**CHAPTER ONE**

**INTRODUCTION**

**1.1 Background of study**

E-learning which refers to leveraging the advancement of modern technology in teaching and learning practices, has been on the rise in the past few years. Many e-learning platforms have been developed to solve problems that arise due to the pandemic. According to the Ghana Journal of Higher Education, the modern landscape of higher education is undergoing a shift towards digital platforms, allowing for a wider accommodation of students across a relatively broader geographical area for teaching and learning. Amid the pandemic necessities, e-learning rose to become a basic form of education at all teaching levels, which actually led to an increased accessibility and flexibility and also enabled a broader reach for students across different locations. However, there is the question about the sustainability of this e-learning trend post-pandemic, and whether there will be a return to traditional teaching and learning methods, or that the development of e-learning platforms will be continued by innovators.

The emergence of e-learning in the traditional teaching and learning presents its own sets of opportunities and challenges. Gyamfi and Addo discuss the limitations of the traditional model, especially in addressing the modern demands of education. This approach has struggled to accommodate the evolving needs of the modern digital age, particularly in providing access to education, especially in remote regions, contributing to a gap in effective online learning. They emphasize the importance of acknowledging the limitations of traditional teaching methods and embracing innovative approaches to education, such as e-learning. One such approach would be in the development of a comprehensive, integrated learning platform that caters to the modern demands of education:- personalize the learning experience for each student, catering to their individual strengths and weaknesses; incorporate opportunities for students to develop critical thinking skills through interactive activities, simulations and project based learning;developing of digital literacy skills as well as fostering collaboration and communication among students and tutors.

There are many such e-learning systems in the world we live in today. Such platforms like Udemy, ALX SE, Edureka, Scrimba, among others, have played a vital role in facilitating access to educational resources and opportunities (educational democratization), however, these platforms often focus on specific niches or cater to a more individual learner journey.

Kim, Lee & Yoon came up with a model to guide the design and development of an e-learning platform so it would be successful. They suggest five factors that contribute to the success of an e-learning platform.These are;

1. system quality - this is the functionality, reliability and usability of the e-learning platform
2. lecture content - referring to the quality, relevance and accessibility of learning materials on the platform.
3. teaching quality - which is the effectiveness on the lecturer's part in delivering educational content.
4. online interaction - refers to the level of engagement and interaction among students, instructors and course materials.
5. achievements - which are the tangible outcomes attained by students and instructors in relation to predefined learning objectives and performance standards that have been set.

By focusing on these core principles, we aim to create an integrated teaching and learning environment using GCTU as a case study. The internet is the perfect tool for learning, as it offers flexibility and expediency to learners at the same time offering endless opportunities for innovative teaching.

**1.2 Problem Statement**

This project proposes the development of a comprehensive, integrated e-learning platform, leveraging the university’s technical expertise. It will address the challenges of student location and accessibility while remaining cost-effective in the long term. Universities in Ghana, especially, GCTU face challenges in up pace with growing student population. There is also the limited accommodation on campus as well as around campus that create a bottleneck, hindering access to education for many qualified students. Furthermore, the need for providing quality education to individuals in remote regions and also expanding the universities reputation or reach beyond the Ghana geographical borders is also there.

E-learning provides a very promising solution to this challenges by reducing the reliance on physical classrooms, thereby enhancing access to education for students in remote areas and also expand the universities global reach. It will solve the problem of accommodation constraints by offering courses online, eliminating the need for everybody to come to campus at once. Also students in remote areas can access the quality education by using the e-learning platform, regardless of their location. This bridges the geographical gap and allows for fair and equal access to quality education. Finally, the university would be able to extend its wings and offer access to education to students worldwide. This would increase the university’s international recognition and would contribute in fostering a global learning community - where students from different countries worldwide can collaborate and learn together.

By embracing e-learning, GCTU can address the significant issues of enrollment challenges, democratize access to education and cement their status on the international stage.

**1.2.1 Limited Accommodation and Accessibility Challenges at GCTU**

This university faces a significant challenge in providing adequate on-campus housing for its student population and the ones available around campus are costly. This results in a large portion of the students body residing far from campus, often at least 6 - 10 miles away. This geographical distance creates a barrier to traditional in-person learning, giving that lectures start at 8 am, it forces students to make long and potentially expensive and exhausting daily commutes to attend lectures.

**1.2.2 The High Cost of Existing Solutions**

While third-party video conferencing platforms like Zoom or TeamViewer provide an option for remote learning, the ongoing costs associated with these services could result in a substantial financial challenge for GCTU. For a technical institution like GCTU, which encourages innovation and seeks to capitalize on its own experience, this is particularly concerning.

**1.2.3 The Need for a Custom, Cost-Effective E-Learning Platform**

A comprehensive e-learning platform that is specifically tailored to GCTU's particular circumstances is absolutely essential. Such a platform requires to provide top priority to features like:

Videoconferencing: Facilitate real-time interaction and collaboration between instructors and students regardless of location

Flexibility and Accessibility: Cater to the diverse needs of students by offering asynchronous learning opportunities alongside live lectures.

Cost-Effectiveness: Eliminate ongoing licensing fees for external video conferencing platforms, saving GCTU valuable resources.

**1.3 Research Aim and Objectives**

**1.3.1 Research Aim**

The main objective is to develop an interactive e-learning platform.

**1.3.2 Specific Objectives**

1. Since the platform allows students to access university resources, we need to create an index of all these resources, including recorded lecture sessions, per course, per year.

b. We also want to make sure all students regardless of your device and network connection, you'd be able to access the platform and all of its features.

**1.4 Significance of study**

The COVID-19 pandemic accelerated the shift towards digital learning, as highlighted by research conducted by Jakhar et al. (2020). While many schools are transitioning back to in-person classes, the need for flexible and accessible learning solutions still remain. In a similar research conducted by the students of GCTU last year (2023), Adagobo et al, proposed that successfully developing a platform that serves in the context of e-learning would serve the university in improving learning procedures on campus. Implementing a hybrid approach to learning, combining the positives of asynchronous learning and synchronous learning would greatly improve teaching and learning in the school. Students residing far from campus or juggling work and studies can access course materials and complete assignments on time, and since some students grasps concepts quickly, while others benefit from revisiting materials and practicing at their own pace, the features incorporated on this platform would allow them to focus on understanding before moving on. Some students also prefer visual learning through recordings, while others benefit from interactive activities. This hybrid approach would cater to diverse preferences.

**1.5 Scope and Limitation**

**1.5.1 The scope of this research**

The project will focus on providing a solution for a comprehensive hybrid learning module for Ghana Communication Technology University.

**1.5.2 The limitations of this research**

1. The initial development phase will focus on core functionalities and will need further iterations to incorporate more advanced features.

2. It will also be piloted with courses for the Faculty of Engineering, as scaling it up for university-wide adoption would require further planning and resource allocation.

3. Also external factors such as students internet connectivity could impact its effectiveness.

**1.6 Brief Methodology**

**1.6.1 Design Concept**

The Agile software development methodology will be used for this project. According to Al-Saqqa et al.(2020), this model is suitable for cost effective, flexible and iterative development by reducing overhead and cost , allowing for changes in requirements at any stage, and making it adapt to changing or evolving needs and user feedback.

**1.6.2 Software required**

1. Ubuntu 20.04LTS Operating system on Windows Subsystem for Linux
2. Microsoft Windows 11 pro
3. Visual Studio Code for Windows as a text-editor for developing both client-side and server side
4. Docker as a containerization platform that will allow us to package our application and its dependencies into self-contained units for easy deployment.
5. Chrome, Firefox Web Browsers

**1.6.3 Frameworks and Libraries**

1. Web Real Time Communication (WebRTC) technology
2. Firebase Cloud Service for Signaling Server
3. MongoDB with Mongoose for database
4. NodeJS to serve as the runtime environment for our server
5. ExpressJS as our web Framework
6. Socket.io for real-time bidirectional communication
7. Embedded JavaScript (EJS) as a templating engine to render dynamic views
8. Git and GitHub for version Control
9. Heroku for hosting NodeJS applications

**1.6.4 Hardware Requirements**

1. Processor (CPU):

Minimum: Intel Core i5-8th Gen or AMD Ryzen 5 3rd Gen (or equivalent)

Recommended: Intel Core i7-10th Gen or AMD Ryzen 7 3rd Gen (or equivalent)

1. RAM:

Minimum: 8GB DDR4 RAM

Recommended: 16GB DDR4 RAM - This would allow us to run multiple development tools smoothly

1. Storage:

Minimum: 256GB SSD for faster loading times and overall performance

**1.7 Organization of Project**

The project is organized as follows: Chapter 1 covers the introduction, study background, issue description, major and secondary objectives, significance of the study, scope and limitations, process, and project organization. In Chapter 2, the literature review is discussed in order to offer an analysis of relevant and current research studies. The project's methodology is thoroughly discussed in Chapter 3. This is an extended version of the brief method from chapter 1. Chapter 4 covers outcomes and analysis, or the evaluation and analysis of results. Chapter 5 is meant to be the conclusion. Stated differently, it wraps up the entire endeavor by summarizing its limitations, recommendations, and sources.