UNIVERSITY of GREENWICH
Alliance with FPT Education

BTEC

BTEC Level 5 HND Diploma in Computing

Unit 30: Application Development

Learner's name:

ID:

Class:

Subject ID:

Assessor name:

Assignment due: Assignment submitted:

Assignment Brief 1 (RQF)

Higher National Certificate/Diploma in Computing

Student Name/ID Number:	
Unit Number and Title:	**Unit 30: Application Development**
Academic Year:	**2021 – 2022**
Unit Assessor:	
Assignment Title:	**Analysis and Design solution for a given problem**
Issue Date:	**January 4, 2022**
Submission Date:	**December 30, 2021**
Internal Verifier Name:	
Date:	

Submission Format:

Format: The submission is in the form of two documents/files

- An individual SRS document in PDF format. Writing must be professional.
- An individual evaluation document in PDF format. Writing must be professional.

Submission

- Students are compulsory to submit the assignment in due date and in a way requested by the Tutor.
- The form of submission will be a soft copy posted on http://cms.greenwich.edu.vn/.
- Remember to convert the word file into PDF file before the submission on CMS.

Note:

- The individual Assignment *must* be your own work, and not copied by or from another student.
- If you use ideas, quotes or data (such as diagrams) from books, journals or other sources, you must reference your sources, using the Harvard style.
- Make sure that you understand and follow the guidelines to avoid plagiarism. Failure to comply this requirement will result in a failed assignment.

Unit Learning Outcomes:

LO1 Produce a Software Design Document by analysing a business-related problem and deduce an appropriate solution including a set of initial requirements

LO2 Use design and development methodologies with tools and techniques associated with the creation of a business application

Assignment Brief and Guidance:

Scenario: As the technology is being developed rapidly nowadays, FPT Co. desires to build the continuing study environment throughout the corporation. It is necessary to develop a system, which manages the activity of "Training" for internal training program of the company. This system can be used to manage trainee accounts, manage trainers, manage course categories, manage courses, manage topics, assign topic to course, assign trainer to topic, assign trainee to course.

This is a system used by HR department. We have four roles in this system, an administrator, training staff, a trainer and trainees. The detailed description of those roles can be viewed in the attached document (Requirements.docx).

Tasks

You and your team (2 members/team maximum) need to prepare a software design document with the following sections:

- A requirement specification which explores the problem by a set of user and system requirements, as well as determine any risks related to the successful completion of your application. You are advised to use an SRS template or modify one to complete this task.
- An evaluation section in which you research the use of software development tools and techniques and identify any that have been selected for the development of this application. You should compare them and justify your choices.
- A design section in which you use chosen tools from previous step to produce design diagrams for your solution based on the requirement specification.

Learning Outcomes and Assessment Criteria (Assignment 1):			
Learning Outcome	Pass	Merit	Distinction
LO1	**P1** Explore a business-related problem and produce a well-defined Problem Definition Statement supported by a set of user and system requirements. **P2** Determine any areas of risk related to the successful completion of your application.	**M1** Analyse a business-related problem using appropriate methods and produce a well-structured Software Design Document that defines a proposed solution and includes relevant details on requirements, system analysis, system design, coding, testing and implementation.	**D1** Justify the tools and techniques chosen to realise a custom built website. Justify your preferred selection of tools and techniques in deducing an appropriate solution to a business related problem.
LO2	**P3** Research the use of software development tools and techniques and identify any that have been selected for the development of this application.	**M2** Compare the differences between the various software development tools and techniques researched and justify your preferred selection as well as your preferred software development methodology.	

Table of Contents

ASSIGNMENT 1 ANSWERS

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

1. Introduction

Along with the rapid development of technology. Web applications are increasingly popular because of the benefits that it brings such as: High interactivity, storing and retrieving data quickly. Integrate multiple tasks to support features, management, and tracking. Increase user experience, increase brand effect and save maintenance cost. FPT Company is also not out of that trend. They want to develop a web-based system to manage the fiTrainingfi activities for the company's internal training program to ensure a continuous learning environment throughout FPT Corporation. The system is used by the human resources department. We have three roles in this system, administrator, training staff and a trainer. The system's functions include: student account management, lecturer management, course catalog management, course management, topic management, subject assignment for the course, assignment of lecturers for the course. topics, assign instructors to the course.

1.1. Document Purpose

This document is intended to explain the role requirements of each human resources department.

An administrator's role:

- Can login to the system through the first page of the application
- Can create/edit/delete new user account for trainer/training staff and assign/change(if existing user) username and a password

A training staff's role:

- A registered training staff, who is assigned a user name and a password by the administrator logs in can create trainee accounts by entering details like trainee name, trainee accounts, age, date of birth, education, main programming language, TOEIC score, experience details, department, location, etc.
- After entering successfully all details for trainees, his/her details are then stored in the database. The training staff is given a list of trainees for him to view and search. From the list of trainees, he can also search by trainee account, programming language, TOEIC score…
- Can update, delete trainee accounts

- Can manage course categories such as searching, adding, updating and deleting course categories. Course category includes the information such as course category name and descriptions.
- Can manage courses such as searching, adding, updating and deleting courses. Course includes course name and description.
- Can add topics such as topic name and topic descriptions into a course, add courses into a category.
- Can manage trainer profile such as adding, updating and deleting the information: Trainer name, External or Internal Type, working place, telephone, and email address.
- Can assign trainer to a topic.
- Can assign trainee to a course.

A trainer's role:

- In the same system, the trainer who have been registered by the administrator can login and can update his profile such as Trainer name, External or Internal Type, education, working place, telephone, and email address.
- Can view courses which have a topic he is assigned to.

The above roles are divided to make the work process easy, clear, and understandable for users.

1.2. Product Scope

This software is being developed primarily for education for each role in the field. Helps to easily manage student accounts, manage instructors, manage course catalogs, manage courses, manage topics, assign topics to courses, assign instructors to topics, assign instructors for the course. Easily integrate all of the above as a means of communication so that everyone can easily interact through at work.

1.3. Intended Audience and Document Overview

The intended audience of this project includes people who act as system users such as administrators, training staff and trainers. In addition, the people who need to read this document are those responsible for software design such as: software engineers, technical architects, project managers...

The document refers to the design and use of a web-based system to manage the fiTrainingfi activity for FPT's internal training program.

Internal trainer is defined as an employee who was delegated by manager or volunteer with personal willingness to conduct education as additional task to cover business needs.

1.4. Definitions, Acronyms and Abbreviations

Internal training is the practice of teaching learners within an organisation by learning and development officers. It refers to commercial operations and corporate learning rather than pure-learning institutions.

Training is teaching, or developing in oneself or others, any skills and knowledge or fitness that relate to specific useful competencies. Training has specific goals of improving one's capability, capacity, productivity and performance. It forms the core of apprenticeships and provides the backbone of content at institutes of technology (also known as technical colleges or polytechnics). In addition to the basic training required for a trade, occupation or profession, training may continue beyond initial competence to maintain, upgrade and update skills throughout working life. People within some professions and occupations may refer to this sort of training as professional development. Training also refers to the development of physical fitness related to a specific competence, such as sport, martial arts, military applications and some other occupations.

Course (education)

In higher education in various countries, such as Canada, Nigeria and the United States, a course is a unit of teaching that typically lasts one academic term, is led by one or more instructors (teachers or professors), and has a fixed roster of students. A course usually covers an individual subject. Courses generally have a fixed program of sessions every week during the term, called lessons or classes. Students may receive a grade and academic credit after completion of the course.

2. Overall Description

2.1. Product Overview

Currently, with the rapidly developing technology, FPT company is planning to develop a system for internal training activities in the company in order to increase the training quality of FPT company. This will be a completely new system to replace the traditional training management process. It is used by the human resources department including: administrators, training staff, trainers and trainees. Web application of FPT Company will be used to manage trainee accounts, manage trainers, manage course categories, manage courses, manage topics, assign topic to course, assign trainer to topic, assign trainee to course.

2.2. Product Functionality

There are main levels of access:

- Administrators
- Training staff
- Trainers

According to the project, the main functions will be performed as follows: You can log in to the system through the first page of the application. When the user enters the system, he will be required to log in. If he does not have an account, create an account. The data when the user logs in will be saved to the database. Furthermore, as a user, it is possible to change, create, edit, and delete an account when that person is no longer in use. To avoid full data that will lead to delay when loading resources, after logging in the manager will provide a role for the user, the user will use those roles correctly. After logging in, if the system updates wrong information, users can edit and update the system again. Users entering the system can find the correct route they are learning the date and time of the content. Through this section, the functions of updating and correcting information are very important to implement for the project.

2.3. Risks related to the project

Broken Access Control

This means that restrictions on authenticated users are not properly enforced, leading to one user able to see other users' files or modify other users data.

XML External Entities

This occurs when older or badly configured XML processors evaluate external entity references within XML docs. That can expose internal files and allow for internal port scanning, remote code execution, and denial of service attacks.

Sensitive Data Exposure

This is where sensitive data is not encrypted in transit or at rest, leaving it exposed for attackers to steal or modify.

Broken Authentication

If authentication and session management is implemented wrong, attackers can compromise passwords, keys or session tokens and assume other users' identities.

Injection

Whether it's SQL, NoSQL, OS, or LDAP, an untrusted dataset gets sent to an interpreter tacked on to a command or query, tricking the interpreter into executing unintended commands or accessing data without authorization.

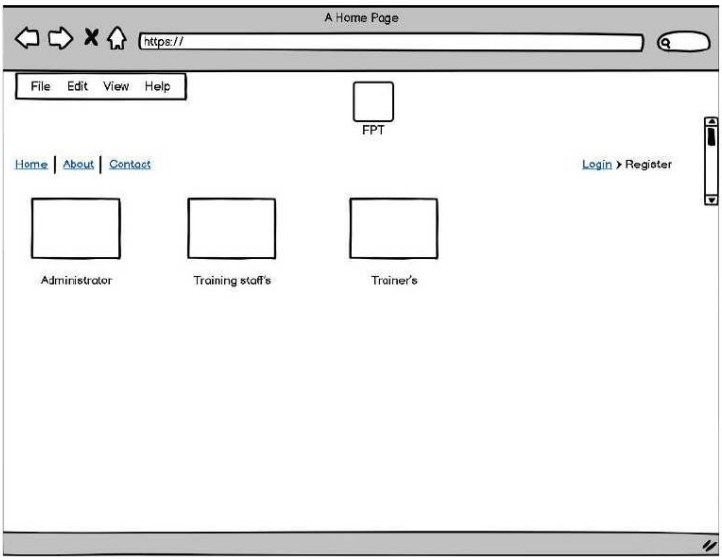
2.4. Assumptions and Dependencies

Software developers will need to take into consideration the operating environment in which their products will be deployed when designing, developing, and testing the software. To deploy a product in a specific operating environment, the software must be designed to operate in that specific environment. Software development also depends on third-party tools and/or services for design, marketing, analytics, etc.

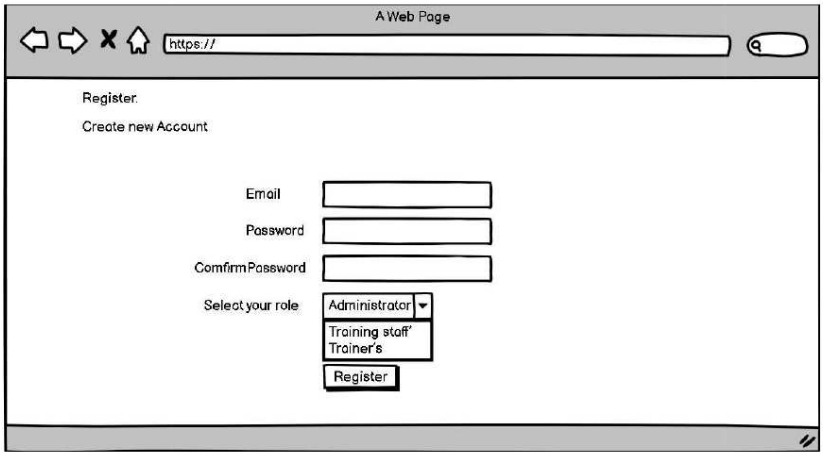
3. Specific Requirements

3.1. External Interface Requirements

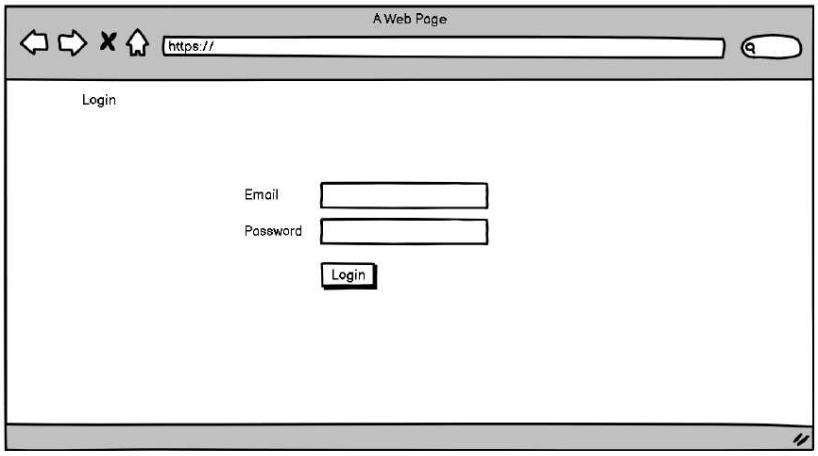
User Interfaces



This is the home page, the user can enter the correct web address, this first page will appear, here the web will display information about the user's roles. And there are information tabs of the system such as login to register to have a system account, with contact information that needs support, there is a separate information page.



The next page is the account registration page, users can enter email information to user registration. Password to register, confirm the password is correct or not. Finally, choose the right role you need to use.



Finally, on the system login page, the user logs in correctly and requires an email and password that is registered. If the system fails, the user can go back registration page to re-subscribe through the re-login page.

Functional Requirements

F1: Our system will create user request pages, through which users can choose the right role they are using. Usually, uploaders must register before they can edit their information. This is so that there are no multiple copies of the same property.

<Functional Requirement or Feature #2>

Each user role has a different function

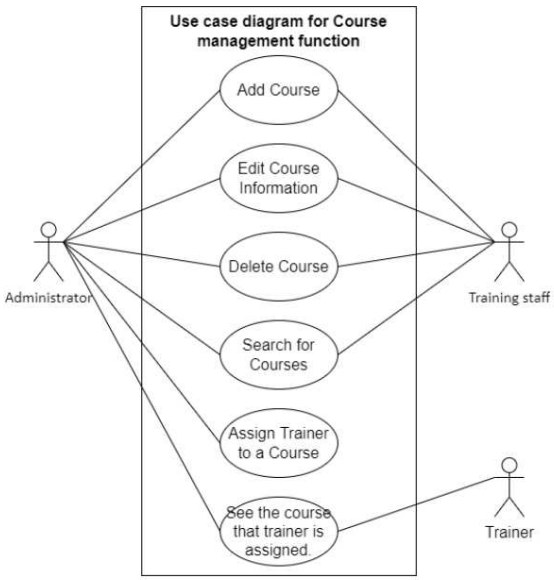
Trainers and Trainees: can view personal information editing courses

Training staff: edit the course to change the status of the information and remove more students.

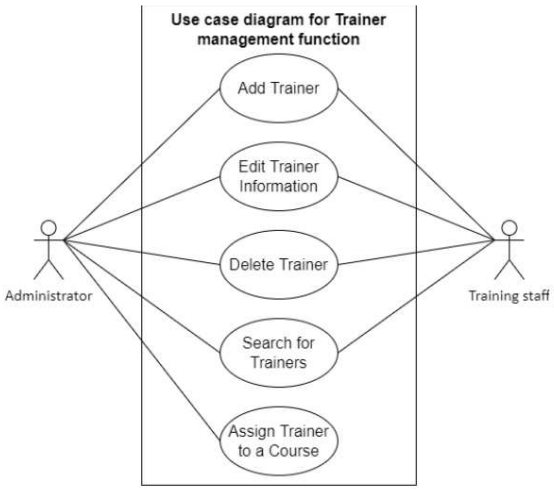
Administrators: can access the system more easily, delete, add, edit and edit teachers and students.

3.3. Use Case Model

Use Case diagram for course management functionality.



Use Case diagram for trainer management functionality.



3.3.1. Use Case #1 (Course Management Function - UC 1)

Use Case ID: UC 1

Use Case Name: Course Management

Description: As a manager, I want to use the system's course management functionality to create and assign courses to trainers and trainees.

Actor(s): User (Administrator, Training staff)

Priority: Must Have

Trigger: User wants to create a new training course for FPT's system.

Pre-Condition(s):

- User accounts already created
- User accounts have been authorized
- User's account has been logged into the system

- The user's device is already connected to the internet when performing the function

Post-Condition(s):

- User successfully created a new course for the system.
- The system records successful create new course in the Activity Log.

Use-case Normal steps:

Step No.	Actor	System	Notes
1	The administrator clicks the link to create a new course on the home screen of the system.	Displays the Create New Course screen for the administrator.	See Create New Course screen layout design below
2	Enter all the information for the course such as Course Name, Course Description, Course Date.	Verify information about the course	
3	Click the create new course button	Show newly created course in course management screen.	See Course Management screen layout design below

Alternative 1: The administrator wants to delete unnecessary courses to easily for manage other courses.

Step No.	Actor	System	Notes
1	Admin clicks on the link to the course management screen	Displays the Course Management screen for the administrator.	See Course Management screen layout design below
2	Admins search for the course they want to delete from the system.	Show course information	See Course Information screen layout design below
3	Click the Delete button	Display message: Successfully deleted course The system records Successful course deletion in the Activity Log	See Notification screen layout design below

Alternative 2: The administrator wants to assign trainers to the courses in the system.

Step No.	Actor	System	Notes
1	Admin clicks on the link to the course management screen	Displays the Course Management screen for the administrator.	See Course Management screen layout design below
2	Click the link to add a trainer for the course	Select a trainer that the manager wants to add to the course from the list of trainers.	See List Of Trainers screen layout design below
3	Click the button to assign a trainer to the course	The system records successfully assigned a trainer to the course in the Activity Log.	See Notification screen layout design below

3.3.2. Use Case #2 (Trainer Management Function - UC 2)

Use Case ID: UC 2

Use Case Name: Trainer Management

Description: As a manager, I want to add a user as a trainer to use the system functions.

Actor(s): User (Administrator)

Priority: Must Have

Trigger: User wants to register an account for a new trainer in the FPT Company's system.

Pre-Condition(s):

- User accounts already created
- User accounts have been authorized
- User's account has been logged into the system
- The user's device is already connected to the internet when performing the function

Post-Condition(s):

- User successfully registers an account for a new trainer to access the system.
- The system records successful add new trainer role in Activity Log

Use-case Normal steps:

Step No.	Actor	System	Notes
1	The administrator clicks the link to create a new trainer	Displays the Create New Trainer screen for the administrator.	See Create New Trainer screen layout design

	on the home screen of the system.		below
2	The administrator enters the full information for the trainer's account that needs to be added to the system.	Check trainer information If true, redirect to new account creation screen If false, request to re-enter the trainer's information	
3	Enter the full username and password for the trainer account	Verify account information	See Create New Account screen layout below
4	Clicks on create new account button	The system records the successful Creation of a new account for trainer in the Activity Log.	

Alternative 1: The administrator wants to remove unnecessary trainer for easier management.

Step No.	Actor	System	Notes
1	The administrator clicks the link to the trainer management screen in the system.	Displays the Trainer Management screen for the administrator.	See Trainer Management screen layout design below
2	Search for the name of the trainer who need to deleted from the management list.	Display the information of the trainer need to find	See Trainer Information screen layout design below
3	Click on delete trainer button	Send confirmation message to admin	See Notification screen layout design below
4	The administrator confirms deleting the trainer from the system.	Show message: Delete user successfully The system records successfully Deleted trainer in the Activity Log	

Alternative 2: The administrator wants to edit trainer information.

Step No.	Actor	System	Notes

1	The administrator clicks the link to the trainer management screen in the system.	Displays the Trainer Management screen for the administrator.	See Trainer Management screen layout design below
2	Search for the name of the trainer who need to edited from the management list.	Display the information of the trainer need to find	See Trainer Information screen layout design below
3	Click the button edit trainer information	Show details of all previously added trainer information.	
4	The administrator clicks on the row whose information need to edited. After editing is complete, the administrator clicks on the finish button.	Send notification: Edit successful The system records successful information editing in the Activity Log	See Notification screen layout design below

3.4. Other Non-functional Requirements

Some non-functional requirements in our system:

- Users who enter incorrect login information for the 5th time in a row will have their account locked for 15 minutes.
- Time out for login screen under 60 seconds.
- The maximum delay in redirecting to another page is 30 seconds

P2 Determine any areas of risk related to the successful completion of your application.

REF / ID	PRE-MITIGATION				DEPARTMENT / LOCATION	MITIGATIONS / WARNINGS / REMEDIES	POST-MITIGATION			
	RISK	RISK SEVERITY	RISK LIKELIHOOD	RISK LEVEL			RISK SEVERITY	RISK LIKELIHOOD	RISK LEVEL	ACCEPTABLE TO PROCEED?
		– ACCEPTAttLE – TOLERAttLE – UNDESIRAttLE – INTOLERAttLE	– IMPROttAttLE – POSSIttLE – PROttAttLE	**– LOW** **– MEDIUM** **– HIGH** **– EXTREME**			– ACCEPTAttLE – TOLERAttLE – UNDESIRAttLE – INTOLERAttLE	– IMPROttAttLE – POSSIttLE – PROttAttLE	**– LOW** **– MEDIUM** **– HIGH** **– EXTREME**	**YES / NO**
1	Project purpose and need is not well-defined.	TOLERAttLE	POSSIttLE	**HIGH**	Project Sponsor	ttusiness case re-written with clear deliverables and submitted to the Project ttoard for approval.	TOLERAttLE	POSSIttLE	**MEDIUM**	**YES**
2	Estimating/or scheduling errors	INTOLERAttLE	PROttAttLE	**HIGH**	Project Manager	ttreak this two risks 'cost estimating' and 'scheduling errors'. Use two methods of cost estimation, and carefully track costs and forecast cost at completion making adjustments as necessary. ttuild in 10% contingency on cost and scheduling. Track schedules daily and include schedule review as an agenda item in every project team meeting. Flag forecast errors and/or delays to the	ACCEPTAttLE	IMPROttAttLE	**MEDIUM**	**YES**

						Project ttoard early.				
3	Project schedule is not clearly defined or understood	INTOLERAttLE	IMPROttAttLE	**MEDIUM**	Project Manager	Hold scheduling workshops with the project team so they understand the plan and likelihood of missed tasks is reduced.	INTOLERAttLE	PROttAttLE	**HIGH**	**YES**
4	Lack of communication, causing lack of clarity and confusion.	ACCEPTAttLE	POSSIttLE	**MEDIUM**	Project Manager	fiWrite a communication plan which includes frequency, goal, and audience of each communication. Identify stakeholders early and make sure they are considered I the communication plan. Use most appropriate channel of communication for audience e.g. don't send 3 paragraph email to Developers, have a call instead. fi	INTOLERAttLE	IMPROttAttLE	**EXTREME**	**YES**
5	Pressure to arbitrarily reduce task durations and or run tasks in parallel would increase the risk of errors.	ACCEPTAttLE	PROttAttLE	Medium	Project Manager	fiShare the schedule with key stakeholders to reduce the risk of this happening. Patiently explain that schedule was built using the expertise of subject matter experts. Explain the risks of the changes.	ACCEPTAttLE	PROttAttLE	**MEDIUM**	**YES**

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

1. Design tools

1.1. UML definition:

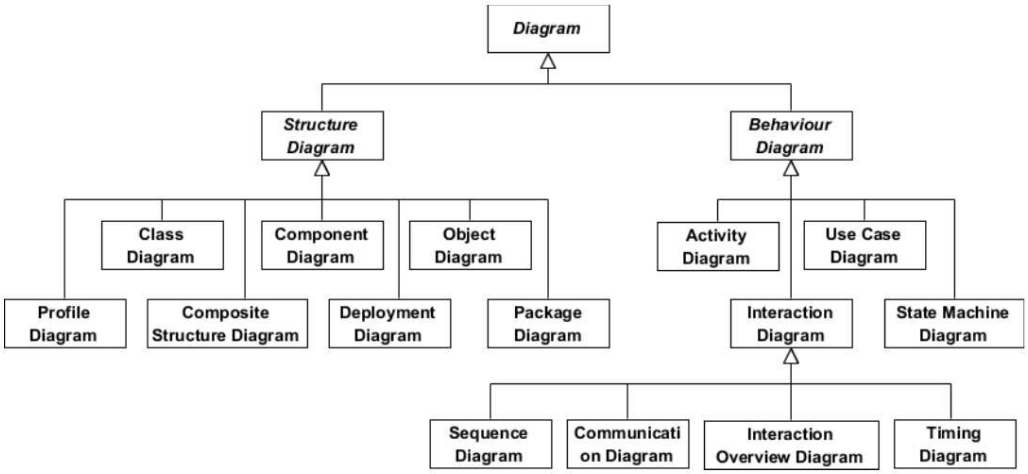
Unified Modeling language (UML) is a standardized modeling language enabling developers to specify, visualize, construct and document artifacts of a software system. Thus, UML makes these artifacts scalable, secure and robust in execution. UML is an important aspect involved in object-oriented software development. It uses graphic notation to create visual models of software systems.

The UML architecture is based on the meta object facility, which defines the foundation for creating modeling language. They are precise enough to generate the entire application. A fully executable UML can be deployed to multiple platforms using different technologies and can be used with all processes throughout the software development cycle.

UML is designed to enable users to develop an expressive, ready to use visual modeling language. In addition, it supports high level development concepts such as frameworks, patterns and collaborations. UML includes a collection of elements such as:

- Programming Language Statements
- Actors: specify a role played by a user or any other system interacting with the subject.
- Activities: These are tasks, which must take place in order to fulfill an operation contract. They are represented in activity diagrams.
- ttusiness Process: includes a collection of tasks producing a specific service for customers and is visualized with a flowchart as a sequence of activities.
- Logical and Reusable Software Components

1.2. Some popular UML diagrams:



UML diagrams can be divided into two types. The first category includes chart types that represent structural information.

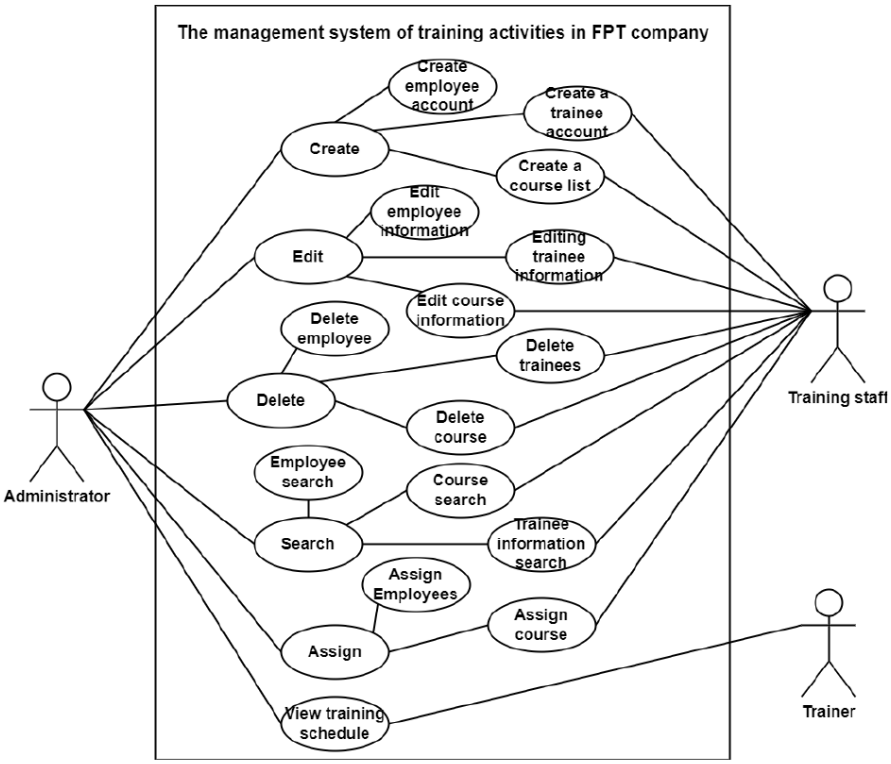
- Class Diagram: represents system class, attributes and relationships among the classes.
- Component Diagram: represents how components are split in a software system and dependencies among the components.
- Object Diagram: represents a complete or partial view of the structure of a modeled system.

The second category includes chart types that represent general types of behavior.

- Activity Diagram: represents step by step workflow of business and operational components.
- Use Case Diagram: describes functionality of a system in terms of actors, goals as use cases and dependencies among the use cases.

1.3. Use the UML tool to give examples.

Use case diagram for FPT's training system:



2. Development tools and techniques

2.1. Cloud provider

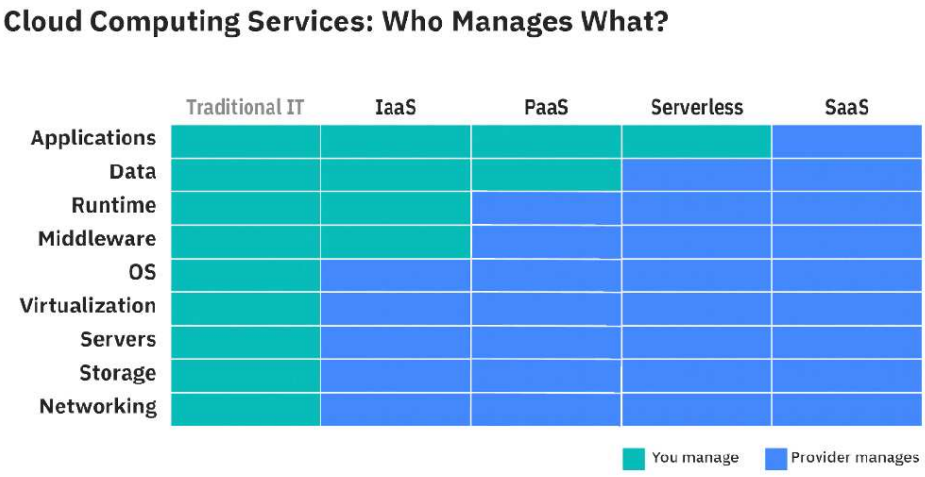
Cloud computing providers play a foundational role for businesses. Virtually every enterprise uses cloud computing in some manner, whether it's to deliver key infrastructure and services, host applications or a content delivery network (CDN), or handle machine learning and software development.

The convenience and economics of cloud providers make them increasingly appealing. Cloud deployments are:

- Typically fast and easy to provision.
- Deliver enormous flexibility and are always-on.
- ttoost speed and performance.
- Move organizations away from a cash-intensive CAPEX model toward a more budget-friendly OPEX framework.

For many companies, it is clearly evident that implementing and incorporating cloud technologies as part of their business strategy will remain a top priority in the foreseeable future. Some of the largest cloud providers

include Microsoft Azure, Amazon Web Services (AWS) and Google Cloud Platform (GCP). Depending on your needs, these providers often offer 3 different types of cloud services: Infrastructure (IaaS), Software (SaaS) and Platform (PaaS).



The image above: summary of the comparison between traditional IT and cloud services

List some of the top cloud providers:

Amazon Web Services (AWS)

Amazon Web Services (AWS) is an Amazon company that was launched in the year 2002. AWS is the most popular cloud service provider in the world.

Amazon Web Services (AWS) is the world's most comprehensive and broadly adopted cloud platform, offering over 165 fully-featured services from data centers globally. This service is used by millions of customers.

AWS offers hundreds of services. Some of these include Virtual Private Cloud, EC2, AWS Data Transfer, Simple Storage Service, DynamoDtt, Elastic Compute Cloud, AWS Key Management Service, AmazonCloudWatch, Simple Notification Service, Relational Database Service, Route 53, Simple Queue Service, CloudTrail, and Simple Email Service.

Microsoft Azure

Microsoft Azure is one of the fastest-growing clouds among them all. Azure was launched years after the release of AWS and Google Cloud but is still knocking on the door to become the top cloud services provider. Microsoft Azure recently won a $10 billion US government contract.

Azure offers hundreds of services within various categories including AI + Machine Learning, Analytics, ttlockchain, Compute, Containers, Databases, Developer Tools, DevOps, Identity, Integration, Internet of Things, Management, Media, Microsoft Azure Stack, Migration, Mixed Reality, Mobile, Networking, Security, Storage, Web, and Windows Virtual Desktop.

IBM Cloud

IttM Cloud developed by IttM is a set of cloud computing services for businesses. Similar to other cloud service providers, the IttM cloud includes IaaS, SaaS, and PaaS services via public, private, and hybrid cloud models.

Compute, Network, Storage, Cloud Packs, Management, Security, Database, Analytics, AI, IoT, Mobile, Dev Tools, ttlockchain, Integration, Migration, Private Cloud, and VMware.

Google Cloud

Google cloud platform is Google's cloud. Similar to AWS and Azure, Google Cloud also offers similar services in various categories, including compute, storage, identity, security, database, AI and machine learning, virtualization, DevOps and more.

Here is a list of complete products and services categories Google Cloud Platform services:

- AI and Machine Learning, API Management, Compute, Containers, Data Analytics, Databases, Developer Tools, Healthcare and Life Sciences, Hybrid and Multi-cloud, Internet of Things, Management Tools, Media and Gaming, Migration, Networking, Security and Identity, Serverless Computing, and Storage.
- Google products are also offered in the cloud, including G Suite, Google Maps Platform, Google Hardware, Google Identity, Chrome Enterprise, Android Enterprise, Apigee, Firebase, and Orbitera.

Oracle Cloud

Oracle cloud platform is the cloud offering of Oracle corporation. Oracle cloud offers IaaS, PaaS, SaaS, and Data as a Service (DaaS).

Oracle offerings include the following:

- Oracle IaaS offerings are Compute, Storage, Networking, Governance, Database, Load ttalancing, DNS Monitoring, Ravello, and FastConnect.

- Oracle PaaS offerings are Data Management, Application Development, Integration, ttusiness Analytics, Security, Management, and Content and Enterprise.
- Oracle SaaS offerings are CX, HCM, ERP, SCM, EPM, IoT, Analytics, Data, and ttlockchain Applications.
- Oracle DaaS is the Oracle Data Cloud.

2.2. Development languages / Framework

2.2.1. Programming languages

In this section we will discuss the top programming languages that can be used to develop web applications for businesses.

JavaScript

JavaScript and Python are always in close competition. Over the past few years, JavaScript has maintained its position at the top when it comes to enterprise app development. Enterprises are now looking for more front end web development services to redesign their apps.

JavaScript works with both HTML and CSS to offer interactive applications. With versatile functionality, it has become the go-to language for enterprise app development for most of the web development companies.

Meanwhile, all the other programming languages have remained steady. It shows that the demand for web development services is still rising, especially with the introduction of cloud-native practices.

Python

Python has always been the most versatile programming language. It is simply best for application development. It comes with the simplest scripts and links to the database with great ease. With Python, you can develop pretty much anything you want to. Python's best thing is that it can create a neural network for AI, which is something large enterprises are considering now.

Its huge standard library and its compatibility with major systems make it come handy for enterprise app developers. Also, it's easy syntax makes reading and redesigning quite easier.

One thing you need to know here that web developers have progressed to Python 3 as Python has been recently discontinued in 2020.

Java

Java holds up its standards of write once, works everywhere. This makes it the best programming language for enterprises that want to ensure consistent and topnotch user experience. Despite the operating system, Java programs run over wide networks.

Java differs from JavaScript, which is mainly a front-end programming language. However, it shares a similar syntax.

C++

C++, despite being the beginner's programming language, makes it into the list of top 7 programming languages for enterprise app development. It is also known as the benchmark language, as it allows object-oriented development.

C#

If you are looking for a sole enterprise language, C# is the answer. It is technically more complicated than C++ and other languages in the C family. It comes as a high-level language, and so, most web developers use C# for enterprise app development. It compiles to the byte-code and not the Assembly.

However, you need to know that C# works best for internal business applications. If you want a traditional app for your enterprise, C# is the best option. ttut, if you are looking for cloud-based services and web apps, JavaScript and Python are the ones to consider.

PHP

PHP ranks to the 6th position in top programming languages for enterprise app development. It can easily fetch data out of the database. It allows direct embedding into HTML for web app development.

As PHP is an open-source language, it is continually evolving and improving. However, it is still low in demand. Maybe we see its surge in years to come.

For this project, we decided to use the programming language C#. ttecause the project is on the size of a company. Larger the company size, the higher the number of languages used. Large enterprises mostly use multiple languages, and Cloud Foundry reported higher use of Python and C# than other languages.

2.2.2. Framework:

Web application frameworks offer a wide range of pre-written components, code snippets, and whole application templates. Web development frameworks can be used for the development of web services, web APIs (Application Programming Interface) and other web resources.

There are generally two types of development frameworks – client side and server side frameworks. While client side frameworks are used for dealing with the user interface, a server side framework works in the background to ensure the smooth functioning of the website.

Front-end Frameworks	Back-end Frameworks
The frontend is the part of the website visible to the users.	ttackend refers to the background functioning of the sites.
Also known as client-side frameworks	Also known as Server side frameworks
Involves UI-UX designing, SEO optimization, performance and scalability enhancing, creating reusable templates	Involves database management, security, URL routing, designing site architecture, the server handling
Frontend Languages – HTML, CSS, JavaScript, JQuery	ttackend Languages – Python, JavaScript, PHP, Ruby, .NET
Frontend Frameworks- React, Vue, ttootStrap, Ember, Angular	ttackend frameworks- Django, Ruby On Rails, Express, Spring, ASP.NET Core
Front end frameworks provide pre-written code snippets, reusable templates, integrable elements and manage user interaction	Database manipulation, user authorization, privacy encryptions, reusable components are some benefits of using backend frameworks

The most popular web frameworks

Ruby on Rails

Ruby on Rails is a dynamic web application framework, perfect for developing a high-speed application. Discovered by David Heinemeier Hansson, Ruby on Rails applications are generally ten times faster. It is one of the best backend frameworks as it comprises everything that is needed to form a database-driven application. Websites that have incorporated Ruby on Rails are GitHub, Airbnb, GroupOn, Shopify, Hulu, etc.

Laravel

Simple, elegant, and readable are the USPs of Larval. Taylor Otwell developed Laravel in 2011. Similar to other contemporary development frameworks, it functions on an MVC architectural model that uses PHP.

Laravel has API support and contains a good quantity of packages that could expand its reach. Laracasts is a tutorial website with thousands of videos on Laravel, PHP, and frontend technologies in the ecosystem of Laravel.

Laravel includes a lot of features such as dependency injection, server side rendering It is proving to be the best framework for websites like Neighbourhood, Travel, Deltanet, Lender, and many more.

Django

Django is one of the reliable backend web development frameworks that aid in developing a robust web application. It uses 'Convention over Configuration,' as well as DRY pattern. Django provides tools and techniques to developers for building a safe website, implementing the security features in the framework for best web development.

It is perfect when competing with fast-moving deadlines and the challenging requirements of veteran developers. The Django applications are tremendously scalable, fast, versatile, and secure. The companies that use Django are Pinterest, Disqus, YouTube, Spotify, Instagram, and other popular giants.

ASP.NET

A popular web development framework that is immensely helpful to build dynamic web applications for PC and mobiles is ASP.NET. Microsoft invented it to let programmers build vibrant websites, applications, and services.

Asp.net Core is a novel version of Asp.net and is renowned for its speed, productivity, and power. It is a high-performing and lightweight. Some famous companies using ASP.NET are Tacottell, GettyImages, StackOverflow, etc.

Express

Express is an open-source backend framework that supplies a variety of features for website and mobile development. It is considered one of the best web development frameworks as it is a minimal, flexible, framework for backend development on Node.js.

It functions on Java, one of the major programming languages, for building up backend web applications. It is preferred by developers all across the globe. Additionally, Express helps develop competent APIs.

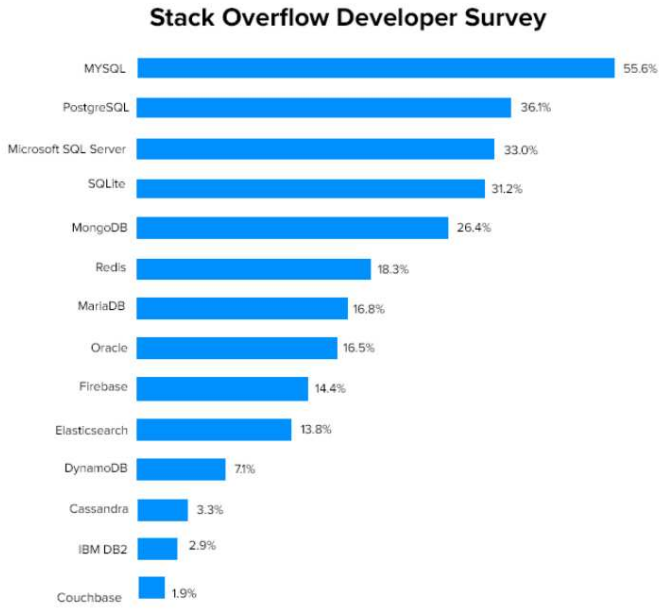
It is one of the significant Express components of the mean software bundle. Companies using Express for their projects are MuleSoft, Accenture, Myntra, Uber, Myspace, etc.

2.3. Database servers

Databases are the cornerstone of any Software Applications. You will need one or more databases to develop almost all kind of Software Applications: Web, Enterprise, Embedded Systems, Real-Time Systems, AI, ML, HPC, ttlockchain, IoT, and many other applications.

A Database is a systematic collection of data which supports storage and manipulation of information. It is usually managed by a Database Management System (DttMS). Data within a database is typically modeled in rows and columns in tables to make data querying and processing more efficient.

Here are some of the best, most popular database servers based on a Stack Overflow survey of 2021:



The Oracle

Oracle is the most widely used commercial relational database management system, built-in assembly languages such as C, C++, and Java. This database's most recent version, 21c, contains a slew of new features.

Oracle is the database management system that stands above the others. Overall, it is the most extensively used RDttMS. It takes up less space and processes data faster, and it includes several new useful features such as JSON from SQL.

MySQL

MySQL is one of the most popular databases to use in 2021 in the computer world, especially in web application development. The main focus of this database is on stability, robustness, and maturity. The most popular application of this database is for web development solutions.

MySQL is written in C and C++ and uses a structured query language. MySQL ft.0 is the most recent version of this database, and it includes a better recovery option. The best SQL database comes in a variety of editions, each with its own set of features.

MS SQL Server

Microsoft provides great toolset support for one of this best database software, both on-premise and in the cloud. It's attuned well with Linux and Windows systems. MS SQL is a multi-model database that supports Structured Data (SQL), Semi-Structured Data(JSON), and Spatial Data.

It is not as inventive or advanced as other modern list of popular databases, but it has undergone considerable improvements and overhauls over the years.

PostgreSQL

POSTGRES was the initial name of the database. Michael was also honored with the Turing Award for his contributions to PostgreSQL.

PostgreSQL is a database management system written in C and used by businesses that deal with huge amounts of data. This database management software is used by several gaming apps, database automation tools, and domain registrations.

MongoDB

When it comes to most popular databases to use in 2021 through a NoSQL database, there are a few things to consider. MongoDtt is the first Document Database management software that was released in 2009. It is challenging to load and access data into RDttMS using object-oriented programming languages which also

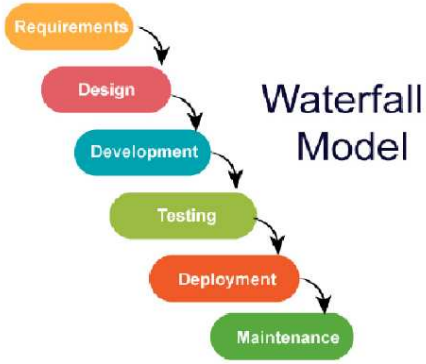
require additional application-level mapping. Thus, to overcome this problem, Mongo was developed to handle Document Data.

2.4. Software Development Models

The software development models are the various processes or methodologies that are being selected for the development of the project depending on the project's aims and goals. There are many development life cycle models that have been developed in order to achieve different required objectives. The models specify the various stages of the process and the order in which they are carried out.

Choosing right model for developing of the software product or application is very important. ttased on the model the development and testing processes are carried out. There are various Software development models or methodologies. They are as follows:

Waterfall Model



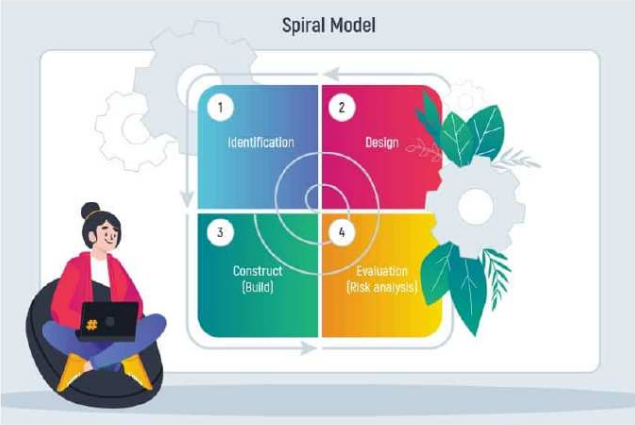
The Waterfall model is the first of the software project development models that have been introduced in the software development circles. It is also called linear as the model implies each stage to be completed before going on to the next one. So, the model goes linearly step by step giving no possibilities to overlap any stage.

Iterative and Incremental Model

In the Iterative model, the development starts with implementing several small requirements, and then the product is enhanced with the help of numerous iterations (incrementally). The process of enhancement goes on in increments (iterations) until the application features are complete and it is ready to be deployed. Developing only a small part of the software is a smart approach as you can easily review what was done, quickly identify further requirements and proceed with the implementation or provide some changes to the

app and then proceed. Either way, you'll benefit from the solutions as every new iteration will bring you a new and better version of the software.

Spiral Model

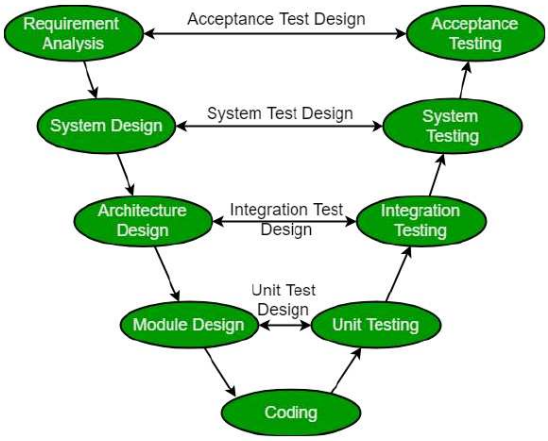


The Spiral Model is a combination of the Iterative and Waterfall models. From the Iterative methodology, it took the cycled development, and from the Waterfall one, it borrowed a systematic approach and the ability to control the process. The biggest emphasis of the current model falls on risk analysis. Also, it delivers a project in iterations, which swirl around the spiral.

The Spiral Model is designed in 4 stages. The product under development passes all of these stages during its iterations, which are also called spirals in this methodology. The stages include:

- Identification
- Design
- Construct (ttuild)
- Evaluation (Risk analysis)

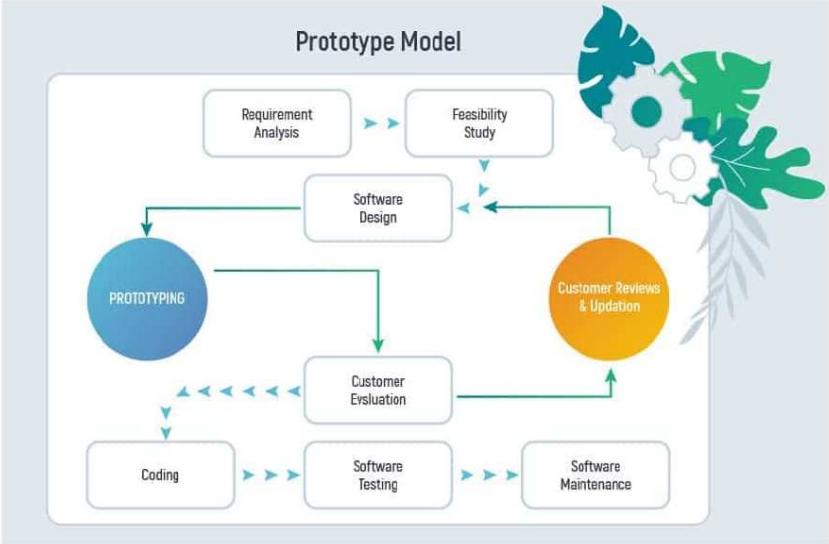
V-shaped Model



The V-model allows a project to be carried out in a sequence and according to the V shape. The other name of this model is a Verification and Validation Model because it is based on the Waterfall Model. However, here, in the SDLC, every stage of development includes testing as well. So, you carry out a phase, complete it, test it and only then go to the next phase that will look identical to the previous one with regards to its structure.

In the V-shaped Model, the development phase corresponds to the testing phase and they go parallelly. This means you can see the Verification phases on one side of the image and the Validation phases on the other. These sides are being joined with the Coding Phase.

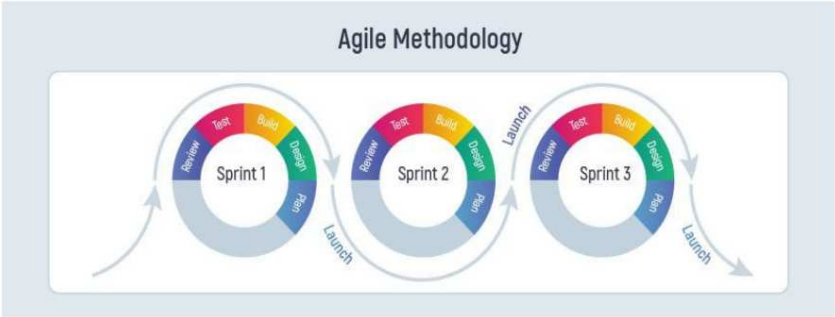
Prototype Model



Prototyping is the creation of software application prototypes that show the visual representation of the minimal features of the incomplete product. This enables understanding customer requirements early in the development stage and getting valuable feedback. The model includes:

- Identification of basic requirements
- Initial prototype development
- Prototype review
- Prototype revision and enhancement

Agile Model



Agile methodology is based on the iterative and incremental model but it is more adaptive and delivers working software at a speedy pace. Due to meeting the clients' requirements and being very flexible, the Agile

methodology brings customer satisfaction. Agile projects tend to break the production process down into incremental builds or we call them iterations. Every iteration has a timeline of 1 to 3 weeks and includes different teams working on various project areas simultaneously. This allows a decrease in the time of production and it may lower production costs as well. Every iteration consists of the same processes, which are:

- Planning
- Requirements Analysis
- Design
- Coding
- Unit Testing
- Acceptance Testing

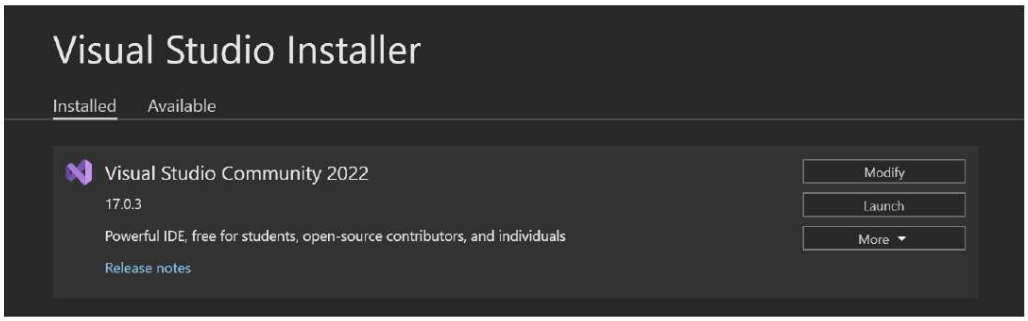
Conclusion

ttefore any software could be programmed decisions are needed to be made on which programming language should be used. The software been a desktop application, visual studio 2022 was used as the IDE and to ensure a standardized object oriented program in its entire ramification, C sharp programming language was used, after Microsoft ADO.Net was used to connect to the database which was created using Microsoft SQL Server. The implementation was carried out using C# .Net Framework with windows applications which serves as the Graphical User Interface (GUI). The application was built on windows 10 operating system, with visual studio a good graphical user interface was design, then using the C sharp programming as code behind to perform all the functionalities.

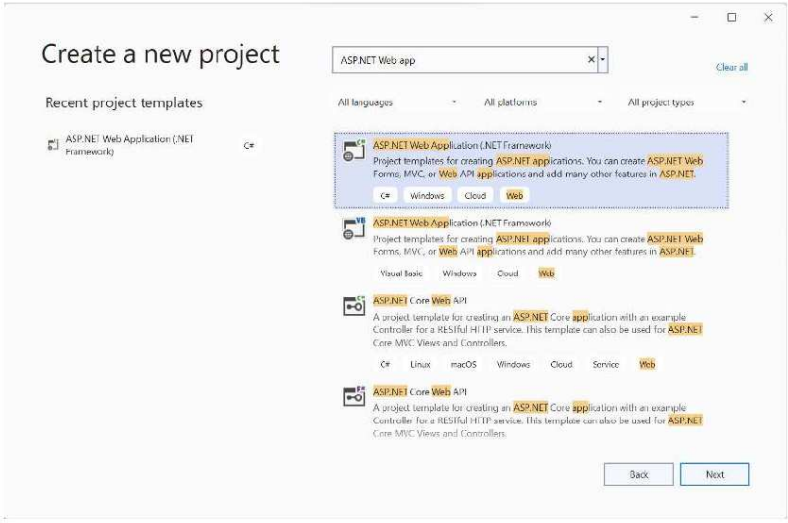
CATEGORY	SOFTWARE USED
OPERATING SYSTEM	Windows
Programming Language	C sharp
IDE	Visual Studio
Framework	.NET and ADO.Net
Database	Microsoft SQL Server

For this project we decided to use Visual Studio for web application development. Visual studio is an effective support software to support website programming work. It is also the system that brings together everything

related to application development, including the code editor, designer, and debugger. That is, you can write code, fix bugs, edit application design easily with just 1 Visual Studio software.



The language we choose for software development is C# to create HTML5, CSS, and JavaScript-based websites that are safe, fast, and scalable to millions of users.



The framework we use in this project is ASP.NET MVC (.NET Framework). ttecause ASP.Net is a powerful technology used to build rich web applications. With it's MVC implementation it just became more systematic, enterprise and rugged. Most importantly, it is very suitable for FPT Company to run enterprise applications related to scalability aspect. ttecause MVC is a cleaner, systematic, and more advanced way of implementing structured growth of software.

Advantages of Using MVC Framework:

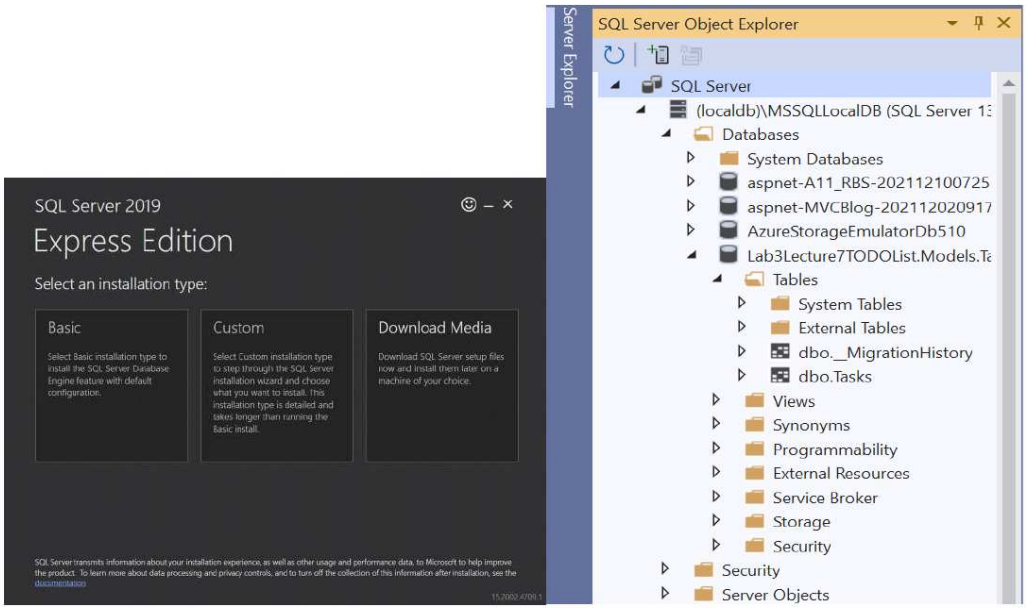
- Faster Development Process

- Ability To Provide Multiple Views
- Support For Asynchronous Technique
- The Modification Does Not Affect The Entire Model
- MVC Model Returns The Data Without Formatting
- SEO Friendly Development Platform

In Visual studio most popular databases are supported, including SQLite, SQL Server, MySQL, PostgreSQL, Dtt2 and more, as well as non-relational stores like MongoDtt, Redis and Azure Cosmos Dtt .

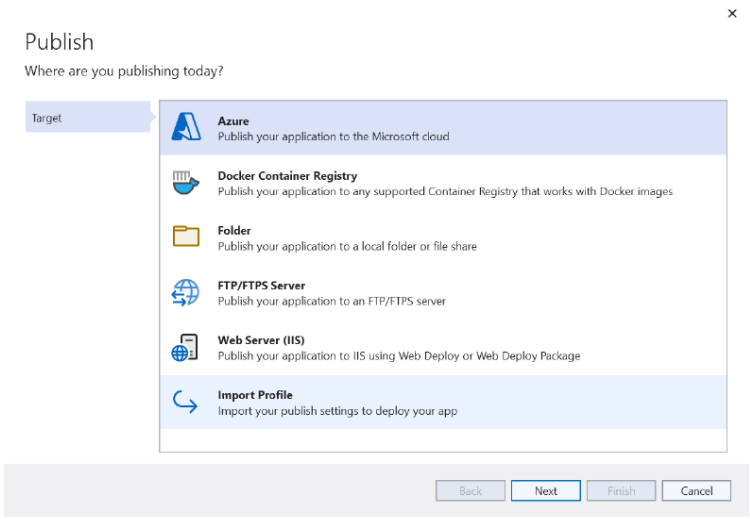
Microsoft SQL Server 2019 Express is a powerful and reliable free data management system that delivers a rich and reliable data store for lightweight Web Sites and desktop applications.

Here, we use Microsoft SQL Server as a place to store and manage data. System users can manipulate this data such as: add, delete, edit or search data.



The recommended cloud provider is Azure. Azure tools help users to store unlimited data, develop applications, manage services on the internet without the need for a suite. memory and personal computer hardware. All operations are performed and processed through Microsoft data centers.

Compared to other cloud platforms, Azure is more open, secure, and powerful. Microsoft Azure provides a wide range of useful services such as virtual machines (Virtual Machines), SQL databases, domain services, application services, Visual Studio team services, and storage.


Publish
Where are you publishing today?
Target
Azure
Publish your application to the Microsoft cloud
Docker Container Registry
Publish your application to any supported Container Registry that works with Docker images
Folder
Publish your application to a local folder or file share
FTP/FTPS Server
Publish your application to an FTP/FTPS server
Web Server (IIS)
Publish your application to IIS using Web Deploy or Web Deploy Package
Import Profile
Import your publish settings to deploy your app
Back
Next
Finish
Cancel

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