DESIGN AND IMPLEMENTATION OF AN E-LEARNING MANAGEMENT SYSTEM

BY

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CERTIFICATION

This Project titled, **DESIGN AND IMPLEMENTATION OF AN E-LEARNING MANAGEMENT SYSTEM,** prepared and submitted by **SENGE SAMUEL OLUWAPELUMI** in partial fulfilment of the requirements of the degree of **BACHELOR OF SCIENCE** (Computer Science), is hereby accepted

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DEDICATION

I dedicate this project to God almighty for it has been with his guidance I was able to carry out this project successfully.

I also dedicate this project to my parents and siblings for their immense support and encouragement.

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I am forever grateful to my parents, Mr. and Mrs. Senge, for the love and support shown to me throughout my stay at Mountain Top University.

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Above all, I want to express my sincere gratitude to Almighty God, the giver of life and my source of help, for everything.

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ABSTRACT

It has been studied and concluded that learning can be more fun and of better value outside the four walls of a classroom. With software such as the E-Learning Management System,

A learning management system is intended to promote the management of the corporate e-learning programs of an organization. The E-Learning Management System (LMS) has been implemented by several universities to facilitate teaching and learning processes. Most E-Learning management system applications allow for student registration, the delivery and tracking of e-learning courses and content, testing and examinations on the platform also. they may also allow for the management of instructor-led training classes. Students can now acquire knowledge in the comfort of their rooms, places of residence and other locations of convenience. Problems encountered by students involve inaccessibility to course materials and the lecturers. Our main objective is to develop a system that will provide a well-organized mechanism of delivering courses and lecture-related materials online, create a flexible option of obtaining materials, taking quizzes anywhere at any time and provide an easier platform for student-lecturer relationship and easy dissemination of information and lecture materials.

To build the E-learning management system, a structured methodology will be selected, the structured design methodology adopts a systematic step-by - step approach to the life cycle of system creation that moves logically from one stage to the next. The methodology used involved system analysis, system design, system development, and system testing. The system design will be achieved using Hypertext Markup Language (HTML) and Cascade Style Sheet (CSS) along with bootstrap to style the HTML contents and create more responsiveness to ensure its

scalability across various screen sizes. JavaScript will also be used to create dynamically updating content, control multimedia & moving images and interactivity of the user interface for the frontend and PHP and MySQL for backend design.

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CHAPTER ONE

INTRODUCTION

1.1   Background to the Study

Although there is a broad variety of hypotheses that aim to understand the way people learn, the idea of learning has its ambiguity, causing debate and interpretation. We will only be able to unravel its true significance by taking a really close look at the phenomenon.

Learning Management System is one approach to computers use in the education sector which holds great potential and important concepts. E-Learning management system was originally used to describe the management system component of the PLATO K-12 learning system, content-free and separate from the courseware as technological tools become more available for online education, interest continues to increase among learners and other professionals in the application of these tools in online courses. Learning management system (LMS) are software applications that brings learning and teaching into online tools. Many higher education institutions have implemented them to manage online learning and teaching by providing support to staff and students to improve the speed and effectiveness of educational processes and communication among learners as well as between staff and students.

Bailey (1993) presents the following general characteristics for an e-Learning management system in education:

    a. instructional objectives are tied to individual lessons;

    b. lessons are incorporated into the standardized curriculum;

    c. courseware extends several grade levels in a consistent manner;

    d. a management system collects the results of student performance;

    e.   lessons are provided based on the individual student's learning progress.

In order to handle tasks such as compliance training, credential management and sales enablement, E-learning management systems are used to incorporate a range of learning methods across various forms, including formal, experiential and social learning. E-learning has also grown into a source of revenue for the enlarged business. different formats, including formal, experiential and social learning to manage functions such as compliance training, certification management and sales enablement. E-learning has also evolved into a revenue generator for the extended enterprise.

1.2   Statement of the Problem

Unadventurous learning is usually structured relatively and requires learners to meet regularly, at scheduled times, on the same days each week. It, therefore, limits flexibility regarding work and other activities. Generally, students must be in class to obtain learning experience, course materials, lecture notes, and to keep up with the requirements, even in situations of inconvenience.

Accurate exchange of information and course materials among students is of major concern because there may seem to be no adequate mechanism for the communication of various course materials that may hinder student learning, and this may not provide a significant opportunity for students to achieve higher levels of education where possible. Consequently, this work provides access to lecturers/students and course materials online. It also provides easy communication of information to students via announcements and posts online as well as ensure prompt submission of projects and assignments for effective grading and assessment.

1.3   Aim and Objectives of the Study

1.3.1   Aim

The principal aim of this project is to design a learning management system for mountain top university quickly with less effort while at the same time, not compromising the quality of the learning experience.

It does not require the removal of existing learning methods, but rather the preservation of the normal teaching and learning cycle. In other words, it is a step forward with the help of advanced technology to take existing learning activities to the next level.

1.3.1   Objectives

The e-learning management system proposed is aimed at achieving active learning through virtual presentations, web-based resources and multimedia to improve teaching. The learning management system will enable the students perform the following activities remotely and electronically:

a. Allow student to download and read materials online

b. Allow students view courses and course outline

c. Allow students take quiz/tests on the system

d. Reduce stress and gain easy access to both students and staffs record

e. Allow lecturers track progress of student and keep record safely

f. Allow students get instants notification of upcoming events/lectures via E-mail

g. Improve performance

h. Establish video calls and real-time chat platforms in order to facilitate interaction among users

The learning management system will exhibit the following features:

   i.   A user-friendly interface and responding database

   ii.   A web application that provides a native app-like user experience on any device and saves users' sessions

   iii.   A secured database system

   iv.   A portal accessible across multiple device type, and operating system

1.4   Scope of the Study

The development of online and Web-enabling technology has a significant effect on e-learning performance.

In order to be usable, secure and compatible with all of the traditional educational learning systems, electronic learning platforms must be carefully designed and constructed using a realistic method that supports well-defined processes and methods to aid the use of such facilities.

Therefore, this work is concerned with developing and incorporating an E-Learning web portal in the form of a Progressive web application where learning can occur remotely, and learning materials can be exchanged using test data from the department of Computer science, Mountain Top University.

Excitedly, this work will promote and assist with the learning process at different schools across the country when this application is introduced and launched, and provide solutions to different learning challenges.

1.5   Significance of the Study

The fast growth of computer technology in almost all operating areas and its use in educational sector, it has become essential to look into the development of a learning management system meet up with innovative and creative approaches to instruction and provides unprecedented access to resources and information. The learning management system will therefore assist students learn in flexible self-directed pace and management to Reduce the workload in the current scheme.

1.6   Limitation of study

Due to time and financial constraints, the learning management system that is developed would serve for only registered students of the university non-registered students shall be given a limited access to the portal (not being able to have access to the learning resources).

1.7   Definition of Terms

1.7.1   Learning

Learning is a personal process of acquiring, developing, and consolidating knowledge, skills, understanding, and values. (British International School of Stockholm, n.d.) Learners participate and reflect on knowledge and observations to create or change new existing, understanding, development, and application of personal, social, physical, and intellectual abilities and values, which can require synthesis of different information types. It has a starting point and a multitude of recognizable endpoints, according to what we learn, and at what stage.

1.7.2   E-Learning

E-Learning is learning refers to learning using electronic technologies to access educational curriculum outside of a traditional classroom. E-learning makes use of the optimal training modes of skills development integrating instructional materials, learning tools, lecturer-student communication, and interactive computerization software into an open unified learning framework system. There are different forms of E-learning

1.7.2.1   The primary forms of E-Learning

   i.   Synchronous E-learning:

This involves real-time communication between students and a lecturer over the web. For examples – Virtual Classrooms. Students interact with each other and instructors through instant messaging, speaking, audio and video conferencing, and additionally, all sessions can be filmed and played back. It requires classes of students to engage concurrently in a learning experience from anywhere in the world. It involves learning from the sources of Virtual Classroom: Audio and Video Conferencing, Chat, Webinars, Application Sharing, Messaging instantly.

   i.   Asynchronous E-learning:

Asynchronous E-Learning means "not at the same time," which allows the learners learn at their own pace, without live interaction with the instructor. It is Information that is accessible on a self-help basis, 24/7. Students study independently at different times and locations from each other, without real-time communication taking place the advantage is that this kind of e-Learning offers the learners the knowledge they always need available. It also has interaction amongst participants through message boards, bulletin boards, and discussion forums.

1.7.3 Learning Management System

The learning management system (LMS) is a software framework that is used to control learning, create, manage, deliver, and track your learning process.

1.7.4 Online learning

Online Learning can be said to be any learning performed on a computer and the Internet.

1.7.5 Blended Learning

Blended learning is the combination of face to face strategies for learning and online learning methods focused on technology. It is described as a combination of live training at self-pace.

1.7.6 Computer Aided Learning (CAL)

Learning assisted by the computer.

1.7.7 Computer Based Learning (CBL)

A term for all computer-aided instruction/training types, educational materials, or tools for instructional technology.

1.7.8 Web Application

A web-based application is any software accessible using HTTP over a network interface, rather than residing in the memory of a computer.

1.7.9 User Interface (UI)

The user interface is the way the user communicates with the operating program.

1.7.10 Web Browser

A web browser is a computer program that interprets HTML command to compile, organize, and view pieces of a web page.

1.7.11 JavaScript

JavaScript is the programming language of HTML and the web. HTML programming language and website. Commands in JavaScript allow a browser to complete tasks if a user is browsing a web page. JavaScript also handles interaction between regular contact, including xAPI and SCORM and LMS.

1.7.12 Media

Media is any visual representation that has a blend of audio, video, animation, or graphics.

1.7.13 Session

It is a total period devoted to the activity. For computer systems, a user session occurs when a user signs in or accesses a device, network or web service. This stops until the user log off the program or shuts the computer down.

1.8   Organization of Project

Chapter One (INTRODUCTION) presents the groundwork of the project, statement of the problem, the aim, and objectives, methodology, the scope of the study, the significance of the study, and implementation strategy useful to solve the problem.

Chapter Two (LITERATURE REVIEW) offers a review of the literature.

Chapter Three (METHODOLOGY) presents the architecture of the projected system, the flowchart, processes, and the structure of the database that produces a detailed report of the components that makes up the system.

Chapter Four (SYSTEM IMPLEMENTATION AND RESULTS DISCUSSION) shows the operation of the proposed system, and the various components would be tested.

Chapter Five (SUMMARY, CONCLUSION, AND RECOMMENDATION) concludes the project.

CHAPTER TWO

LITERATURE REVIEW

2.1   Introduction

Technological and environmental evolvement in the global world tends to change the mode of living and these movements have transformed learning and teaching in institutions and tend to do more. Recently the pandemic that occurred in the world made more institutions adapt the E-learning teaching methods.

In our age time, computer has rotated into a key part to our day by day life due to the progression innovation of World Wide Web that turns into a web that permit every single client associated with their computer for data sharing all through the entire world. The World Wide Web completed an incredible commitment to a great deal of big business which utilize this component for data sharing inside the endeavor and furthermore outside the undertaking (Kapchnaga, R, 2014). Therefore, the goal of this chapter is to provide a discussion of the existing learning environments, including their feature, concepts, and factors that influence the acceptance of E-learning management system.

This section attempts to examine the ICT-enabled learning trend in the past and how it motivates academics in today's age and this could be achieved by stirring up literature as literature is the principal witness to the progress in teaching and learning. While education has changed in all dimensions, the effect of e-learning on learners is unconquerable. This section will help to find hidden patterns of ICT growth enabled learning and evaluating such literature and analyzing the pattern of variation in the education sector.

2.2 Historical Background and Evolution of E-Learning

E-learning dates back to the early 1900s and has grown to influence different fields in various ways. There were few electronic technology programs at universities during the 1960s, and it was thought that the high cost of technology would prevent its widespread use as an educational resource. The first "Automatic Teacher" a computer learning system was created by Ohio State University Professor Sidney Pressey in 1924. The system was intended to replace an automatic computer for standardized research. The technology struggled to hit the masses due to a lack of demand and investment.

The system that Pressey had built represented a typewriter with a monitor that displayed a problem with four responses. The user presses the key that correlates to the appropriate answer. When the user presses the key, the computer registered the response on display at the back of the system and showed the next question. Once the student is done, the test scorer slides the test sheet back into the system and registered the score on display.

In 1960, Professor Don Bitzer of the University of Illinois developed the very first computer-based educational system called the PLATO (Programmed Logic for Automated Teaching Operations). Initially, in order to improve student literacy, PLATO was used to distribute computer-based teaching. The device, however, quickly overcame its sole educational advantage and became the pillar of modern multi-user computing. A time-sharing operating network with users and developers connected to the mainframe was the subject of PLATO. The first presentation of PLATO occurred on the ILLIAC I device, which was substituted by the Control Data Corporation (CDC) 1604 machine in later iterations of PLATO. Since then, there have been various inventories regarding creating various e-learning systems. The PLATO

network was able to accommodate thousands of users at its height two decades before the advent of the World Wide Web, and much of the century's greatest educational software was built on PLATO across many educational disciplines. The PLATO terminals were very pricey, but they were worth every penny.

In 1969, ARPANET was created by interconnecting four university computers. ARPANET's original aim was educational, with the goal of sharing resources at related institutions among scientific users. It is, however, widely regarded today as the founder of the modern Internet, then Apple II Personal Computer was established in 1977 with Apple co-founder Steve Wozniak pointing out that schooling is the primary application of modern technology. Apple II incorporated color visuals and sounds, which for the time being, was very interesting and rendered the apps attractive to young audiences.

In 1983, The Electronic University Network (EUN) was introduced by former Atari President Ron Gordon to enable universities to continue introducing online courses, and by 1986, 25 percent of high schools were already using computers for university and job guidance.

In 1989, the World Wide Web was launched, and the first accredited Online High School was founded in 1994. In 1999, at a CBT Systems Conference, the word 'E-Learning' was first used and adopted. Compared with words like "Digital Education" or "Virtual Training" this word is intended to define as a means of learning based on the use of digital resources that allow internet access.

In 2000 – 2005, Technology advanced but the technical advances that had taken place did not immediately stop accessible e-learning, which was widely known in the nineties. Instead, advances have made the concept of e-learning more cultured. More

users have been encouraged by new techniques, methodologies and applications to use PowerPoint methods and programs for learning management (LMS).

2006-2010 was a period in which e-learning platforms were very standard. The accessibility of online learning opportunities to "everyone" made it possible for the average person to know more. The improved benefits of technological development, coupled with fewer resources and no regional borders, have altered the way in which education is conducted. A bounty for the online computing niche has been the emergence of innovations such as podcasting, smartphones, streaming technology and virtual reality.

1n 2015, many colleges had been set up that offered classes online only, making the most of the internet and introducing education to people who wouldn't previously have been able to attend a college due to geographical or time constraints. Technological developments have also helped educational institutions minimize distance learning expenditures, a saving that will also be passed on to students, helping to bring education to a larger audience.

The e-learning market is rapidly expanding, currently doubling every two years, more than 40 percent of the 500 largest businesses are now using E-Learning to educate their staff. E-learning would be an integral component of training in the future.

In 2018, the global E-Learning market size reached $168.8 billion.

In 2020, The COVID-19 pandemic caused the closing of classrooms all over the world and forced 1.5 billion students and 63 million educators to suddenly modify their face-to-face academic practices, wherever possible which didn't stop education from going on it just made more users feel the relevance of E-learning.

E-learning's previous experience has shown that it is currently on an exponential growth, and experts believe that this growth can only continue to increase over time,

but in order to remain competitive in the education sector, it is likely that they will need to reinvent and adapt to e-learning practices.

2.3 Overview of E-learning

E-learning centres around the field of learning and technology. Education is a structured process for understanding, and technology is the driving force behind the learning cycle, which means that it is used like every other form of educational practice, such as a pencil or a notebook. The pencil is a more technically complex product, but this sounds very simple and logical, and its use may seem more instinctive to others. Other problematic conditions are underpinned by growth as it encompasses different aspects.

A variety of tools, such as writing technology, interactive technologies, simulation and storage, are integrated into e-learning programs. For these reasons, scientists and researchers have requested that e-learning systems be transformed into technologically distinct instruments, such as pencils or notebooks. The literature on e-learning is vast and is growing steadily. The growth rate of online courses is 65% (Barbara, Yukie, Robert, Marianne, & Karla, 2010) and some researchers suggest that policies allowing the use of e-learning should be advocated at the government level (Siu-cheung, et al., 2014).

2.4 Basic Concepts of E-Learning

Each section describes essential e-learning concepts. E-learning definition: (Schank, 2002) and (Roffe, 2002) refer to e-learning as "communication and learning activities through computers and networks (or via electronic means)". To be more precise, it can be explained as the "delivery of training and education via networked interactivity and a range of other knowledge collection and distribution technologies." (Bleimann, 2004) specified that e-learning is self-directed learning that is based on technology,

especially web-based technology. He also stressed that e-learning is collaborative learning.

E-learning is therefore based on ICT as technology is vital in e-learning to inform learners better using two-way film, two-way computer interaction, data links and the Internet. (Peter, 2001) offered various concrete instances of learning activities that involved ICT. These instances include learning from an e-mail, online, review papers research, online discussion and coaching by e-mail. From these definitions and examples, we can, therefore, define e-learning as learning activities that involve computers, networks and multimedia technologies.

2.5   E-learning Theory framework

A framework identifies fundamental factors in the execution of data frameworks and can propose that every one of these components is causally identified with the creation proficiency of projects. The presentation of the critical elements of data frameworks to e-learning frameworks in a setting is reasonable speculation coming from the writing survey on e-learning viewpoints. The theoretical framework of the e-learning frameworks incorporates the three principal components of the information systems. These are Individuals, technology and resources. Users are engaging with e-learning programs, and it facilitates overt or indirect contact between various user classes. Technologies offer help for the convergence of information, connectivity and collaboration methods. E-learning programs incorporate the two works on identifying with academic standards and instructional methodologies. The dynamic mix of communication is an immediate or roundabout intercession of e-learning programs. At the same period, systems offer services by supportive measures for operations. In

other terms, the program requirements are e-learning practices associated with e-learning educational frameworks and instructional approaches. E-learning programs incorporate the two works on identifying with academic standards and instructional methodologies. The dynamic mix of communication is an immediate or roundabout intercession of e-learning programs. At the same period, systems offer services by supportive measures for operations. In other terms, the program requirements are e-learning practices associated with e-learning educational frameworks and instructional approaches.

2.6 **Theory Based Design Framework for E-Learning**

This e-learning concept specifies that three primary components function together to facilitate effective learning and interaction:

1. Educational models or constructs,

2. Instructional and learning strategies and

3. Educational tools or online learning technologies (i.e., Internet and Web-based technologies).

All three components form an iterative process in which, based on the understanding of cognition, educational frameworks direct the design of e-learning by contributing to the creation of instructional and learning methods that are eventually facilitated or implemented in Figure 2.1 by the use of digital technologies. In this way, as current processes are increased progress begins to develop, new prospects for activity are changed, instructive techniques and cultural frameworks are changed. In this way, the three-component model proposes a transformative relationship which affects e-learning. In order to sustain the framework of e-learning, teachers and instructors should consider this a grounded structure system.

Instructional Strategies
(e.g., collaboration, articulation, reflection, role-playing, exploration, problem solving)

E-Learning

Educational Models or Constructs (e.g., open/flexible learning, distributed learning, knowledge building communities)

Learning Technologies
(e.g., asynchronous & synchronous communication tools, hypermedia & multimedia tools, Web authoring tools, course management systems)

Figure 2. 1: Theory-based framework (Aparicio & Bação, 2013)

These three components (educational models, teaching techniques, and learning technologies) facilitate the link between who is involved in the learning process (open learning, distributed learning), how these highlights work together (collaborating, articulating, reflecting, exploring) and the progress in which the communication process takes place (synchronous, asynchronous, communication tools).

2.7   **Elements of an E-Learning management system**

The elements of the e-learning management system consist of three elements. E-learning can be defined through a theoretical framework that refers to learning technologies, educational strategies, and instructive models or structures. It includes various factors, including the way people learn (open/flexible way), the learning strategy (collaboration, exploration, problem-solving) and innovative technologies.

It is an instructive model, and subjective models or hypothetical builds are gotten from information obtaining models or perspectives about discernment and information, which structure the reason for learning hypothesis. Furthermore, they are the component by which we link research and performance.

Instructional strategies encourage learning, for example, coordinated effort, explanation, reflection, and pretending, among others. Although they are educational models, our principal objective in this examination is to survey the writing on e-learning frameworks.

Following the above, which presents the ideas of the setting of the e-learning frameworks, a table is built-in which those ideas are grouped by two different ways of e-learning definitional features.

Initially, the ideas are ordered by (N., 2005) structure, as indicated by whether the ideas mirror a educational model, instructional strategy, or learning technology. Also, they identify the concepts according to (Mason & Rennie, 2006) organization of e-learning perspectives, whether concepts are content-driven, communication intended or technologically positioned. Some of the conceptual revolution of E-Learning and their related concepts are shown in Table 2.1.

Table 2. 1: E-learning related concepts and their Various Authors (Mason & Rennie, 2006)

ACRONYM	Description	Concept Focus	AUTHORS
CAI	Computer-Assisted Instruction	Institutional driven, use of the computer to facilitate and test learning.	(KEMENY & THOMAS, 1968), (TERRY, 2008)
ALE	Artificial Learning Environments	Use of an artefact as a mediator in learning	(MARLENE & MARJORIE, 1985)
CAL	Computer-Assisted Learning	They are focused on individuals rather than on tasks.	(HART, 1981), M (LEVY, 1997)

REAL	Rich Environments for Active Learning	Student responsibility and initiative. Productive learning activities. Authentic learning contexts. Authentic assessment strategies. Co-operative support	(JOANNA & SCOTT, 1998)
CFL	Computer-Facilitated Learning	Emulates teacher-driven learning episodes, contrasts with the constructivist approach. Environments are to group applications into functionally similar categories and highlight the learning processes and outcomes which are likely to be 'afforded' by each category	(JOHN, CARMEL, COLLEEN, & GILLIAN)
SRE	Self-Regulatory Efficacy	Learner's independent assessment of self-regulatory learning ability	(YOUNG-JU , MIMI , & HA-JEEN , 2000)
CAE	Computer-Assisted Education	The computer uses Materials Production Students` use of the computer	(KARL, 2003)

CBE	Computer-Based Education	Variety of computer uses	(KARL, 2003)
CMI	Computer-Managed Instruction	Focused on teacher tasks	(KARL, 2003)
E-LEARNING	Electronic Learning	Use of a Web System that makes information available, disregarding time and space.	(MARC, 2000)
LMS	Learning Management Systems	Registration, tracking and deliver content to learners Reports learner progress, assessment results and skill gaps for instructors.; "Includes learning contents and teacher interactions"	(ISMAIL, 2002) (JONG-KI & WOONG-KYU, 2008)
LCMS	Learning Content Management Systems	Content Management launch pads for third party content that the organisation would purchase or outsource	(ISMAIL, 2002)
SDL	Self-Directed Learning	Focus on the teaching-learning method. "Learner attends lectures only to register time, place, subject, and to alter the order of attending lectures"; "the core of learning is the	(ROVAI, 2004) (JONG-KI & WOONG-

		students and every service offered by e-Learning"	KYU, 2008)
ILM	Internet-based learning medium	"Primary goals of using an ILM is to support and improve student learning."	(CHRISTY, MATTHEW, & ZHAOHUI, 2005)
CSCL	Computer Support for Collaborative Learning	Computers facilitate, augment and redefine support learning in groups.	(STAHL, T., & DAN, 2006) (STEN & ANDERS, 2009), (MØRCH, 2013)
MOOC	MASSIVE OPEN ONLINE COURSE	FREE DIFFUSION OF CONTENT COURSES TO A GLOBAL USAGE THROUGH THE WEB. INTEGRATES THE CONNECTIVITY OF SOCIAL NETWORKING, THE FACILITATION OF AN ACKNOWLEDGED EXPERT IN A	(MEHLENBACHER, 2010) (GODWIN-JONE

| | FIELD OF STUDY, AND A COLLECTION OF FREELY ACCESSIBLE ONLINE RESOURCES. | S, 2012) |

It is obvious from this that the idea of e-learning was not the first word to be used in the conceptualization of the use of electronic systems in order to allow or simplify the learning process. In the 1960s, this theory centered on the achievement of the mission and then focused more on the students.

E-learning can also be defined as digital media learning, such as TV, computers, images, and multimedia files.

Another concept identified with e-learning is web-based learning. Online-based learning is defined as learning to explore that occurs incomplete or entirely on the web, making data or knowledge available to users who dismiss time constraints or geographical closeness.

The ideas of e-learning systems provide a mechanical and realistic center on the prospects of the Internet in defeating problems of fact.

2.8 E-Learning stakeholders

The most important stakeholders in a quality e-learning course and program are the learners. The following describes the roles of stakeholders in a quality E-learning environment.

1. Students

Students are motivated to use e-learning. It could be a part of a conventional course for a few, while whole courses could be completely on the web for other people. E-learning can provide access to advanced education, particularly during the latter,

which they would not normally get. E-Learning provides an entirely different learning environment for students, requiring a range of skills to succeed. Students are often more self-reliant than in the traditional environment, especially in fully electronic lessons.

2. Instructors

Teachers may be inspired to use e-learning in their classrooms for many purposes. For instance, their institutions may inspire or influence them; they may want to reach a broader group of students, or they may have an interest in the benefits of technology-based learning. Technological developments in e-learning have brought as much improvement for lecturers as for learners, again requiring a particular collection of achievement skills. Teachers are moving from being the critical source of student awareness in the e-learning world to becoming the manager of student information properties.

3. Educational Institutions

Educational programs offer online learning, through e-learning, such that they provide exposure to a more excellent range of learners. Financial constraints are often a fundamental problem for institutions. Budget constraints make it hard to incorporate robust, campus-wide e-learning strategies.

There is a tendency for individual departments to implement their solutions, which may not be consistent with the rest of the institution. This lessens the potential for cross-departmental efficiencies and can make the procedure progressively muddled for the workforce, staff, and students primarily on the off chance that they are associated with more than one division.

4. Content Providers

In the context of higher education, the content of online courses will either be offered by trainees or obtained from alternative data. In either scenario, service suppliers are driven to include information that can contribute to successful learning. Intellectual capital rights appear to be the primary concern for content providers in learning. Independent content providers need to guarantee their maintenance of copyrights to offer their item to different clients. Technology standards are another relevant concern for this stakeholder group. Content ought to be made in an arrangement that will permit its usage across different e-learning technology platforms.

5. Technology Providers

Like across content providers, technology companies are driven to deliver products which will lead to active learning. Standards are also an essential factor for this participant. Since education systems also have several approaches adopted by separate teams, commitment to guidelines promotes integration.

Constant changes in equipment and market demand create pressure for tech companies to rush to the market with a new product range. For such companies to be viable, it is crucial to monitor the expense of undertaking this continuous innovation.

6. Accreditation Bodies

As the percentage of education electronically delivered increases, accreditation bodies need to incorporate e-learning into their guidelines. The rise of e-learning poses new obstacles for accreditation bodies.

As the percentage of learning institutions expands to leverage on the extra cost of higher education, accreditation bodies get a rising number of schools requesting their authorization. This rise in the volume of work is coupled with a shift like a project performed by these organizations.

7. Employers

Employers are progressively persuaded to consider e-learning as an advanced education elective. Precluding the incentive from securing e-learning will confine their pool of possible recruits. It will likewise restrict the accessibility of courses and expert improvement exercises that their representatives may take an interest in.

Since several seek after advanced education to start or propelling their professions, an absence of help for e-learning by employers could prevent students from seeking after their coursework through electronic methods.

2.9 Models for Delivering quality E-learning

E-learning models have progressed. In this area, the five-advance model for conveying quality e-learning which think about the sociality, innovation and teaching method in arranging and use of e-learning is considered.

1- Learning activities

The meaning of a learning activity is that one or more learning outcomes related to it must be included. There is a set of activities that must be performed in order to achieve the expected learning outcomes. Various factors are associated with the learning programs when conducting these tasks.

These exercises are characterized into two levels: for the basic levels of studying, where the campaign fundamentally requires students to understand and collect data and advanced degrees of studying, where the action expects students to apply the data, analyze outcomes, travel to figure out how to another situation, and interact with others.

2- Environment

This is the establishment on which e-learning is constructed. The framework, which incorporates specialized foundation, programming and equipment, and all available web tools, are expected to help and empower e-learning in schools. The environment

must be stable and secure. The skills will blend and match with the conveyance choices relying upon the course structure and other learning conditions. The choice may even be identified with the individual style of the educator and student and the instructive issues.

3- Awareness

In an association, the full implementation of e-learning involves the ideal people, the perfect place, and the right properties. The cornerstone of fitting society and knowledge is essential for an association's active appropriation of e-learning. Additionally, its appreciation by the stakeholders involves a matter of high significance for its adequacy. It is vital to building up a key intend to make familiarity with e-learning and realize recognition of this new learning chance.

4- Services

The accessibility of essential assets, any authoritative and specialized assistance, personnel availability, usability, hardware, software and staff training in system features should be included in this.

2.10 Key Principles in E-learning

Design guidelines have been adopted to minimize academically demanding loads and integrate appropriate loads at user-specific levels. These include the core guidelines which have been established:

1. Multimedia Principle

Using only two of the audio visual, and text combinations makes the learning process simpler than using one of the three.

2. Learner control principle

Being able to monitor the pace over which they learn, like most students, helps to assist them in encouraging the learning process. Other than having a set of controls (back, forward, play, pause), just play and pause dials will support users. Advanced students will appreciate the instant play of teaching with the opportunity to pause when they decide to.

3. Contiguity principle

Learning becomes very successful when the related content is provided in close collaboration, The relevant text should also be put next to the examples, and any responses that the learner may make should be closely linked to feedback and answers.

4. Modality principle

When visuals are joined by good representation asides on-screen text, learning is increasingly viable. There are exemptions for whether the student is conscious of the content, is not a local speaker of the narrative language, or when the key items introduced on the screen are written words.

5. Segmenting principle

More efficient learning can take place as learning is divided into smaller parts. Taking down lengthy lectures and going along shorter ones tends to facilitate more-in-depth thinking.

6. Coherence principle

The fewer students care about the quality of the lecture, the more they may be overwhelmed by irrelevant material. Inconsequential video, music, graphics, should indeed be cut out to reduce the cognitive burden that could be caused by learning

needless content. However, students with specific previous experience may have enhanced encouragement and curiosity in irrelevant materials

7. Personalization principle

A tone that is increasingly relaxed and conversational, advances more learning by passing on all a social presence. Starting learners can benefit from an increasingly considerate way of speaking, while students with previous data can benefit from a more direct way of speaking. By representing the exercise, PC characters will help improve the content.

8. Redundancy principle

Having illustrations clarified by both sound portrayal and on-screen text makes repetition. The best technique is to utilize either sound portrayal of on-screen text to go with visuals.

9. Pre-training principle

The addition of core subject principles and terminology before lessons will help to improve learning. This theory tends to extend more to low prior knowledge learners than to keen prior knowledge learners.

CHAPTER THREE

METHODOLOGY

3.1   Introduction

The methodology is a section of the research report for this review that specifically points out what has been accomplished and how it has been accomplished regarding the use of the eLearning framework.

This chapter is intended to provide point-by - point instructions on structuring and setting up and using an e-learning web application. It also offers specific ideas and information on the e-learning advancement processes and assets that can be of some value to restricted development administrators.

Unified training design models and teaching methods in the delivery of e-learning courses in development contexts are the subject of the documentation in this module.

The focus of this segment is on formal learning, standardized courses designed to meet the needs of education related to students.

3.2 Analysis of existing system

Electronic learning empowers a lot more students to approach a distance learning condition, giving students and educators remarkable adaptability and comfort.

E-learning systems are commonly used at various levels, some of which include:

- MOOCs (Massive Online Open Courses): Coursera or FutureLearn.
- Virtual learning environment (VLE): Learn or Blackboard.
- Video streaming services: YouTube.
- Virtual instructor-led training (VILT): WebEx or webinars.

In this particular case, in the final evaluation and testing stage of this study, user information from the computer science department is used.

However, at Mountain Top University, a multi-platform mobile educational application is currently used and open to all students within the school, regardless of department or faculty. This research work is not only limited to Mountain Top University or the department of computer science and can be executed using data of any institution within the country and beyond.

Deployment of an eLearning platform is crucial in every learning process across the various institutions. In this case, it could be implemented and used alongside the usual traditional learning.

The inexistence on this platform at various levels is prone to lots of challenges, among which are:

1. Misleading/Inaccurate circulation of lecture materials
2. Limitation in flexibility with work and other activities.
3. Restriction in students and lecturer's communication

4. Inconsistency: E-Learning enables teachers to attain a high level of availability for their audience and guarantees that the message is conveyed uniformly. It results in all students having the same training at the very same time.

5. Shaky and non- integral network to enable the accurate flow of course-related data

6. Shaky and non- integral network to enable the accurate flow of course-related data

3.3 Technical Solutions to the problem

This study focuses on the structure and deployment of a uniform web application for e-learning. This system is web-based and offers its accessibility due to secure access to the internet. This platform will be built with a range of integrated web platforms providing students with access to content, information and resources to help the distribution and managing of education. The services and development of this system brings are:

1. Upgrading of the value of data in the system

2. Contribute to making learning activities smarter and simpler

3. Allowing information to be transmitted easily and securely to the users concerned

4. It allows policy changes, training, ideas and philosophies to be created and communicated, whether it's for fun or formal education.

5. Process standardization

6. Minimization of manual methods

7. Enabling use of self-pacing which permits students to study at their pace and speed.

3.4 Data Collection

The test data for this project would be collected from the Department of Computer Science, Mountain Top University while Interviews and online research were carried as methods applied in getting the required information needed.

3.5 System Design

System Design is a way to structure an innovative system or replace an existing system by fully understanding the old system and deciding how computers can best be used to make their operation more efficient and to demonstrate their architecture, part or modules to satisfy the particular requirements. Throughout the analysis stage, system design takes the specifications known and fuses them into a new system. It addressed the data and processed an interface from the inventor's viewpoint.

3.5.1 Requirement Analysis

3.5.1.1 Functional Requirement

The basic goals of electronic learning are to develop and deliver courses, enroll students in the courses offered, provide a platform for the introduction and review of course content, store course materials electronically so that they are readily accessible, and providing the details needed for student evaluation and feedback

The most important feature is to preserve the user's identity. This includes creating a new profile and changing it later. All students should be allowed to create and modify an existing profile, but only the administrator should be allowed to archive it. User profiles may be made up of students or instructors.

In the real world when this application is fully implemented and used by a fully functioning institution, i.e. a university, a user or student will not be required to create

a profile as every users' profile is already stored in the institution's database. Only a login and validation functionality is required but, in the case, a sign up is used in creating a user profile to test data and functionality.

The second principal component of a virtual classroom is to maintain the courses taught by the lecturers. Like a user account, each course will have a profile that can be modified or archived.

A course will be in open (students can register) and will require approval from the lecturer in charge upon request. A searchable directory of all courses and their corresponding details should also be maintained.

Each course will be associated with the accounts of the learners who are enrolled in the course. The lecturer will be able to access certain parts of the student profiles following the institution policy.

The eLearning web app permits signing up and authentication of users (lecturers and students) on the platform to perform several actions on the web app with necessary actions accessible to each user. The users are split into various sections:

1. User module (only for students)

The roles of this module include:

- Register

- Logging into the system

- Reset password

- Choose/Drop a course

- View Lecture notes, materials, multimedia and course-related information

- View Notifications


2. Lecturer module (only for Lecturers)

The roles of this module include:

- Register

- Logging into the system

- Reset password

- Upload and update lecture materials

- Upload Course-related information

- Set Quiz

- Create and view notifications

3. Administrator module (only for admins)

The roles of this module include:

- Manage User module

- Manage lecturer module

- Develop E-Learning Courses

- Review Contents Contained in the app

- Provide Ongoing Feedback

- Manage and Deploy Application

- Troubleshooting
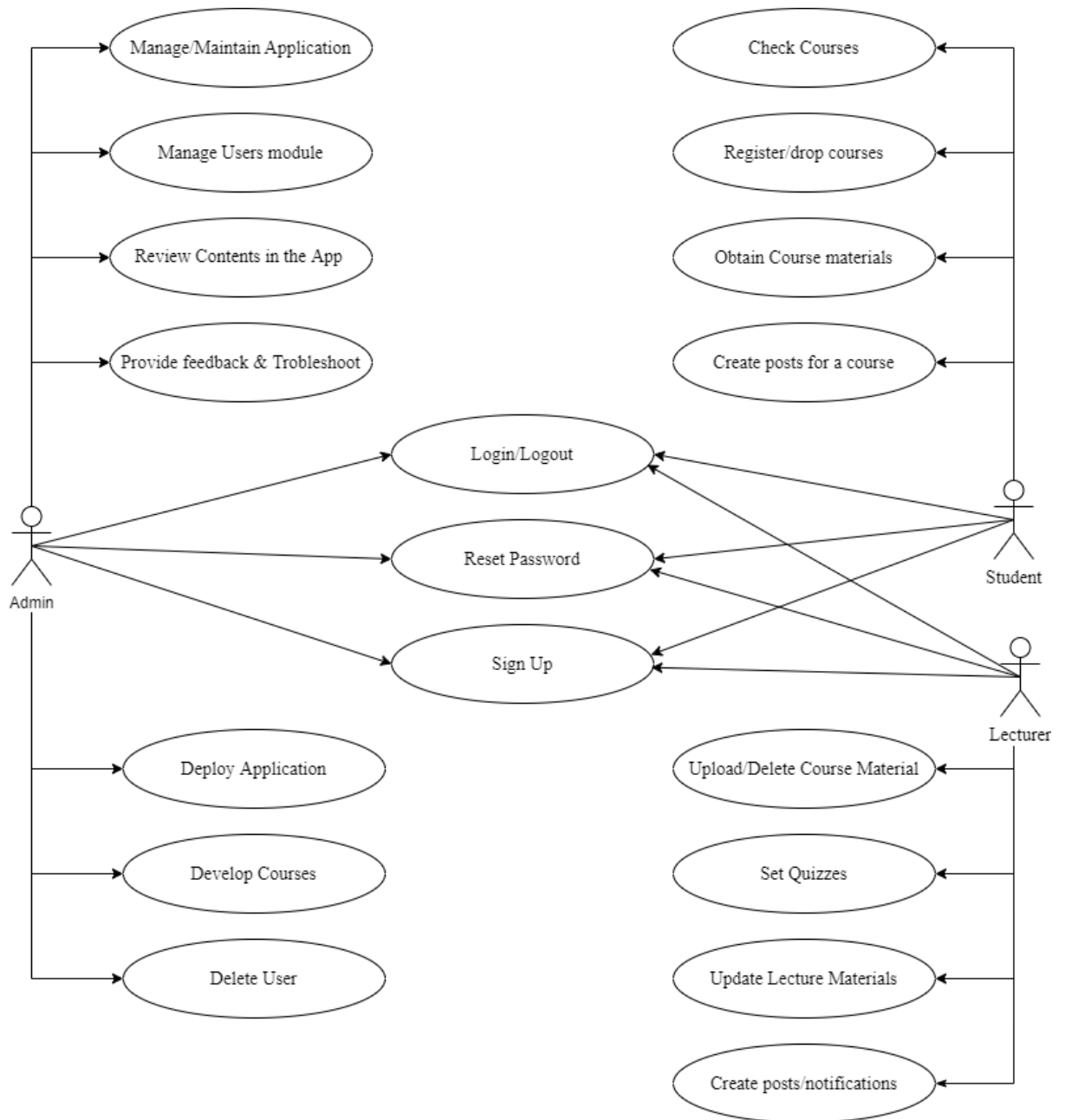
Figure 3. 1: Functional Requirement of Users

3.5.1.2 Non-functional requirement

These requirements are necessary for the system to provide instructional services in such a way that students are not frustrated and continue learning in a virtual world.

A non-functional requirement is a requirement to evaluate the functioning of the system. These are not functional requirements, but coupled with functional requirements, they now become basic standards of the framework. Also, these non-functional requirements affect the way the software is designed and developed. The non-functional requirement incorporated in the design are as follows:

1. Availability: The e-learning development is internet-based, and therefore it is accessible wherever at any time and with high bandwidth. The platform will be available to users not only within the university premises but also outside the campus. It will have a stable service (24x7) using redundant systems to prevent a net overflow of traffic. This specification will be done when finally implementing a Public Cloud program.

2. Scalability: This web platform system will be able to add/remove additional materials whenever necessary. Thus, through the dynamic allocation of resources, the app can handle scalability on a per-use basis and decrease maintenance costs.

3. Security: A secure database will be crested, and most operations will be done on the server-side to prevent users from accessing information. Also, aspects of the E-Learning database will be private and, as data is transferred to the server, the data seems out of the user's reach.

4. Authentication: This web application will be built on a secure system of access control. As the app will be implemented, and during development mode, an authentication strategy will be put in place to permit verified learners.

5. Privacy: Besides the high level of the security created, users' information will be discreet for the particular type of user of the institution. In this situation, the student's details and login info is private information that can only be processed in the institution's or, in this case, the application's database.

6. Learnability: This system will concentrate on the students and not just on contents. The portal will have the available courses offered in the institution which students can pick what they offer.

7. Usability: The system will be highly useful in order to improve the efficiency, productivity and satisfaction of the system, thus increasing the system's performance.

3.6   Process Model

Capable architecture and preparation, though essential for all forms of training programs, are much more critical for e-learning initiatives. Traditional teaching requires the utmost initiative in the implementation of training courses, while e-learning includes the creation and production of standardized content, which must be self-contained and capable of being utilized several times without any continuing changes.

Sam Model

The Successive Approximation Model (SAM) method of analysis is the preferred instructional development method for rapid implementation. Emphasis on "approximation". That is what the principal model is probably going to be—an estimation of the polished product.

This model was chosen in this research because it allows users to assess the application frequently and be flexible with the users' response. This continuous feedback mechanism is the foundation for a more cooperative project, responsive to the frequent influx of learning goals.

This creates an avenue for improvement and is cost-friendly since there is no need only to make changes after the final deployment, and this is possible due to SAM's iterative process.

The successive approximation model can also be said to be a formative evaluation method that uses gradual steps to the aim instead of one giant leap. It depends on fast deadlines and rapid delivery as a tool for swift and fast production, and probably a significant win. The SAM-based design encourages collaboration because designers would be less committed to their quick fix and more committed to finding the right solution.

SAM model depends on quicker results and making changes as a piece of the procedure. As indicated by designers, "it starts with performance, so the customers end with performance." It starts with a brisk arrangement stage—where data and the vital foundation information is accumulated.

Then comes the Iterative Design step, which starts with Smart Start-the initial group coming up with ideas that contribute to the iterative cycle of concept, implementation and analysis. This is preceded by the Iterative Growth Process, which involves growth, execution and assessment. Modifications are implemented as soon as possible to reduce potential risk.

Due of its accentuation on rehashed gradual procedures and iterations, it aims to address probably the most widely recognized instructional plan pain points, such as meeting timetables and working together with Subject Matter Experts (SMEs).

SAM model has its one-of-a-kind incentive in supporting the improvement of computerized identification course and non-credit program, which promotes performance-driven education and typically provides material to a broader audience within a short time.

There are three phases or developmental stages of SAM, each of which is cycled to be like the optimal.

Preparation phase

Iteration Design Phase

Iterative Development Phase

3.6.1 Preparation phase

SAM Model begins with what is called the Planning Process, unlike the ADDIE model, which starts with the Analysis Phase. This method is used by learners and lecturers to gather contextual information. It is a quick process that generally includes assessing the skills and weaknesses of participants, focusing on about the implicit prior experience, and deciding the overall objectives of the project.

For this project, the context of knowledge for students was collected, which includes:

Information of the classes they attend (the topics and requirements), their level, when and how they are generally taught (the program and the environment). Whereas for the lecturers, the knowledge about how they instruct (their students), wherever they teach (their classes, communities, societies) and what they teach (the school subject, the stage, the program, and their connection to local, state, and national standards) were all gathered and evaluated during this study.

This phase concludes with something called the SAVY start. The SAVY start provides an opportunity for every stakeholder to obtain and proceed with coming up with ideas about the layout of the training and its prospective training techniques.

The beginning of the SAVY is a session where the developer quickly comes up with ideas. Designs Obtained from a variety of creative ideas are established, which are unpolished and invalid of interaction. Such designs are usually sketching and quick storyboards which function as the foundation for more design sessions after the SAVY starts. At the end of the SAVY launch, the developer will come up with future concepts for every content aspect.

3.6.2   Iterative design phase

This process focuses on project preparation and external construction. For this project, it will be designed and developed by one single developer, and there might not necessarily be any reduction in the staffs/designers.

The various information and context of knowledge collected in the preparation phases will be used in this model in establishing project deadlines, expenses (time and money) and specifying activities that need to be done.

When project preparation is complete, the developer will push on with the other designs putting into factor the information collated. That is where project management choices are taken, and the teaching elements are rendered more refined and measurable. The new design phase will use the early design decisions taken within the scope of the SAVY start and continue to iterate until the design proof has been agreed finalized.

The developer, in this case, will focus on creating three possible layouts for any content area. The possible explanation for three would be that the developer will not be fixed on a single design that could be void of the needed instruction components. Essentially, it enables the developer to be inventive beyond the evident design solutions considering any possible changes that could be made from the context of knowledge of users.

3.6.3   Iterative development phase

Development, implementation and evaluation work together at this stage. The project begins from its architecture proof which is a result of the iterative design phase and continues to move Alpha to become a beta and finalizes it. This iterative process is created to target any errors, improve and allow changes before proceeding to the next phase.

In the previous phase (Iteration Design Phase), a design for the system is established after deliberation, and it is implemented into an existing system which will be evaluated, tested and released for usage.

The four steps of this process begin with a layout proof obtained from the very first iterative process implementation, move to Alpha (complete edition of the instructional application version available for testing), after which it moves to Beta (version after Alpha step reviews) and complete to Gold (version after Beta step reviews).

The designer continues to examine and assess the entire process. At a certain point where there is a need for modification, there can be a rapid reduction in any risk of moving out of the spending plan or duration, which allows for greater flexibility while using materials during development. It is also one of the significant benefits of the SAM model and why it was chosen for this project.

3.6.3.1 Alpha, Beta, Gold Release

The Alpha phase is the very first edition of an entirely completed project. At this phase, all the elements of the course can be used from start to finish. This includes learning communication in the media form and formative feedback loops. At this phase, no significant course weaknesses should be found, but it is still common for slight editing possibilities to arise.

The beta and gold release phases are the completed elements of the SAM. The beta is an alpha-modified version based on responses and final review. It is not unusual for the beta update to be the gold edition of the product. The beta is a completed way to examine and resolve the project based on reviews from the alpha phase.

When final changes have been made, the software transitions to the gold release and is available for complete implementation. This continuous feedback mechanism acts as a platform for a more coherent project which is flexible to the often inflow of learning objectives.
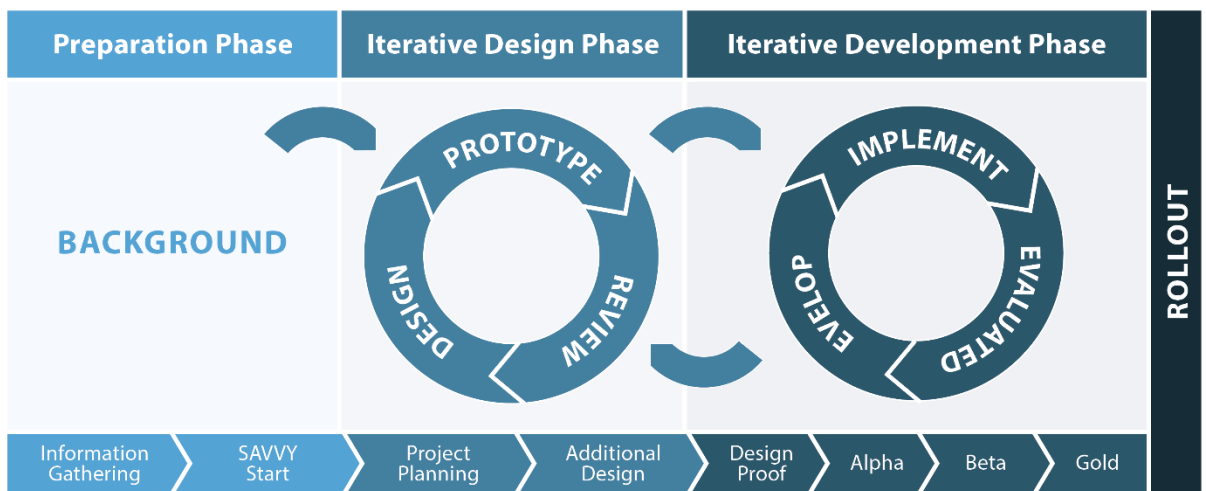
Figure 3. 2: Graphical Illustration of a SAM Model (Mazhar, 2018)

3.7   The System Architecture of the Proposed System

Model-View-Controller (MVC)

The Model-View-Controller (MVC) architecture is an architectural concept that divides the code into three significant conceptual components Model, View and Controller. It is the abbreviation MVC. Every architecture part is structured to manage the construction element of the application. MVC distinguishes the framework of market theory and analysis from each other.

It has historically been used for mobile graphical user interfaces (GUIs). Nowadays, the architectural style of MVC has now become famous for both mobile and web applications.

Feature of MVC

1. Provides complete control of both the HTML and URLs

2. Utilize existing features provided by ASP.NET, JSP, Django and node.js being used for this application.

3. Highly usable, powerful, flexible and configurable frame

4. Http Routing to SEO Enhanced Sites. Active URL filtering with apparent and discoverable URLs

5. Clear organization of logic: Model, View, Controller.

6. The organization of project activities, business logic, Ul logic, and input logic

7. Enables Test Driven Development (TDD)

3.7.1 Model

Information and related logic is stored in the model portion. It denotes files and data exchanged between the components of the controller and some other logic for business growth. For example, user information stored in the database must be collected by the Controller object. It seeks to influence and explicitly pass the information to the database or uses it to provide the same information. As illustrated, the view alerts the controller of a user's request; then the controller updates the model based on the event received from the view and therefore sent a response back to the user through the view. The user sees and directly interacts with the view, and the process continues until it gets to the model and back to the user for every event/request.

All data is extracted from the software; furthermore, the software cannot be named directly-it is the controller that demands a particular file or information and the model renders the query and delivers the data to the controller.

3.7.2 Controller

The Controller is the component of the program that manages the contact of the device. The Controller interprets the request from the user, informs the model and the view controllers to modify as suitable.

The Controller sends directives to the model to change its status (e.g., Saving a document). The Controller often sends commands to its related view to adjust the appearance of the view (e.g. scrolling a file)

3.7.3 View

A view is the last phase of the MVC Design that houses the program's user interface. A view in software applications includes HTML, CSS, JavaScript and XML or JSON. This is a transparent layer to the consumer, while the templates and controls remain shielded from the consumer.

A View is the aspect of the application which defines the look of the data. Views are generated by the data obtained from the model data. A view asks the model to provide data in such a manner that the performance design becomes useful to the customer.
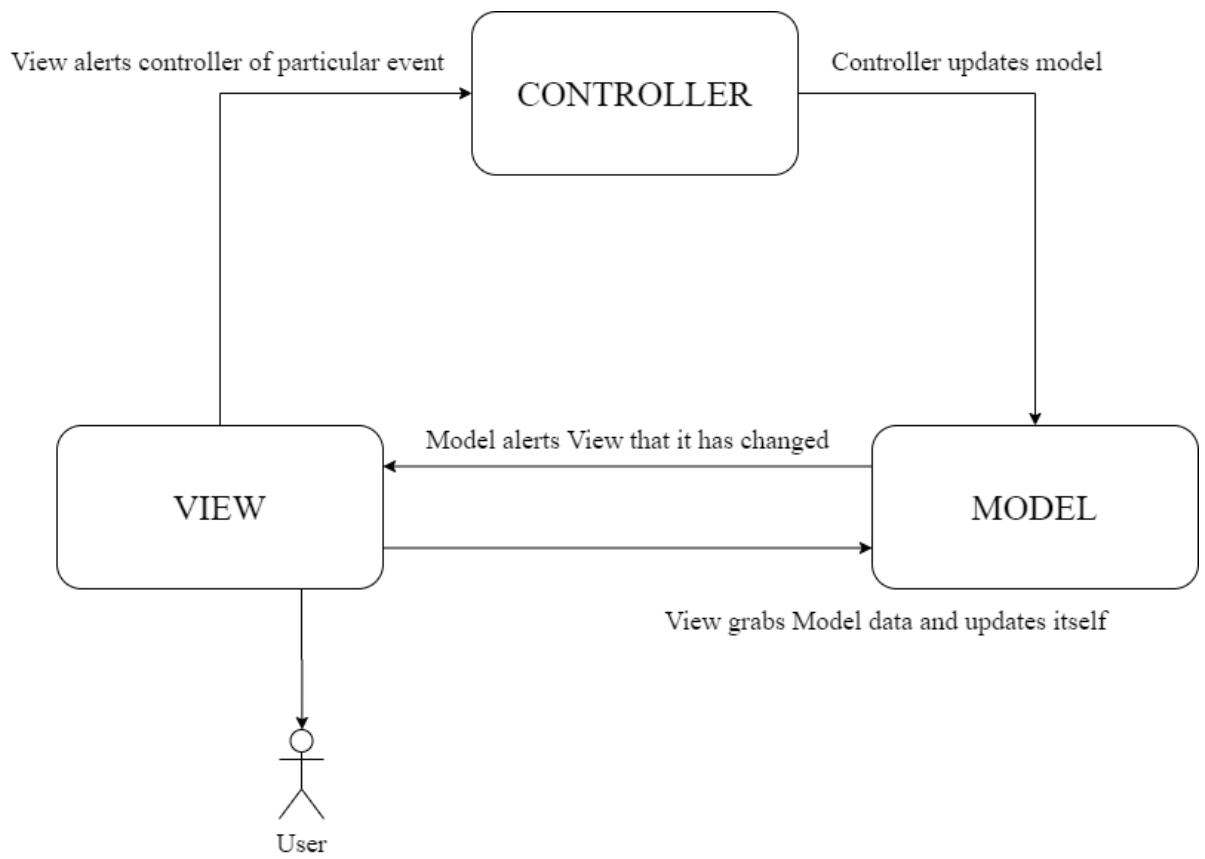
Figure 3. 3: MVC Framework

3.8   Major System Design Activities

Many model activities are completed in a systematized process. Those provide database design, software architecture, development preparation, framework and evaluation application scheduling as well as user documentation.

The system design activities mentioned below led to the development of the e-learning web application.

3.8.1   Database design

It is a compilation of files or tables for gathering data on a set of similar entities (e-learning application will have student, admin, lecturer and their various roles)

Database architecture is the method of creating a comprehensive database data model. This data model includes all the conceptual and physical design choices and physical storage parameters required to produce the concept.

3.8.2   Program Design

The program design is the task of going from the definition of software necessary to the explanation of the system itself. Most of the software life-cycle phase models (SDLC) recognize the design process as one of the stages. The input for this process is a requirement of what the system needs to do. Throughout the design process, choices are made as to whether the system can fulfil these specifications, and the development step is a summary of the software in a way that offers an adequate framework for future execution.

3.8.3   System and Program test preparation

Each component has a various testing requirement. Framework validation is conducted until both development and processing are done.

Test cases encompass each aspect of the proposed application, overall process, user experience. System test requirements become a pre-requisite for the execution of the design specification.

3.8.4 User documentation

End-users of a device provide application documentation. The primary objective of the documented information is to support end-users by delivering them with clear and concise information on the specific product or service.

Tech journalists define the following features in user documentation:

- Software requirements.

- Installation guide.

- How to start the system.

- How to use features of a service.

- Screenshots explaining those features

- Contact details of the creator if an unanswered problem occurs and more.

3.9 Database Design of System

This web-based e-learning system involves entry of data; hence, a database is required. Mongo DB used in this case involved a collection of various documents, and there are a variety of items in the database that hold various records and documents in this segment, and some of the specific vital data tables are listed.

Table 3. 1: Database Design of System

Collection	Description
Courses Table	It stores the data of the various courses that can be applied for
Course Material Table	It stores and shows the various materials uploaded
User Table	It stores the profile details, which are First name, Last name, email, phone number, password.
User type	It stores the different type of user that has access to the system: Admin, Lecturer or Student
Quiz	Saves All the quizzes created with ID's that assign them to the respective courses
Session	Stores all user's sessions upon login and automatically delete when a User signs out

Course Table

Table 3. 2: Course Table

Field	Type	Size	Description
course_id	var_char	11	primary key of collection
course_description	string		description of the course
course_name	string	50	course title
lecturer_in_charge	string		lecturer's name for a course

Table 3. 3: Course Item Table

Field	Type	Size	Description
item_id	var_char	11	primary key of collection
item_title	string		title of material
item_description	string	200	brief description of course item
item type	.mp3, .mp4, .docx, .pdf, .jpg, .jpeg, .png	max? = 20mb	type of item uploaded

Table 3. 4: User Table

Field	Type	Size	Description
user_id	var_char	11	primary key of collection
first_name	string		first name of the user
last_name	string		last name of the user
level	integer	3	school level of user
department	string		department user belongs to
email	string	200	the email address of the user
user_type_id	var_char	11	secondary key linking user to type field
user_type	string		type of user (lecturer or student)
password	string		password of user
courses	object		Courses are taken/taught by the user

Table 3. 5: Quiz Table

Field	Type	Size	Description
quiz_id	var_char	11	the primary key of the collection
quiz_title	string		title of quiz
quiz_description	string		a brief description on the quiz
lecturer_id	var_char	3	lecture in charge of course quiz belongs to

Table 3. 6: Question Table

Field	Type	Size	Description
quiz_question_id	var_char	11	primary key of collection
quiz_id	var_char		the secondary key linking the question to its respective quiz
question	string		question asked
points	integer		the score of a student after every answer
answer	text	200	the correct answer of a question
answer_id	var_char		secondary key of an answer to a question

3.10 Design of System

3.10.1 Flowchart

A flowchart is an image of the different stages of a continuous order method. It is a collective term that can be used for a broad range of uses that may be used to define specific procedures, such as the production phase, the management or operation method or the project schedule.
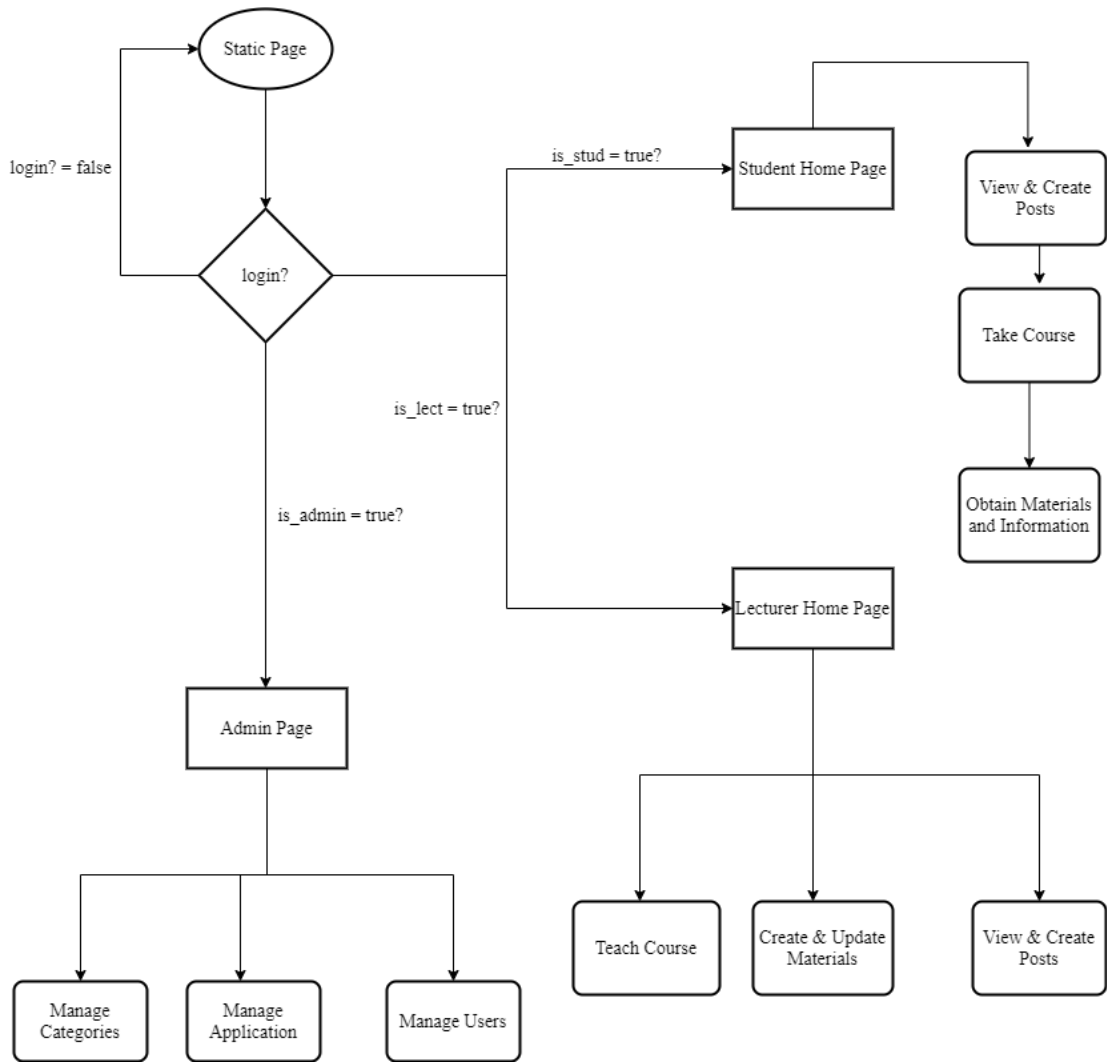
Figure 3. 4: Flow Chart Diagram

3.10.2 Use Case Diagram

The use diagram is a graphical representation of the relationships among all the components of the E-Learning system/application. It reflects the approach utilized in system research to define, explain, and coordinate program criteria in an e-learning framework. It can also be used to portray the functional requirement of the system. Figure 3.1 is the use case diagram of the web application, which was created with draw.io.
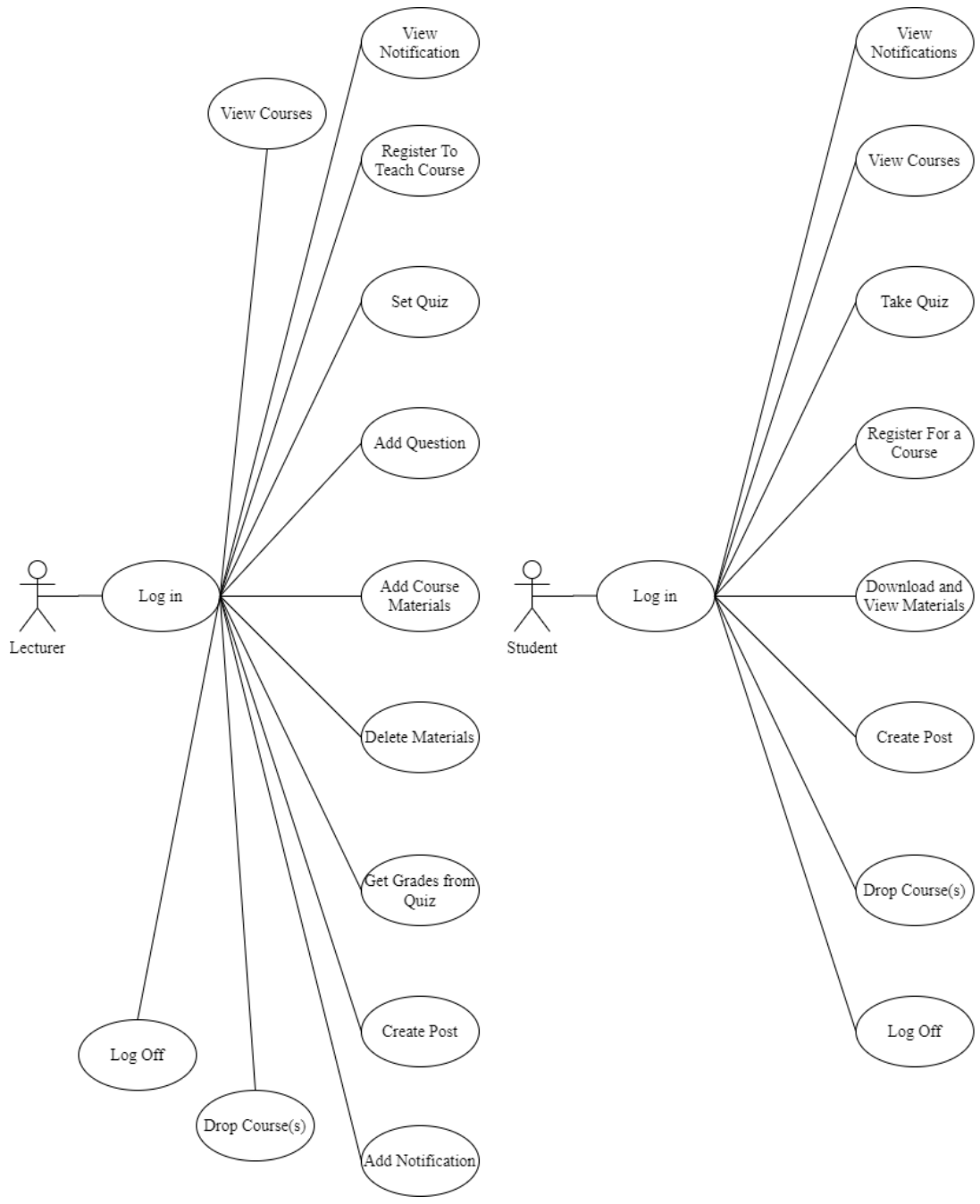
Figure 3. 5: Use Case Diagram

3.10.3 Sequence Diagram

A sequence diagram describes the coordination of objects which is used to categorize events and actions among objects for a given outcome. A sequence diagram is a crucial element used during evaluation, design and development processes.
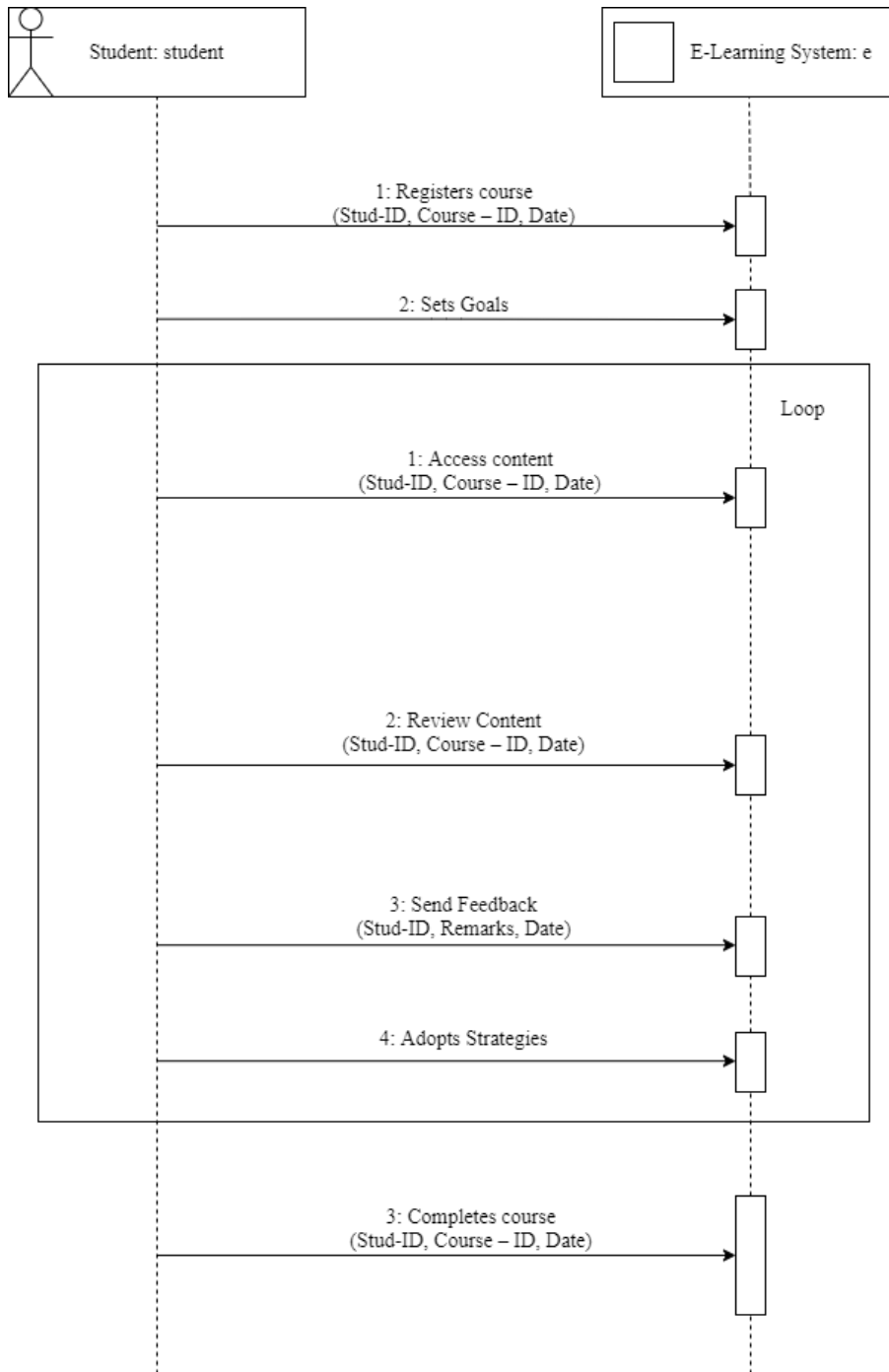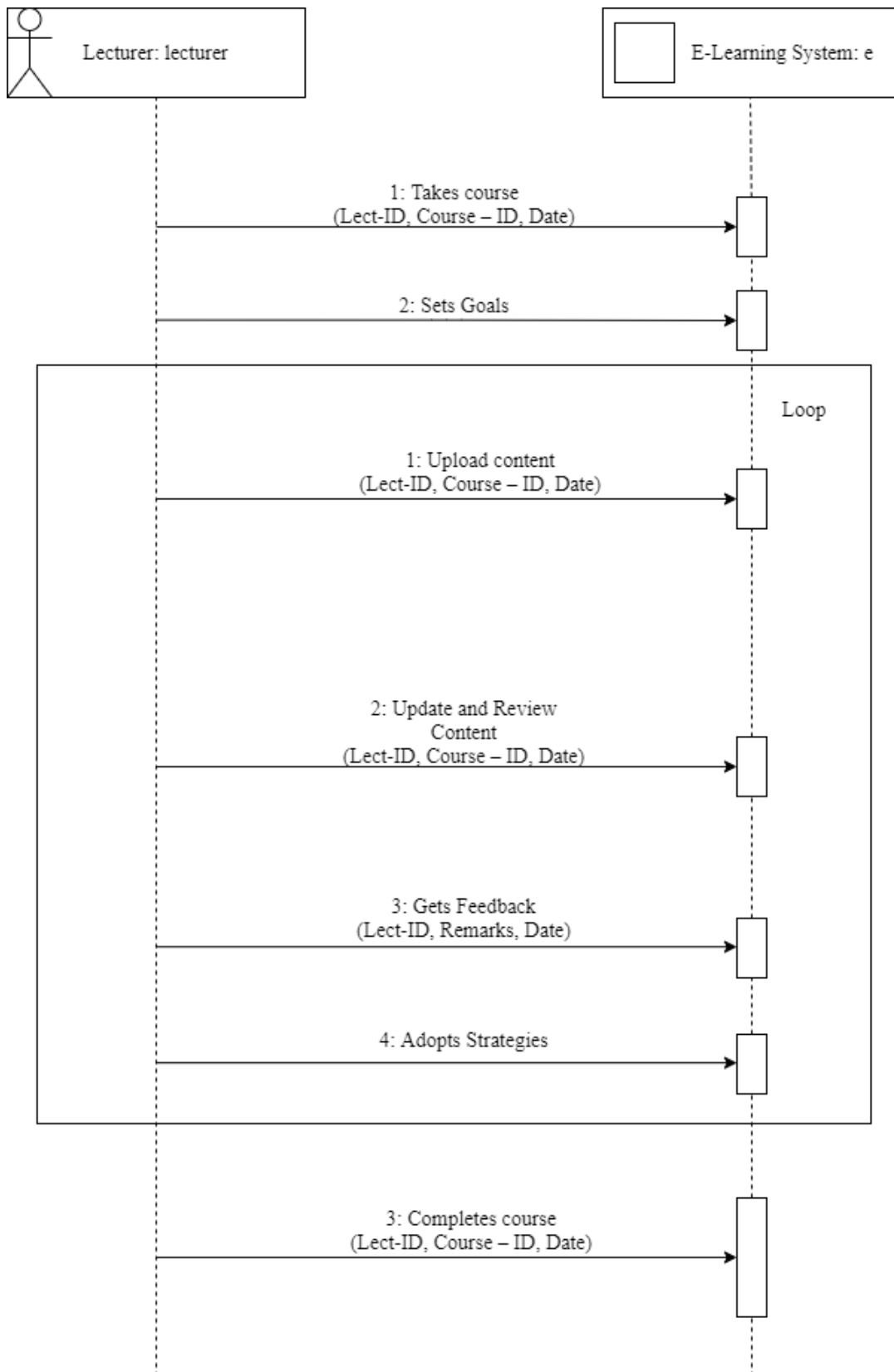
Figure 3. 6: Sequence Diagram (Students)

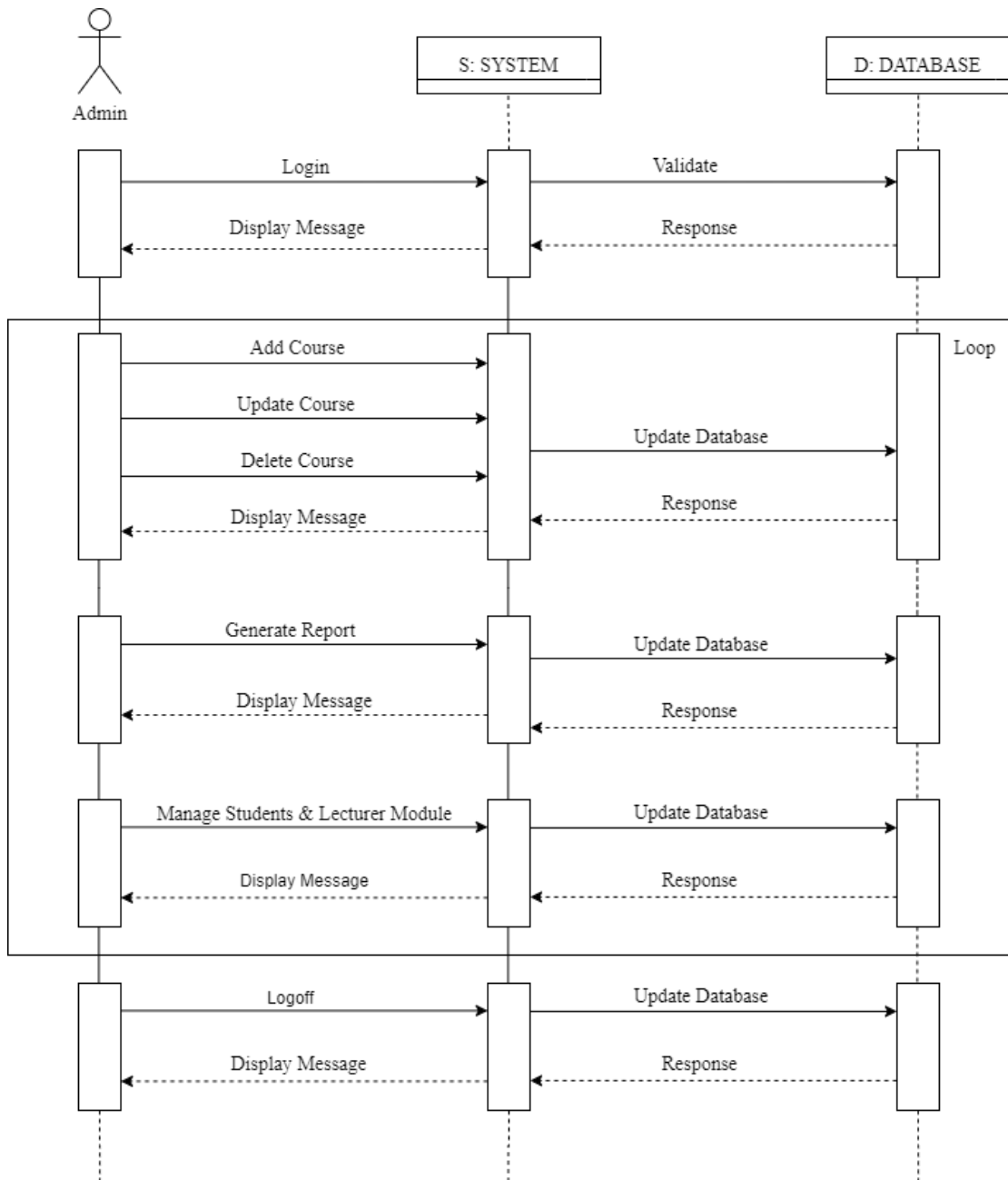Figure 3. 7: Sequence Diagram (Lecturers)

Figure 3. 8: Sequence Diagram (Admin)

3.10.4 Software Development Life Cycle

The Software Development Life Cycle consists of a full strategy illustrating how to develop, maintain and replace the software platform. SDLC models describe the stages of the software development cycle and the sequence in which the processes are completed.
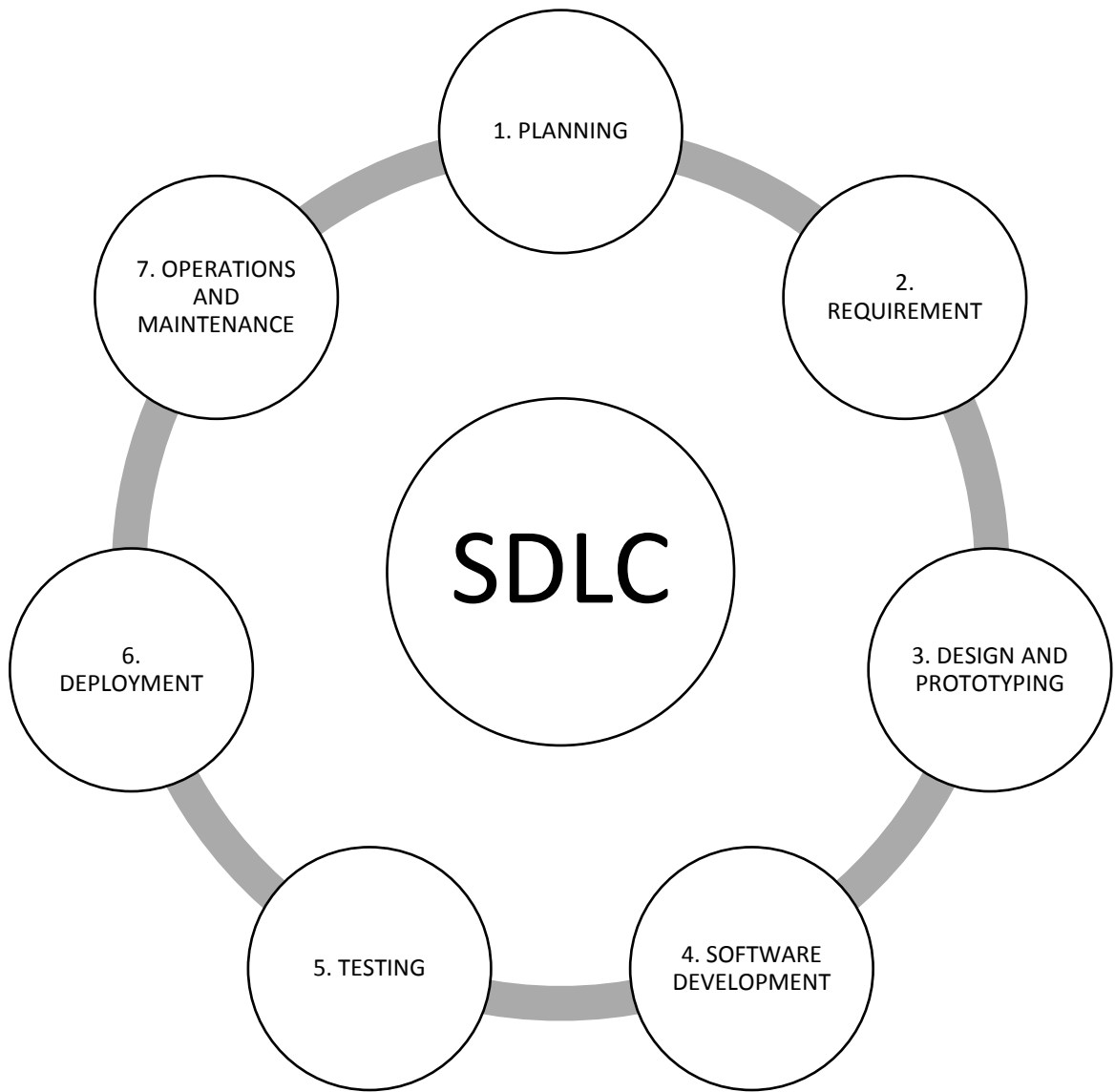
Figure 3. 9: Software Development Life Cycle

CHAPTER FOUR

SYSTEM IMPLEMENTATION AND RESULTS

DISCUSSION

4.1   Introduction

This chapter outlines the deployment of the web-based e-learning software developed for this project. It involves constructing the design elements that will be used for this web application and the results of the proposed system.

4.2   Development Tools for the System

HTML, CSS and JavaScript were utilized to construct a web application. Nodejs and Mongo DB were required to link the client-side to the database and to develop the database, respectively. The features of all of these components are below:

HTML (Hypertext Mark-up Language)

HTML is used to create pages shown on the web. Every page includes a set of links to individual sites named hyperlinks. Each web page on the web is constructed using one or more variants of HTML code.

Anything between the open and the closing tag in HTML is shown or influenced by the tag.

The reasons it was used in this course are stated below:

1) It is effortless and can be recognized and changed.

2) It is effortless to render a successful HTML layout since it has a lot of tag design.

3) It is a mark-up language, so it gives an adaptable method to configure site pages alongside the content.

4) It makes it easier to append a link to web pages (by HTML anchor tag), so it increases the user's preferences in browsing

CSS (Cascading Style Sheets)

CSS is a stylistic sheet tool used to characterize a text published in a mark-up language. Together with HTML and JavaScript, CSS is a crucial component utilized by most sites to build visually appealing web portals, web device user interfaces and various smartphone user interfaces.

CSS was chosen because of the following characteristics:

- Less software and more transparency

- CSS contains many functions and methods with which to provide expanded features to visitors.

- All changes are carried out centrally.

JavaScript

JavaScript is a scripting language which is compact, multi-platform, and viewed. It is well recognized for developing website content and is also used by many non-browser ecosystems. JavaScript could be used for improvements on the web server as well as on the client-side. Some of its benefits in this project include:

a. Less server interaction

b. Increased interactivity

c. Speeds up software execution, since it allows time to link to the server

d. Implementation is realistic, sparing a ton of time to create interactive material for the site

Since JavaScript works on the client-side, data on the application can be tested without always being submitted to the database. In the event of any inconsistency, no reloading of the entire website by the user. The user only adjusts the chosen section of the website. This was evident and used in the creation of the quiz module and collection of this project.

NodeJS

As noted above, JavaScript was used on the server-side and in this case, NodeJS was used, which is a JavaScript run-time environment and programming tool built to run server-side JavaScript code. Node is suitable for creating apps involving a continuous link from the client to the server and is frequently used during real-time applications.

Usage of node.js in this project include:

    a.   Provides simple usability

    b.   It has the advantage of Caching

    c.   Provides the ability to build software

    d.   Handles the Requests Simultaneously

MongoDB

A database is a collection of data organized. MongoDB is a document-oriented, multi-platform database that delivers high performance, high accessibility and high scalability. MongoDB focuses on concept and document definitions. MongoDB is a NoSQL database, with no schema. Reasons why MongoDB is used in this work, including the following:

a. MongoDB is used because there is no need to build the database schema, which saves a massive deal of effort.

b. Since the MongoDB utilizes JSON format for data storage, arrays and objects are relatively easy to process.

c. A MongoDB-supported database query language is quite essential as contrasted with SQL queries

d. MongoDB's efficiency is much superior to other relational databases.

e. MongoDB uses internal memory space which allows faster and more convenient access to data.

4.3 System Requirement

Minimum Requirement for the E-learning progressive web application

The minimum software and hardware required to operate the E-Learning web portal outlined in tables 4.1, 4.2 and 4.3 below.

Table 4. 1: Hardware Requirements

Hardware Component	Minimum Specification
Type	A device with access to a browser
Connectivity	Internet

Table 4. 2: Software requirements

Software Component	Minimum Specification
Operating System (OS)	Windows, MAC, IOS, Android
Browser Requirement	A browser that runs JavaScript and accepts cookies.

Table 4. 3: Server-Side requirement

Software Component	Minimum Specification
Web Server (Deployment)	GitHub & Netlify
Run-Time Environment	Node JS
Database Service	MongoDB Atlas

4.4   Implementation Process

This section shows some screenshots of some functions of the users.

- General functions

- Student's module

- Lecturer's module

4.4.1   General Functions

There are several functions in the eLearning web application that the users share.

These functions include:

1. Create an account

2. Login

3. Request new password

4. View All Available Courses

4.4.1.1   Create an Account

This section is for the student/lecturer who has not accessed the platform before and does not have any information stored in the database; therefore, has no login information. A user's account page was created in figure4.1, such that the individual enters the required fields, and the details are stored in the database. Upon sign up, a user is required to provide a specific role which they belong to, a lecturer or a student. If a lecturer role is picked, a unique id will be needed from the lecturer to confirm authentication. Figure 4.1 shows an illustration of the sign-up page.
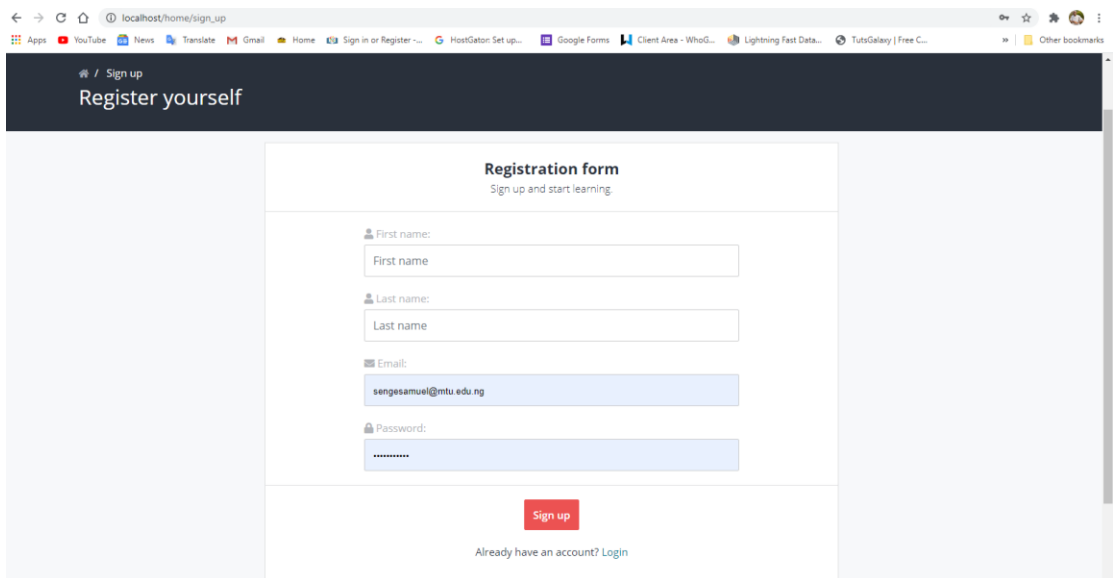
Figure 4. 1: Sign Up

Step 1: The new user fills the required fields on the page.

Step 2: After performing step 1, the user should proceed to "Sign Up", and upon successful completion of the account, the user should check their mail for confirmation.

4.4.1.2 Sign In

After the successful registration of the user, the user can log in to the web application with their credentials as shown in figure 4.2, i.e., the user's email address and password are validated, and the user is redirected to their respective pages. Both types of users will have different functionalities and features based on their role in the application. The user's sessions will be stored after login, so a user does not always login every time the browser or an existing tab is closed.
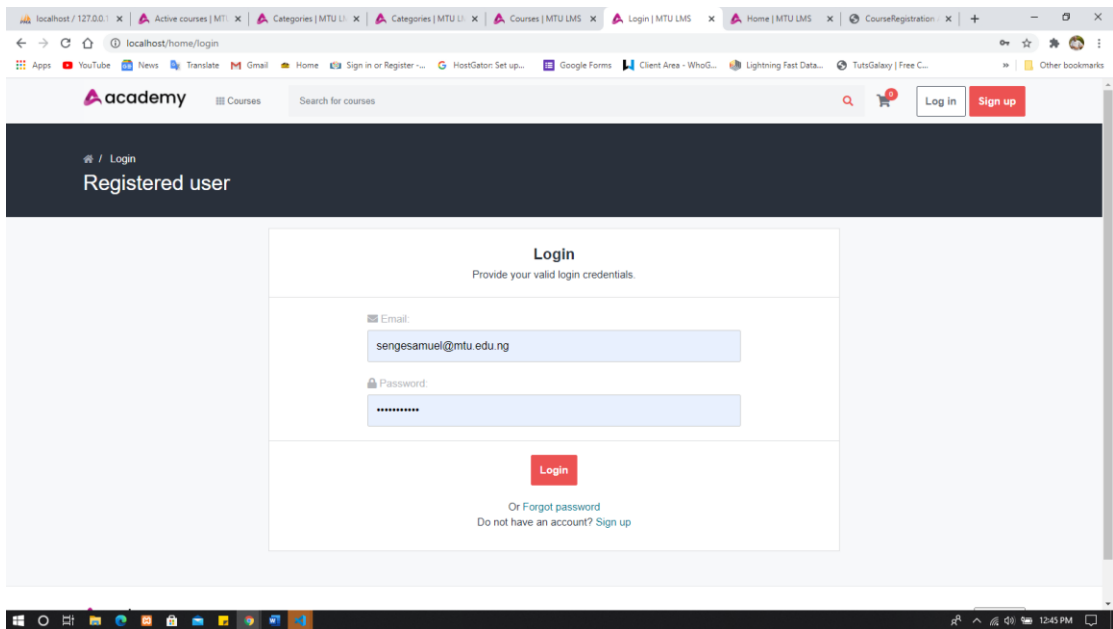
Figure 4. 2: Sign in

4.4.1.3   Reset password

All user can change their password through the forgot password option. In this case, it is done with tokenization with the help of a "csurf" NPM package. Validation of the user's email will be required in order to proceed to reset the password. In figure 4.3, a user inputs an email used during registration, and further details are sent to proceed with the password reset.

Figure 4. 3: Password reset

4.4.1.4 View All Available Courses

All logged-in users, both lecturers and students, can view all available courses offered by the department (in this case) from the "All Courses" menu. There is a search tab to find a course by inserting the course code to the search tab, and this sends a query to the database. A student can register to take a course while a lecturer registers to teach a course. Depending on the user's role, the register button takes the user to their respective pages and assign the various functions. Figure 4.4 shows the "All Courses" page of the web application.
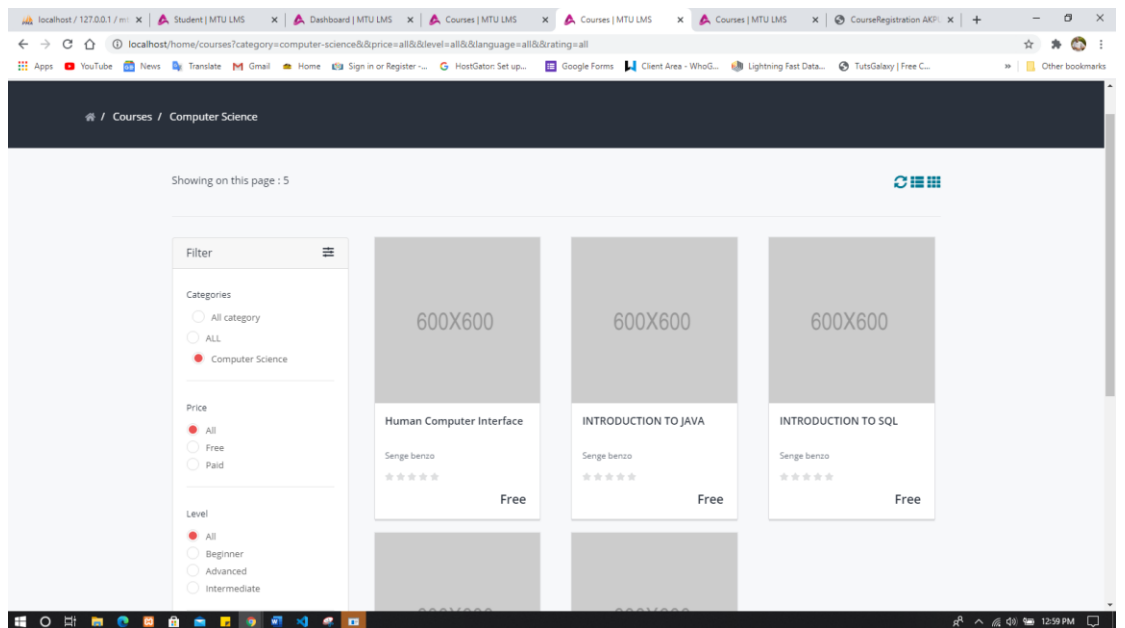
Figure 4. 4: View All Courses

4.4.2 Testing of Lecturers' Module

4.4.2.1   Home page

After the lecturer successfully logs in, he is directed to "my courses" page which contains all the courses a lecturer teaches. This redirect is done automatically based on the user's details already stored in the database in which the user's role has been predefined. For testing this project, a user (lecturer) was created with the name "Prof Ayeni" as shown in Figure 4.17 and used to test the lecturers' module.
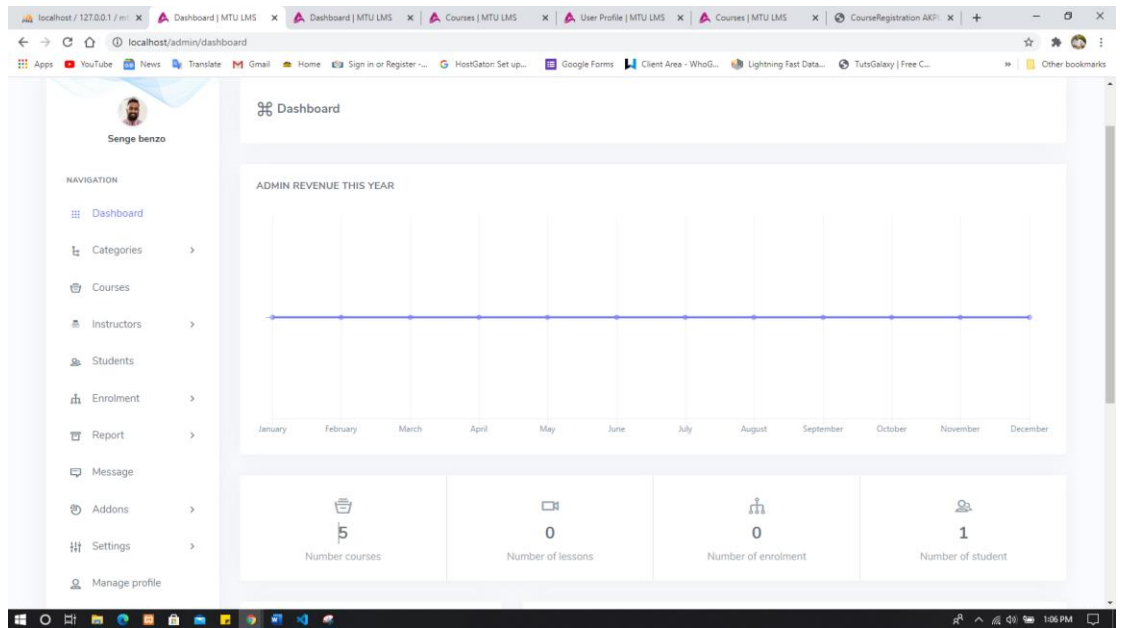
Figure 4. 5: Home Page (Lecturer)

4.4.2.2 Create and Delete Notifications

Only lecturers can create general notifications which can be viewed by all students and lecturers shown in Figures 4.18. Also, only a lecturer that uploads a notification is granted permission to delete it.
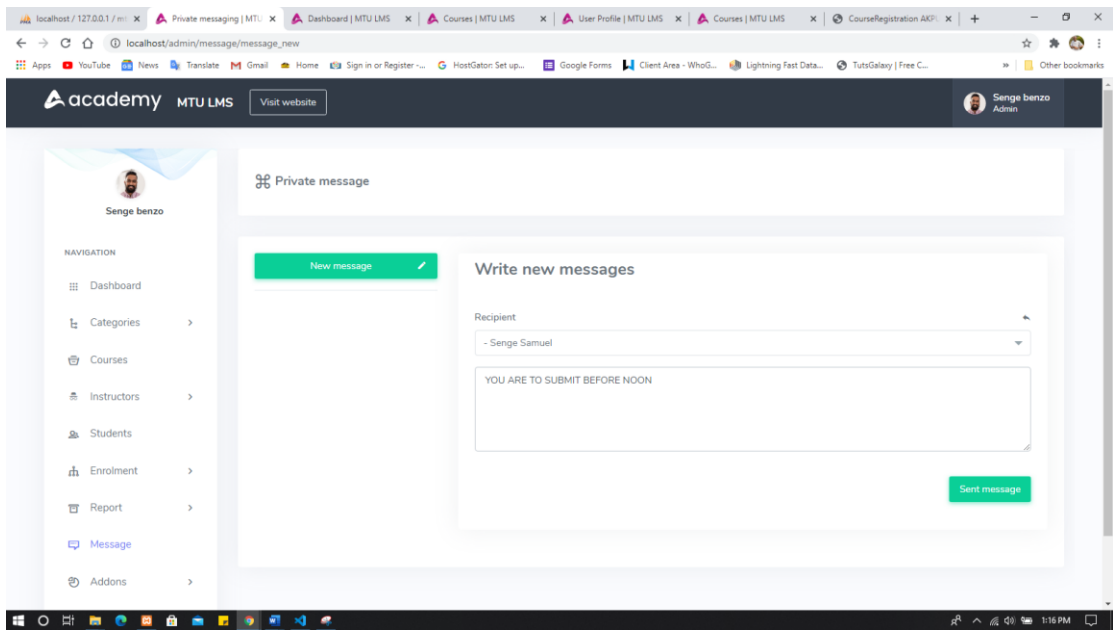
Figure 4. 6: Notification Page (For Lecturers)

4.4.2.3 Access, Create and Modify Course Contents

When a lecturer successfully registers to take a course, the lecturer can create and upload course contents and files when convenient. Figure 4.19 shows a course page with the feature to post on a "course wall." As explained earlier, this feature is granted to all user. The course wall contains all the latest updates concerning a course. Updates could include announcements, lessons,
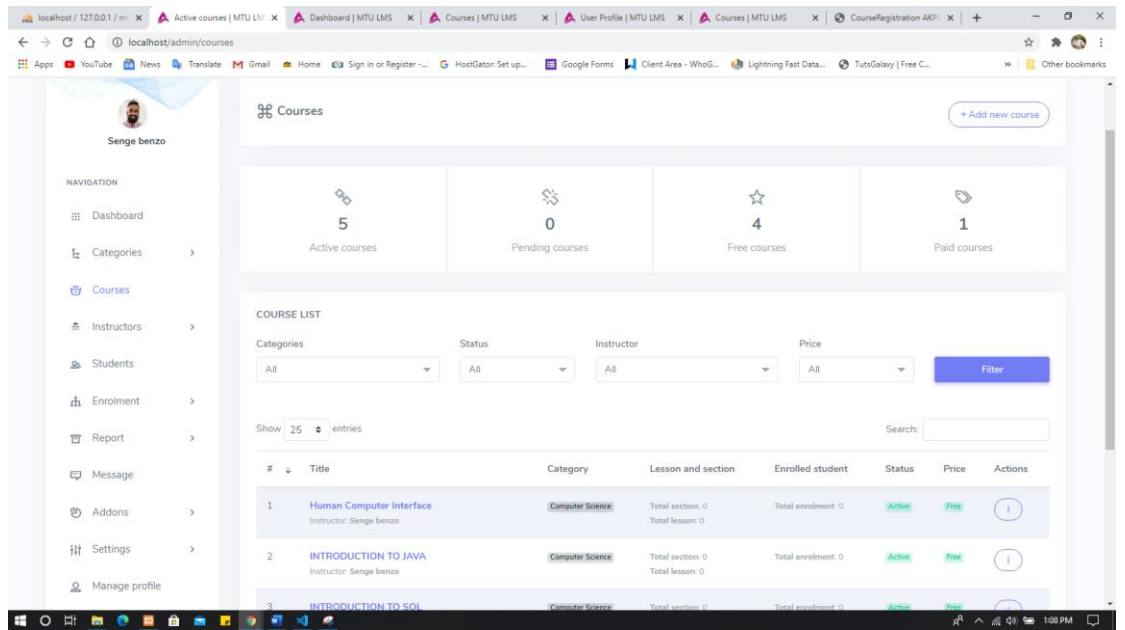
Figure 4. 7: Classroom Page

4.4.2.4   Upload and Delete Lesson

A lecturer can view and create course materials. This feature is restricted to a lecturer only. All materials uploaded by a lecturer can be viewed by all users regardless of the user's role. Figure 4.19 shows the course upload, and view page before and after a lesson is created respectively.
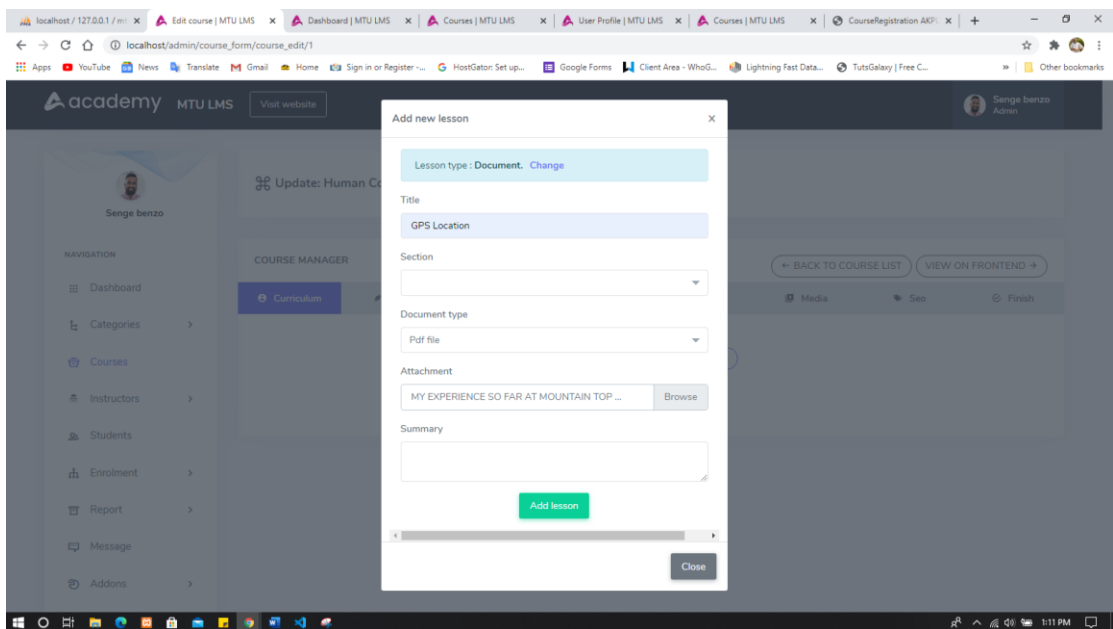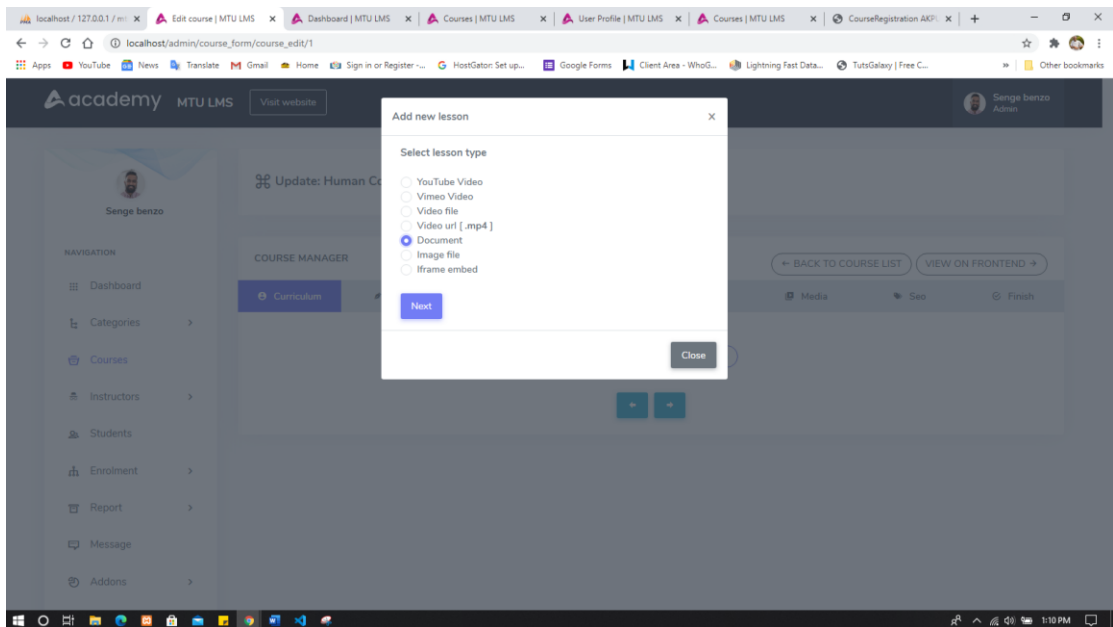
Figure 4. 8: Lessons Page (Before a lesson is uploaded)
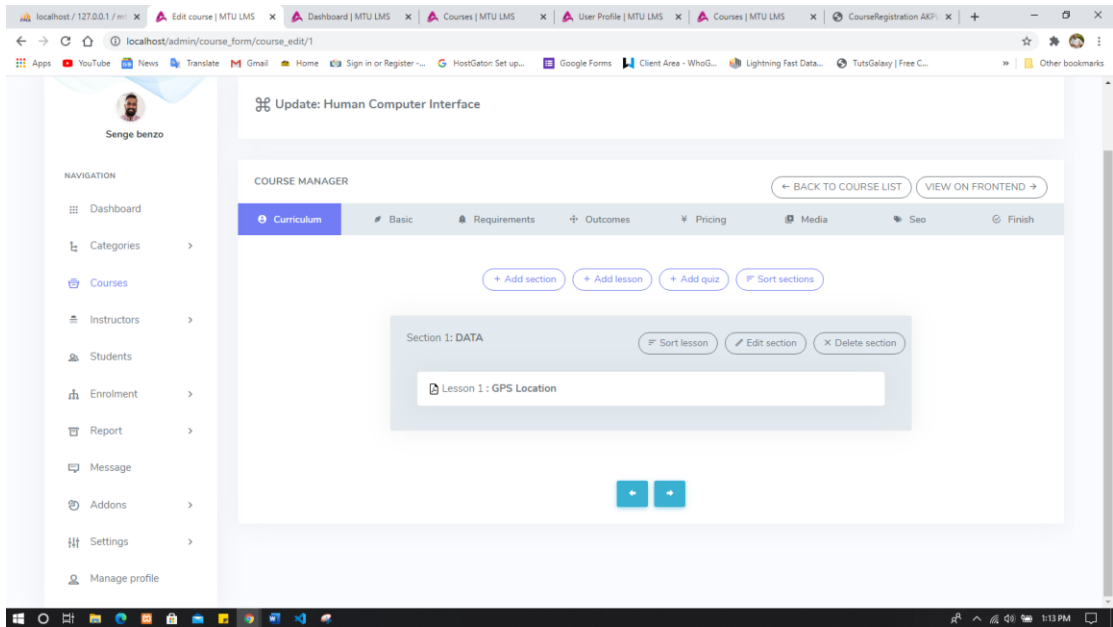
Figure 4. 9 Lessons Page (After a lesson is uploaded)

4.4.2.5 Create and modify Quiz

A lecturer can view a list of quizzes he has already created previously. Also, the lecturer-in-charge can create, reset, update and delete a specific quiz created. Every quiz created is attached to the course id for the specific course it was created for. The quiz aspect uses ajax so there is no frequent reload during quiz sessions. Figures 4.24 and 4.25 shows the pages for creating and modifying a quiz.

Figure 4. 10: Create a Quiz Page

Figure 4. 11: Update existing Quiz

CHAPTER FIVE

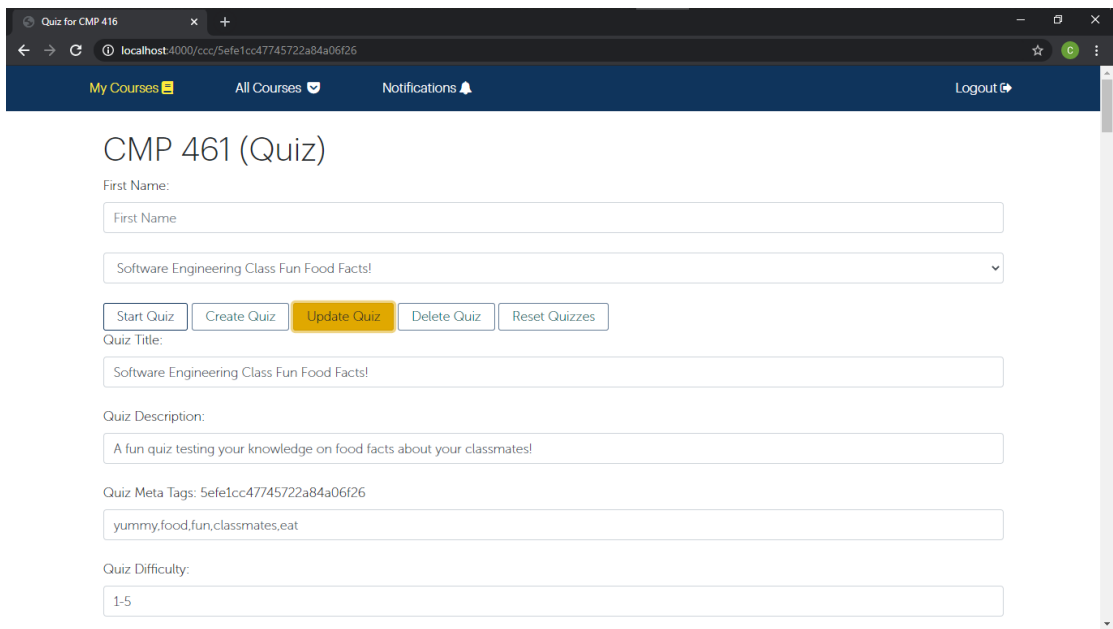# SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter summarizes the objectives of the system stipulated in an earlier section; limitation encountered while carrying out this study, conclusion, and recommendation of the system.

5.2 Summary

As discussed in previous chapters, the main problem addressed was creating an E-learning platform. The main tools used in the development and design were JavaScript, HTML, CSS and Bootstrap. The web application for institutions built in this work ensured that once an individual visit the web application, creates an account and register for a course; he has access to every available course content from the lecturer. Also, an individual can unenroll from a class, view notifications and create post concerning a course. The permission granted to the user is minimal, unlike the lecturer that can make changes, delete course materials, create and update quizzes. This project work is not limited to Redeemer's University and can be integrated into the database of any institution and can be used by the institution.

5.3 Conclusion

The effective use of ICT in the teaching process and the engagement with interactive educational environments, as described, require learners to take on different roles in the learning process. Learning seems to be a very socially oriented practice, and sound and skilled teachers with high rates of personal contact with learners have traditionally been related to quality learning.

Using ICT in teaching makes for more student-centred learning environments, and it often creates tensions for some instructors and learners. However, with the environment gradually shifting towards digital media and information, the position of the educational dimensions of virtual learning is becoming increasingly relevant, and this significance will continue to rise and evolve in the 21st century. It needs the creation of different systems, digital paradigms, help frameworks and information channels, innovative teaching and pedagogical techniques and approaches to utilize the Internet as the primary medium in education. Digital learning is thus expected to provide very conventional instructional systems, practices, strategies, priorities, procedures and, in general, pedagogical. There is a need for the creation of different methods, digital paradigms, help frameworks, information channels, innovative teaching and educational techniques and approaches in order to utilize the Internet as the primary medium in education. Digital learning is thus expected to provide very conventional instructional systems, practices, methods, priorities, procedures and, in general, pedagogical of the very traditional education. The software's primary function is to promote the learning cycle, that provides an electronic interface among teachers and students to satisfy the students ' specific needs. Learners should usually have access to classes, download content, take quizzes and communicate with lecturers should be employed in the modern age of science and technology. By implementing the new program, the students would have easy access to knowledge and resources from the lecturer.

The lecturer can also set quizzes, upload items for post notifications and interact with the students. Considering the difficulties facing the current learning method, this the project proposes an interactive e-learning platform application that can be used by

various organizations and helps to improve learning processes and promote engagement between users.

5.4   Limitations

Considering the financial and time limitations that affect students with a research project of such nature, there is no study work which does not undergo any difficulty. The job on this initiative is no exception. The following are some reasons which have caused the study work to be limited.

Financial limitations: When conducting such a review, it is planned to be carried out on a broader scale and with improved functionality on the project website, but some features for specific roles could not be introduced due to lack of funding

Time limitations: The time to carry of this analysis was brief and in contrast with specific events (i.e. other school projects) that occurred and during the trial.

Restricted access to Information/files: There were some restrictions on the availability to individual records, research works, documentation and records in the process of this work that may have improved the project's progress.

Environmental limitations: These were restrictions imposed by the strength and position of the site of the test sample that had a higher degree of repeated distractions.

5.5   Recommendation

The e-learning platform would facilitate the development of views on life-long learning and a learning culture. It will provide sufficient organized and informal tools for learning, too. Learning with this curriculum is also no longer restricted to the environment of the classroom.

5.6 Future Works

While this study offers a comprehensive review and implementation of an e-learning platform, some improvements can still be made. In the long run, this platform can be enhanced by having the following specifications:

- Build a system that lets students add objectives or research work given

- Finally, a cross-platform application accessible on the iOS and Android platform can be created to increase portability and user accessibility since Android occupies 75 per cent of the smartphone market share, and Apple's IOS holds the remaining.

Furthermore, it is necessary to research the values expressed by certain people in different schools to enhance the usage of e-learning. For example, researching students' views about the idea of online teaching might be helpful to the university as lecturers and other personnel could become informed as to how students perceive digital learning will support their studies.

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APPENDICES

Software Source Code

1. Controller

a) course

```
const Course = require("../models/course");

const lesson = require("../models/lesson");

const Lecturer = require("../models/lecturer");

exports.courseIndexPage = (req, res, next) => {

 Course.find()

   // .select('title description lecturer -
_id')  //select/retrieve the fields to be shown (title, description lecturer) and exclude
the id field

   // .populate('userId') //populate a certain field with not just the id but all the detai
ls info

   .then((courses) => {

    // console.log(courses);

    // res.redirect('/');

    // console.log(courses);

    // console.log(req.session.user.type);

    const user = req.session.user;

    console.log(req.session.user._id);

    // console.log(user);

    res.render("partials/courses", {

     cour: courses,

     pageTitle: "All Courses",

     type: user.type,

     id: user._id,

     path: "/allcourses",

     SampleCSS: true,
```

```javascript
        activeAddProduct: true,

      type: req.session.user.type,

      isAuthenticated: req.session.isLoggedIn,

    });
  .catch((err) => {

    console.log(err);
// Get Courses Details Page
exports.getSingleCoursePage = (req, res, next) => {
  const courId = req.params.courseId;

  const userID = req.session.user;

  Course.findById(courId)
    .then((course) => {

      res.render("course/coursedetails", {

        course: course,

        course_id: req.params.courseId,

        path: "/mycourses",

        userIDD: userID,

        pageTitle: course.title.toUpperCase(),

        type: req.session.user.type,

        isAuthenticated: req.session.isLoggedIn,

      });
  // console.log(lesson);
exports.myClasses = (req, res, next) => {
  res.render("course/my", {

    path: "/mycourses",

    type: req.session.user.type,

    pageTitle: "My Classes Offered",
// Get all lessons
exports.AllLessonsPage = (req, res, next) => {
```

```javascript
    console.log(req.params.courseId);

    const type = req.session.user.type;

    Course.getCourseById([req.params.courseId], function (err, coursename) {

      if (err) console.log(err);

      res.render("course/lessons", {

        type: type,

        course_id: req.params.courseId,

        course: coursename,

        pageTitle: "All lessons",

        path: "/courses",

        type: req.session.user.type,


        isAuthenticated: req.session.isLoggedIn,

      });
exports.getALessonPage = (req, res, next) => {

  const fav = req.params.lessonId;

  const fvv = req.params.courseId;

  console.log(fav);

  // res.redirect('/')

  // console.log(lessons);

  Course.getCourseById([req.params.courseId], function (err, coursename) {

    var lesson;

    if (err) console.log(err);

    for (i = 0; i < coursename.lessons.length; i++) {

      if (coursename.lessons[i]._id == req.params.lessonId) {

        lesson = coursename.lessons[i];

      res.render("course/lessondetails", {

      course: coursename,

      lesson: lesson,
```

```javascript
      pageTitle: lesson.lesson_title + " (" + coursename.title + ")",

      path: "/mycourses",

      type: req.session.user.type,

      isAuthenticated: req.session.isLoggedIn,

    });

  };

exports.getAnAssignmentPage = (req, res, next) => {

  const fav = req.params.assignmentId;

  const fvv = req.params.courseId;

  console.log(fav);

  // res.redirect('/')

  // console.log(assignments);

  Course.getCourseById([req.params.courseId], function (err, coursename) {

    var assignment;

    if (err) console.log(err);

    for (i = 0; i < coursename.assignments.length; i++) {

      if (coursename.assignments[i]._id == req.params.assignmentId) {

        assignment = coursename.assignments[i];

      }

    }


    res.render("course/assignmentdetails", {

      course: coursename,

      assignment: assignment,

      pageTitle: assignment.assignment_title + " (" + coursename.title + ")",

      path: "/mycourses",

      type: req.session.user.type,

      isAuthenticated: req.session.isLoggedIn,

    });
```

```javascript
  });
};


exports.getANotificationPage = (req, res, next) => {
  const fav = req.params.notificationId;
  const fvv = req.params.courseId;
  console.log(fav);
  // res.redirect('/')
  // console.log(notifications);
  Course.getCourseById([req.params.courseId], function (err, coursename) {
    var notification;
    if (err) console.log(err);
    for (i = 0; i < coursename.notifications.length; i++) {
      if (coursename.notifications[i]._id == req.params.notificationId) {
        notification = coursename.notifications[i];
      }
    }

    res.render("course/notificationdetails", {
      course: coursename,
      notification: notification,
      pageTitle:
        notification.notification_title + " (" + coursename.title + ")",
      path: "/mycourses",
      type: req.session.user.type,
      isAuthenticated: req.session.isLoggedIn,
    });
//post Delete lesson
exports.postDeleteLesson = (req, res, next) => {
```

```javascript
const ccc = req.body.courseId;

const lll = req.body.lesson_Id;

Course.update(

  { _id: ccc },

  { $pull: { lessons: { _id: lll } } },

  { safe: true, multi: true },

  function (err, obj) {

    if (err) {

      console.log(err);

    }

    res.redirect(`/courses/details/${ccc}`);

    console.log("Lesson Deleted");

  }

Course.update(

  { _id: ccc },

  { $pull: { assignments: { _id: lll } } },

  { safe: true, multi: true },

  function (err, obj) {

    if (err) {

exports.postDeleteNotification = (req, res, next) => {

  const ccc = req.body.courseId;


  const lll = req.body.notification_Id;


  Course.update(

  { _id: ccc },

  { $pull: { notifications: { _id: lll } } },

  { safe: true, multi: true },

  function (err, obj) {
```

```javascript
    if (err) {

      console.log(err);

    }

    res.redirect(`/courses/details/${ccc}`);

    console.log("Notification Deleted");

  }
//get edit lesson
exports.getEditLesson = (req, res, next) => {
  const editMode = req.query.edit;
  if (!editMode) {
    return res.redirect("/");
  }
  const lll = req.params.lessId;
  const lessId = req.params.courseId;
// const ooo = Course.find({_id:{ $in : lll }})
  // console.log(ooo);
  Course.find({ _id: lll })
   // Course.find({_id:{ $in : lll }})
    .then((lesson) => {
     if (!lesson) {
        res.redirect("/");
     }
     res.render("lecturer/edit-lesson", {
       pageTitle: "Edit Lesson",
       path: "/lecturer/edit-lesson",
       editing: editMode,
       // lesson: lesson,
       lesson: lesson,
       type: req.session.user.type,
```

```
    // isAuthenticated: req.session.isLoggedIn

  });

 })

 .catch((err) => {

  console.log(err);

 });

};

//update lesson uploaded


   b)  Error

exports.errorPage = ((req, res, next) => {

  // res.status(404).send('<h1>This is an error page</h1>');

  // res.status(404).sendFile(path.join(__dirname, 'views', 'error.html'))

 res.status(404).render('error', { pageTitle: 'Page Not Foundd'})

 })


   c)  Lecturer

const Course = require("../models/course");


const User = require("../models/user");


const Lecturer = require("../models/lecturer");

const user = require("../models/user");


// Lecture Courses Offered

exports.lecturerCourses = (req, res, next) => {

 // console.log(user);

 // console.log(req.session.user.email);

 // console.log(lecturer);
```