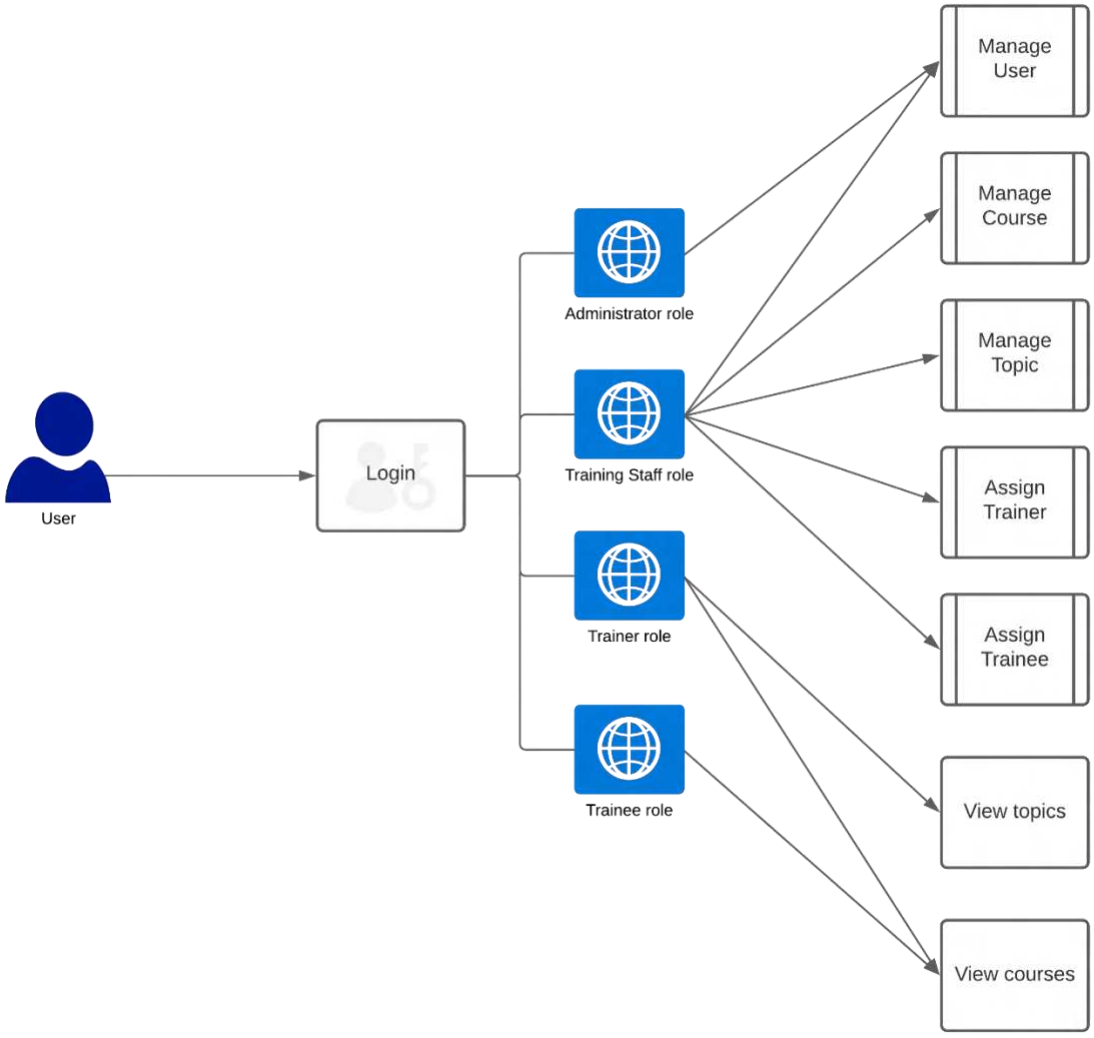
wikipedia. (n.d.). *wikipedia*. Retrieved from wikipedia: https://en.wikipedia.org/wiki/Google_Chrome

2 Overall Description (P1)

2.1 Product Overview



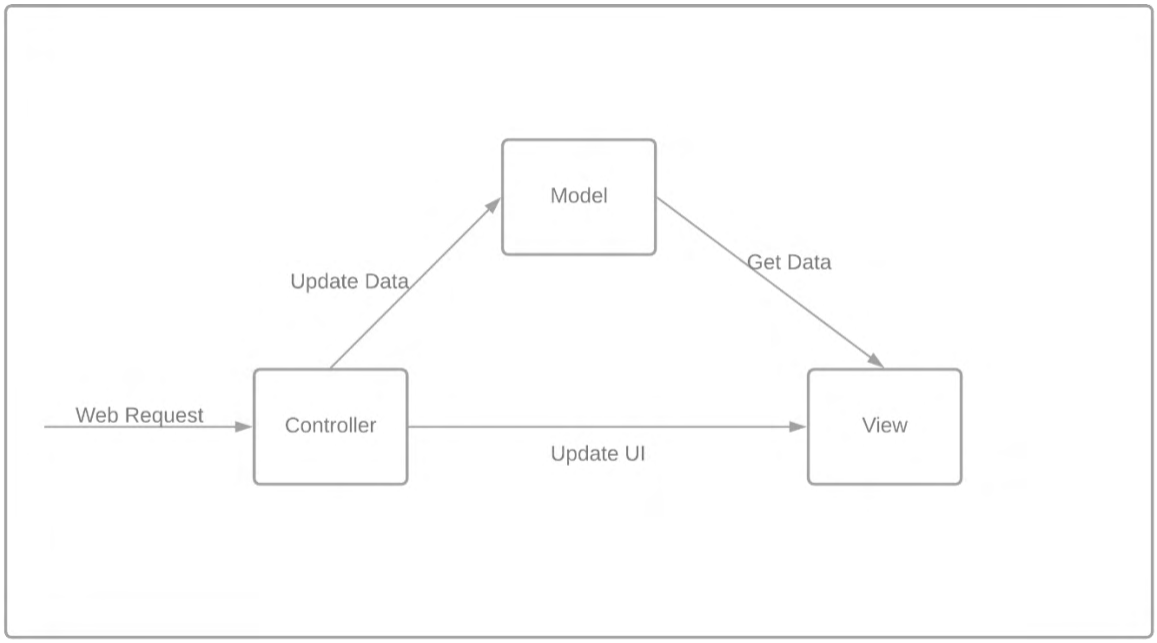


Figure 1:MVC

2.2 Product Functionality

- As an administrator's role:
  - An administrator can log in to FLS
  - An administrator can manage trainer and training staff such as creating, editing, and deleting.
  - An administrator can assign or change username and password for user
- As a training staff's role:
  - Training staff can log in to FLS
  - Training staff can create trainee account by entering details such as trainee name, trainee accounts, age, date of birth.

    - Training staff can view the list of trainees ○ Training staff can look for trainee by trainee account, email.
    - Training staff can manage trainee account such as updating, deleting.
    - Training staff can manage categories such as searching, adding, updating, and deleting.
    - Training staff can manage courses such as searching, adding, updating, and deleting.
    - Training staff can manage topics such as searching, adding, updating, and deleting.
    - Training staff can manage trainer information such as adding, updating, and deleting information.
    - Training staff can assign a trainer to the topic.
    - Training staff can assign trainee to course
- As a trainer's role:
    - A trainer can log in to FLS
    - A trainer can manage his profile by updating the Trainer's name, email, password.
    - A trainer can view courses that trainer has been assigned to a topic.
    - A trainer can view the topic that the trainer has been assigned to the topic.
- As a trainee's role:
    - A trainee can log in to FLS ○ A trainee can view courses that trainee has been assigned to course.

2.3 Design and Implementation Constraints

Hardware constraints

- **For running Node JS core on Windows 10**:
    - Processor: x86 or x64 ○ RAM: 1GB
    - Disk Space: 128Gb
- **For development Environment** ○ Microsoft Visual Studio Code, 2017 version latest 2019.
    - Node JS version 14.16.1 LTS.
    - MonggoDB NoSQL

Database constraints

- **NOT NULL**: Ensures that a column cannot have a NULL value
- **UNIQUE**: Ensures that all values in a column are different
- **PRIMARY KEY**: A combination of a NOT NULL and UNIQUE. Uniquely identifies each row in a table

- **FOREIGN KEY**: Uniquely identifies a row/record in another table
- **CHECK**: Ensures that all values in a column satisfies a specific condition
- **DEFAULT**: Sets a default value for a column when no value is specified

3 Specific Requirements (M1)

3.1 External Interface Requirements

3.1.1 User Interfaces

<\

3.2 Functional Requirements

3.3 3.2 Functional Requirements

3.2.1 Administrator login Use case Description:

Name	Administrator login	**ID**	UC_AD01
Description	Administrator login into FLS through the login page		
Actor	Administrator	**Trigger**	Click on the “login” button
Pre-condition	The login page loads completely		

Post-condition	Account inputted are valid and return to default page with the admin role

Activities:

Actor		**System**	
Main flow: Login Successfully			
1	Administrator input the username/password and clicks the Login button on the login page		-
	-	2	Check the validation of Username and Password
	-	3	Check if the role is Administrator or Not
	-	4	Move to the default page with the admin role

Business Rules:

Rule No.	Rule	Description

System message:

Message No.	Message	Case
1	The Username/Password is incorrect. Please check again!	Wrong Username/ Password
2	The Username/Password does not exist.	The account doesn't exist in the database
3	Login successfully!	Correct Username & Password

3.2.2 Administrator profile

Use case Description:

Name	Administrator view Administrator profile	**ID**	UC_AD02
Description	Administrator view administrator profile through the administrator page		
Actor	Administrator	**Trigger**	Click on the "Administrator profile" button
Pre-condition	The administrator login successfully		

Post-condition	-

Activities:

Actor		**System**	
Main flow: View Successfully			
1	Click on the “Administrator profile” button		-
	-	2	The system move to the administrator profile page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
-	-	-

3.2.3 Training staff profile

Use case Description:

Name	Administrator view Training staff profile	**ID**	UC_AD03
Description	Administrator view Training staff profile through the administrator page		
Actor	Administrator	**Trigger**	Click on the “User management” button
Pre-condition	The administrator login successfully		
Post-condition	-		

Activities:

Actor	**System**
Main flow: View Successfully	

1	Click on the “User management” button		-
	-	2	The system move to the Training staff profile page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
-	-	-

Administrator view

3.2.4 Trainer account

Use case Description:

Name	Administrator view Trainer profile	**ID**	UC_AD04
Description	Administrator view Trainer profile through the administrator page		
Actor	Administrator	**Trigger**	Click on the "User management" button
Pre-condition	The administrator login successfully		
Post-condition	-		

Activities:

Actor		**System**	
Main flow: View Successfully			
1	Click on the "User management" button		-
	-	2	The system move to the Trainer profile page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
-	-	-

3.2.5 Trainee profile

Use case Description:

Name	Administrator view Trainee profile	**ID**	UC_AD05
Description	Administrator view trainee profile through the administrator page		
Actor	Administrator	**Trigger**	Click on the "User management" button
Pre-condition	The administrator login successfully		

Post-condition	-

Administrator view

Activities:

Actor		System	
Main flow: View Successfully			
1	Click on the "User management" button		-
	-	2	The system move to the Trainee profile page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
-	-	-

3.2.6 The administrator creates a new user account for Training staff Use case Description:

Name	Administrator creates Training staff account	**ID**	UC_AD06
Description	Administrator creates Training staff account through the administrator page		
Actor	Administrator	**Trigger**	Click on the "New User" button
Pre-condition	The administrator login successfully		
Post-condition	-		

Activities:

Actor	System
Main flow: Create Successfully	

Message No.	Message	Case
1	"This account has already existed!"	Username has already existed in database
2	"Invalid password, please try again!"	Invalid password
3	"Please choose the role"	Forgot to set the role

4	“Account created successfully!”	Account has been created and saved into database

Administrator view

1	Click on the “New User” button		-
	-	2	The system moves to the “New Account” page
3	Input the Username/Password of the new user		-
4	Select role “Training staff”		-
	-	5	Check the validation of Username and Password
6	Click on the “Create” button		-
	-	7	Create new account with Username and Password assigned in database
	-	8	The system moves to the “User management” page

Business Rules:

Rule No.	Rule	Description
1	Usernames are unique instances	Each account has a unique username

System message:

3.2.7 The administrator creates a new user account for Trainer

Use case Description:

Name	Administrator creates Trainer account	**ID**	UC_AD07
Description	Administrator creates Trainer account through the administrator page		
Actor	Administrator	**Trigger**	Click on the "New User" button
Pre-condition	The administrator login successfully		
Post-condition	-		

Activities:

Actor		**System**	
Main flow: Create Successfully			
1	Click on the "New User" button		-
	-	2	The system moves to the "New Account" page
3	Input the Username/Password of the new user		-
4	Select role "Trainer"		-
	-	5	Check the validation of Username and Password
6	Click on the "Create" button		-
	-	7	Create new account with Username and Password assigned in database
	-	8	The system moves to the "User management" page

Business Rules:

Rule No.	**Rule**	**Description**
1	Usernames are unique instances	Each account have a unique username

System message:

Message No.	**Message**	**Case**
1	"This account has already existed! "	Username has already existed in database
2	"Invalid password, please try again!"	Invalid password
3	"Please choose the role "	Forgot to set the role
4	"Account created successfully!"	Account has been created and saved into database

3.2.8 The administrator creates a new user account for Trainee

Use case Description:

Name	Administrator creates Trainee account	**ID**	UC_AD08
Description	Administrator creates Trainee account through the administrator page		
Actor	Administrator	**Trigger**	Click on the "New User" button
Pre-condition	The administrator login successfully		
Post-condition	-		

Activities:

Actor		**System**	
Main flow: Create Successfully			
1	Click on the "New User" button		-
	-	2	The system moves to the "New Account" page
3	Input the Username/Password of the new user		-
4	Select role "Trainee"		-
	-	5	Check the validation of Username and Password
6	Click on the "Create" button		-
	-	7	Create new account with Username and Password assigned in database
	-	8	The system moves to the "User management" page

Business Rules:

Rule No.	**Rule**	**Description**
1	Usernames are unique instances	Each account has a unique username

System message:

Message No.	**Message**	**Case**
1	"This account has already existed! "	Username has already existed in database
2	"Invalid password, please try again!"	Invalid password
3	"Please choose the role "	Forgot to set the role

4	“Account created successfully!”	Account has been created and saved into database

3.2.9 Administrator account

Use case Description:

Name	Administrator edit Administrator account	**ID**	UC_AD09
Description	Administrator edit Administrator account through the administrator page		
Actor	Administrator	**Trigger**	Click on the “Profile” button
Pre-condition	The administrator login successfully and “Administrator dashboard” page load completely		
Post-condition	-		

Activities:

Actor		**System**	
Main flow: Edited Successfully			
1	Click on the “Profile” button		-
	-	2	The system moves to the “Profile” page with Administrator Id
3	Input the Username/Password of the new user		-
	-	4	Check the validation of Username and Password
5	Click on the “Save” button		-
	-	6	Create new account with Username and Password assigned in database
	-	7	The system moves to the “Administrator profile” page

Business Rules:

Rule No.	Rule	Description
1	Usernames are unique instances	Each account have a unique username

System message:

Message No.	Message	Case
1	“This account has already existed!“	Username has already existed in database
2	“Invalid password, please try again!”	Invalid password
3	“Please choose the role“	Forgot to set the role
4	“Account updated successfully!”	Account has been updated and saved into database

3.2.10 Training staff account

Use case Description:

Name	Administrator edit Training staff account	**ID**	UC_AD10
Description	Administrator edit Training staff account through the administrator page		
Actor	Administrator	**Trigger**	Click on the "Edit" button
Pre-condition	The administrator login successfully and "Administrator dashboard" page load completely		
Post-condition	-		

Activities:

Actor		**System**	
Main flow: Edited Successfully			
1	Click on the "Edit" button		-
	-	2	The system move to the "Edit" page with Administrator Id
3	Input the Username/Password of the new user		-
	-	4	Check the validation of Username and Password
5	Click on the "Update" button		-
	-	6	Create new account with Username and Password assigned in database
	-	7	The system move to the "User management" page

Business Rules:

Rule No.	**Rule**	**Description**
1	Usernames are unique instances	Each account has a unique username

System message:

Message No.	**Message**	**Case**
1	"This account has already existed!"	Username has already existed in database
2	"Invalid password, please try again!"	Invalid password
3	"Please choose the role"	Forgot to set the role
4	"Account updated successfully!"	Account has been updated and saved into database

3.2.11 Trainer account

Use case Description:

Name	Administrator edit Trainer account	**ID**	UC_AD11
Description	Administrator edit Trainer account through the administrator page		
Actor	Administrator	**Trigger**	Click on the "Edit" button
Pre-condition	The administrator login successfully and "Administrator dashboard" page load completely		
Post-condition	-		

Activities:

Actor		System	
Main flow: Edited Successfully			
1	Click on the "Edit" button		-
	-	2	The system move to the "Edit" page with Administrator Id
3	Input the Username/Password of the new user		-
	-	4	Check the validation of Username and Password
5	Click on the "Update" button		-
	-	6	Create new account with Username and Password assigned in database
	-	7	The system move to the "User management" page

Business Rules:

Rule No.	Rule	Description
1	Usernames are unique instances	Each account have a unique username

System message:

Message No.	Message	Case
1	"This account has already existed!"	Username has already existed in database
2	"Invalid password, please try again!"	Invalid password
3	"Please choose the role"	Forgot to set the role

4	"Account updated successfully!"	Account has been updated and saved into database

3.2.12 Trainee account

Use case Description:

Name	Administrator edit Trainee account	**ID**	UC_AD12
Description	Administrator edit Trainee account through the administrator page		
Actor	Administrator	**Trigger**	Click on the "Edit" button
Pre-condition	The administrator login successfully and "Administrator dashboard" page load completely		
Post-condition	-		

Activities:

Actor		System	
Main flow: Edited Successfully			
1	Click on the "Edit" button		-
	-	2	The system move to the "Edit" page with Administrator Id
3	Input the Username/Password of the new user		-
	-	4	Check the validation of Username and Password
5	Click on the "Update" button		-
	-	6	Create new account with Username and Password assigned in database
	-	7	The system move to the "User management" page

Business Rules:

Rule No.	Rule	Description
1	Usernames are unique instances	Each account has a unique username

System message:

Message No.	Message	Case
1	"This account has already existed!"	Username has already existed in database
2	"Invalid password, please try again!"	Invalid password

3	“Please choose the role“	Forgot to set the role
4	“Account updated successfully!”	Account has been updated and saved into database

3.2.13 delete a user account

Use case Description:

Name	Administrator delete exist account	**ID**	UC_AD13
Description	Administrator delete user account through the administrator page		
Actor	Administrator	**Trigger**	Click on the "Delete" button
Pre-condition	The administrator login successfully and "Administrator dashboard" page load completely		
Post-condition	-		

Activities:

Actor		System	
Main flow: Deleted Successfully			
1	Click on the "Delete" button		-
	-	2	The system show pop-up confirm that Administrator want to delete or not
3	Administrator click on "Ok" button		-
	-	4	The account has been deleted in database
	-	5	The system move to the "User management"- page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
1	"Do you want to delete?"	Administrator click on the "delete" button
2	"The account has been deleted!"	The account has been deleted in database

3.2.14 Training staff login Use case Description:

Name	Training staff login	**ID**	UC_TS01
Description	Training staff login into FLS through the login page		

Actor	Training staff	**Trigger**	Click on the “login” button
Pre-condition	The login page loads completely		
Post-condition	Account inputted are valid and return to default page with the Training staff role		

Activities:

Actor		System	
Main flow: Login Successfully			
1	Training staff input the username/password and clicks the Login button on the login page		-
	-	2	Check the validation of Username and Password
	-	3	Check if the role is Administrator or Not
	-	4	Move to the default page with the training staff role

Business Rules:

Rule No.	Rule	Description

System message:

Message No.	Message	Case
1	The Username/Password is incorrect. Please check again!	Wrong Username/ Password
2	The Username/Password does not exist.	The account doesn’t exist in the database
3	Login successfully!	Correct Username & Password

3.2.15 Training staff create trainee account Use case Description:

Name	Training staff creates Trainee account	**ID**	UC_TS02
Description	Training staff creates Trainee account through the Training staff page		
Actor	Training staff	**Trigger**	Click on the “New user” button
Pre-condition	The Training staff login successfully		
Post-condition	-		

Activities:

Actor		System	
Main flow: Created Successfully			
1	Click on the “New user” button		-
	-	2	The system move to the “New Account”page
3	Input the Username/Password of the new user		-
4	Input the trainee name, age, date of birth, education, main programming language, TOEIC score, experience details, department, location, etc		-
	-	5	Check the validation of Username and Password
6	Click on the “Create” button		-
	-	7	Create new account with Username and Password assigned in database
	-	8	The system move to the “Training staff dashboard” page

Business Rules:

Rule No.	Rule	Description
1	Usernames are unique instances	Each account have a unique username

System message:

Message No.	Message	Case
1	“This account has already existed!“	Username has already existed in database
2	“Invalid password, please try again!”	Invalid password
3	“Account created successfully!”	Account has been created and saved into database

3.2.16 Training staff view list of trainees Use case Description:

Name	Training staff view list of trainees	**ID**	UC_TS03
Description	Training staff view list of trainees through the training staff page		
Actor	Training staff	**Trigger**	Click on the "User management" button
Pre-condition	The Training staff login successfully		
Post-condition	-		

Activities:

Actor		System	
Main flow: View Successfully			
1	Click on the "User management" button		-
	-	2	The system move to the "User management" page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
-	-	-

3.2.17 Training staff view trainee profile Use case Description:

Name	Training staff view trainee profile	**ID**	UC_TS04
Description	Training staff view list of trainees through the training staff page		
Actor	Training staff	**Trigger**	Click on the "Trainee profile" button
Pre-condition	The Training staff login successfully		
Post-condition	-		

Activities:

Actor		System	
Main flow: View Successfully			
1	Click on the “Trainee profile” button		-
	-	2	The system move to the trainee profile page with trainee specific id

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
-	-	-

3.2.18 Training staff update trainee profile Use case Description:

Name	Training staff update trainee profile	**ID**	UC_TS05
Description	Training staff update trainee profile through the training staff page		
Actor	Training staff	**Trigger**	Click on the “Edit” button
Pre-condition	The Training staff login successfully		
Post-condition	-		

Activities:

Actor		System	
Main flow: Updated Successfully			
1	Click on the “Edit” button		-
	-	2	The system move to the “edit trainee profile” page with trainee specific id
3	Training staff input the trainee information		
4	Click on the “Update” button		
		5	The trainee information has been updated into database

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
1	"Missing some information. Please fill in again!"	Trainning staff forgot to fill in some information
2	"Updated successfully!"	The trainee information has been updated into database

3.2.35 Trainer login

Use case Description:

Name	Trainer login	**ID**	UC_TN01
Description	Trainer login into FLS through the login page		
Actor	Trainer	**Trigger**	Click on the "login" button
Pre-condition	The login page loads completely		
Post-condition	Account inputted are valid and return to default page with the Trainer role		

Activities:

Actor		System	
Main flow: Login Successfully			
1	Trainer input the username/password and clicks the Login button on the login page		-
	-	2	Check the validation of Username and Password
	-	3	Check if the role is Administrator or Not
	-	4	Move to the default page with the Trainer role

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
1	The Username/Password is incorrect. Please check again!	Wrong Username/ Password
2	The Username/Password does not exist.	The account doesn't exist in the database
3	Login successfully!	Correct Username & Password

3.2.36 Trainer update current trainer profile

Use case Description:

Name	Trainer update current Trainer profile	**ID**	UC_TN02
Description	Trainer update current Trainer profile through the Trainer page		
Actor	Trainer	**Trigger**	Click on the "Update profile" button
Pre-condition	The Trainer login successfully		
Post-condition	-		

Activities:

Actor		System	
Main flow: Updated Successfully			
1	Click on the "Update profile" button		-
	-	2	The system move to the "edit Trainer profile" page with trainee specific id
3	Trainer input the information such as Trainer name, External or Internal Type, education, working place, telephone, and email address.		
4	Click on the "Update" button		
		5	The Trainer information has been updated into database

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case
1	“Missing some information. Please fill in again!”	Trainer forgot to fill in some information
2	“Updated successfully!”	The Trainer information has been updated into database

3.2.37 Trainer view list of topic Use case Description:

Name	Trainer view list of topic	**ID**	UC_TN03
Description	Training staff view list of topic through the Trainer page		
Actor	Trainer	**Trigger**	Click on the “Topic Details” button
Pre-condition	The Trainer login successfully, “Topic” page load completely and the trainer has been assigned to topic		
Post-condition	-		

Activities:

Actor		System	
Main flow: View Successfully			
1	Click on the “Topic Details” button		-
	-	2	The system move to the “Topic Details” page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case

3.2.38 Trainee login

Use case Description:

Name	Trainee login	**ID**	UC_TE01
Description	Trainee login into FLS through the login page		
Actor	Trainee	**Trigger**	Click on the “login” button
Pre-condition	The login page loads completely		
Post-condition	Account inputted are valid and return to default page with the Trainee role		

Activities:

Actor		**System**	
Main flow: Login Successfully			
1	Trainee input the username/password and clicks the Login button on the login page		-
	-	2	Check the validation of Username and Password
	-	3	Check if the role is Administrator or Not
	-	4	Move to the default page with the Trainee role

Business Rules:

Rule No.	**Rule**	**Description**
-	-	-

System message:

Message No.	**Message**	**Case**
1	The Username/Password is incorrect. Please check again!	Wrong Username/ Password
2	The Username/Password does not exist.	The account doesn’t exist in the database
3	Login successfully!	Correct Username & Password

Name	Trainee view list of courses	**ID**	UC_TE02
Description	Trainee view list of course through the Trainee page		
Actor	Trainee	**Trigger**	Click on the “Trainee Course” button
Pre-condition	The Trainee login successfully, “Course” page load completely and the Trainee has been assigned to topic		
Post-condition	-		

Activities:

Actor		**System**	
Main flow: View Successfully			
1	Click on the “Trainee Course” button		-
	-	2	The system move to the “Trainee Course” page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case

3.2.19 Training staff delete trainee account Use case Description:

Name	Training staff delete exist account	**ID**	UC_TS06
Description	Training staff delete trainee account through the Training staff page		
Actor	Training staff	**Trigger**	Click on the "Delete" button
Pre-condition	The Training staff login successfully and "Trainee" page load completely		
Post-condition	-		

Activities:

Actor		**System**	
Main flow: Deleted Successfully			
1	Click on the "Delete" button		-
	-	2	The system show pop-up confirm that want to delete or not
3	Click on "Ok" button		-
	-	4	The account has been deleted in database
	-	5	The system move to the "User management" page

Business Rules:

Rule No.	**Rule**	**Description**
-	-	-

System message:

Message No.	**Message**	**Case**
1	"Do you want to delete?"	Administrator click on the "delete" button
2	"The account has been deleted!"	The account has been deleted in database

3.2.20 Training staff view list of courses Use case Description:

Name	Training staff view list of courses	**ID**	UC_TS07
Description	Training staff view list of course through the Training staff page		
Actor	Training staff	**Trigger**	Click on the "Course management" button
Pre-condition	The Training staff login successfully and "Course" page load completely		
Post-condition	-		

Activities:

Actor		System	
Main flow: View Successfully			
1	Click on the “Course management” button		-
	-	2	The system move to the “Course management” page

Business Rules:

Rule No.	Rule	Description
-	-	-

System message:

Message No.	Message	Case

3.4 3.3 Use Case Model

3.3.1 Administrator use case diagram

4 Other Non-functional Requirements (P2)

4.1 Performance Requirements

- **First Contentful Paint**: Less or equal to 2.0 s
- **First Meaningful Paint**: Less or equal to 2.0 s
- **Speed Index**: Less or equal to 2.0 s
- **First CPU Idle**: Less or equal to 2.0 s
- **Time to Interactive**: Less or equal to 2.3 s
- **Max Potential First Input Delay**: Less or equal to 60 ms

0.1 second: the limit after which the system reaction doesn't seem instantaneous; 1 second: when user will notice the delay, but without interrupting the flow of thought; 10 seconds: when user attention is completely lost.

The landing page supporting 5 thousand users per hour must provide 6 seconds or less response time in a Chrome desktop browser, including the rendering of text and images, over an LTE connection.

4.2 Safety and Security Requirements

The website will deploy with HTTPS and has SSL

4.3 Software Quality Attributes

The web dashboard must be available to users 98 percent of the time every month during business hours

4.4 Localization

The date format must be as follows: month.date.year.
The font on the website must be easy to read.

Index of comments

2.1 Group 1: Hoang Phi Hung, Le Huy Hoang, Nguyen The Hoang, Nguyen Hoang Duong

Team lead + Technical lead: Hoang Phi Hung

Other members: create documents, fix bug and testing

Technology: Front-end + Back end (Node.js)

The program has a login/logout function. Connect to the Database (MySQL). Functionalities are running normally following the requirement. Not enough time for validation.

Should use inheritance in the Login/Logout use case diagram.

The diagram is not right, an use case has only one include use case.

Do not use the standard use case table description.

Lack of Sequence diagram/Class diagram.

Copy text directly from textbooks and other internet sources.

Huy Hoang: report, survey (basic). Mainly ok, but more risks should be identified.

The Hoang: UML (all): Activities and sequence diagrams. Basic diagrams. No clear explanation.

Hoang Duong: Survey 15 people, questions are normal, not very critical. Mostly easy to use. Survey-based on features, design. Some questions can give good feedback such as “difficult to use with validation”. Surveys are quite ok, simple evaluation, need more information.