EXPLOITING THE ADOPTION AND IMPLEMENTATION OF ELECTRONIC LEARNING IN ACCRA TECHNICAL UNIVERSITY

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**A RESEARCH PROJECT REPORT SUBMITTED TO THE FACULTY OF APPLIED SCIENCES, COMPUTER SCIENCE DEPARTMENT, ACCRA TECHNICAL UNIVERSITY IN PARTIAL FULFULLMENT OF THE REQUIREMENTS FOR THE AWARD OF HIGHER NATIONAL DIPLOMA**

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# DECLARATION

This project is submitted as part of fulfillment for the award of a Higher National Diploma in Computer Science: The work is a result or my own investigation. All section of the text and results which have been obtained from other works/ sources are fully referenced. I understand that cheating and plagiarism constitute a breach of Accra Technical University and will be dealt with accordingly.

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# DEDICATION

We dedicate this project work to God Almighty in heaven for his immense mercies, protection and direction to us, throughout our stay in school.

# 

# ACKNOWLEDGEMENTS

We wish to express my profound gratitude to our Parents for their encouragement and their advice, may God bless them.

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We will not forget my good friends, well-wishers and love ones that in one way or the other contributed immensely to success of these projects, we ask almighty God to bless you all Amen.

# ABSTRACT

Globally, education is the key to the national development of every developed or developing country. Face-to-Face (F2F) mode of education is challenged when physical classroom (academic) resources are not available for all students in a particular institution. Consequently, in order to solve such problems in education, there is the need for the incorporation of technological education modes. Accra Technical University (ATU) in Ghana is currently facing the problem of turning away qualified applicants due to the fact that the academic resources in ATU are not enough to accommodate all qualified applicants and students. Technological modes of education such as electronic learning (teaching and learning through personal digital computers) and mobile learning (teaching and learning through smart mobile devices) have been developed and implemented by many educational institutions worldwide. Consequently, an educational mode such as e-learning will support and supplement the current F2F mode of education in ATU.

Using a mixed method approach consisting of quantitative as well as Build Computer Science Research Methods, this research project seeks to solve the problem above by proposing and developing an e-learning system to support the education of applicants/students in ATU. Data analysis of responses from 190 and 14 questionnaires administered to students and lecturers respectively showed that majority of these stakeholders are embracing technology and electronic learning (e-learning) in ATU.

The program used in designing the new system is on the Java-based, client/server type software model. The system is implemented using Java/J2EE technologies. It includes windows as the operating system, MySQL as the backend, BOOTSTRAP, PHP, and SUBLIME TEXT, CSS for decorating the interface and HTML for linking web pages.

Results of the study showed that majority of students and lecturers in ATU are willing to embrace technology for teaching and learning. Furthermore, in comparison to the existing system, the proposed system utilizes less of time for accessing learning materials and at the same time reduces the overall time spent on learning.

Table of Contents

**CONTENTS** **PAGES**

[DECLARATION i](#_Toc519693211)

[DEDICATION ii](#_Toc519693212)

[ACKNOWLEDGEMENTS iv](#_Toc519693213)

[ABSTRACT v](#_Toc519693214)

[LIST OF FIGURES x](#_Toc519693215)

[LIST OF TABLES xi](#_Toc519693216)

[CHAPTER ONE 1](#_Toc519693217)

[INTRODUCTION 1](#_Toc519693217)

[1.0 BACKGROUND OF THE STUDY 1](#_Toc519693218)

[1.1 PROBLEM STATEMENT 4](#_Toc519693219)

[1.1.1 Research Questions 5](#_Toc519693220)

[1.2 RESEARCH OBJECTIVES 5](#_Toc519693221)

[1.3 SIGNIFICANCE OF THE STUDY 5](#_Toc519693222)

[1.4 ORGANIZATION OF THE STUDY 6](#_Toc519693223)

[CHAPTER TWO 7](#_Toc519693224)

[LITERATURE REVIEW 7](#_Toc519693225)

[2.0 INTRODUCTION 7](#_Toc519693227)

[2.1 CONCEPT OF E-LEARNING 7](#_Toc519693228)

[2.2 E-LEARNING ADOPTION AND EXPERIENCES IN AFRICAN COUNTRIES 8](#_Toc519693229)

[2.3 E-LEARNING IN GHANAIAN UNIVERSITIES 9](#_Toc519693230)

[2.4 TYPES OF E-LEARNING 10](#_Toc519693231)

[2.4.1 E-Learning without Both Presence and Communication (E-Learning Mode A) 10](#_Toc519693232)

[2.4.2 E-Learning without Presence and With Communication (E-Learning Mode B) 10](#_Toc519693233)

[2.4.3 E-Learning with Combination of Occasional Presence: Blended Learning (E-learning Mode C) 11](#_Toc519693234)

[2.4.4 E-Learning Used as a Tool in Classroom Teaching (E-Learning Mode D) 11](#_Toc519693235)

[2.5 CHALLENGES IN E-LEARNING 11](#_Toc519693236)

[2.6 BENEFITS OF E-LEARNING 12](#_Toc519693237)

[2.6.1 Disadvantages of E-Learning 13](#_Toc519693238)

[2.7 THEORETICAL FRAMEWORK 14](#_Toc519693239)

[2.7.1 TAM 14](#_Toc519693240)

[2.7.2 TAM-2 15](#_Toc519693241)

[2.7.2.5 Result Demonstrability 18](#_Toc519693242)

[2.8 RELATED WORK 18](#_Toc519693243)

[CHAPTER THREE 20](#_Toc519693244)

[RESEARCH METHODOLOGY 20](#_Toc519693244)

[3.1 RESEARCH METHODOLOGY AND DATA COLLECTION INSTRUMENT 20](#_Toc519693245)

[3.2 VALIDITY AND RELIABILITY OF RESEARCH INSTRUMENT 21](#_Toc519693246)

[3.3 POPULATION, SAMPLING TECHNIQUE AND SAMPLE OF THE STUDY 22](#_Toc519693247)

[3.4 DATA COLLECTION AND ANALYSIS 22](#_Toc519693248)

[3.5 RESULTS OF THE STUDY 24](#_Toc519693249)

[3.5.1 Demography and Profile of Respondents Results of the Study 24](#_Toc519693250)

[3.5.2 Technology Acceptance of Lecturers and Students in ATU 25](#_Toc519693251)

[3.5.3 Perceived Ease of Use (PEOU) of Technology by Students and Lectures 27](#_Toc519693252)

[3.5.4 Perceived Usefulness (PU) of Technology by Students and Lectures in ATU as a Medium for Teaching and Learning 29](#_Toc519693253)

[3.6 INFERENTIAL STATISTICS 29](#_Toc519693254)

[3.6.1 Hypotheses Testing (Student) 30](#_Toc519693255)

[3.6.2 Hypotheses Testing (Lecturers) 31](#_Toc519693256)

[CHAPTER FOUR 32](#_Toc519693257)

[PROPOSED SYSTEM AND IMPLEMENTATION 32](#_Toc519693258)

[4.0 INTRODUCTION 32](#_Toc519693259)

[4.1 SYSTEM IMPLEMENTATION 32](#_Toc519693260)

[4.1.1 Java/J2ee 32](#_Toc519693261)

[4.1.2 Bea Web Logic Server 32](#_Toc519693262)

[4.1.3 MySql 32](#_Toc519693263)

[4.1.4 Bootstrap 33](#_Toc519693264)

[4.1.5 Php 33](#_Toc519693265)

[4.1.6 Sublime Text 3 33](#_Toc519693266)

[4.1.7 Cascading Style Sheet 33](#_Toc519693267)

[4.2 DATABASE IMPLEMENTATION 33](#_Toc519693268)

[4.3 OVERVIEW OF DATABASE TABLES 33](#_Toc519693269)

[4.4 ARCHITECTURE OF THE SYSTEM 35](#_Toc519693270)

[4.5 PRESENT SYSTEM FRAMEWORK 36](#_Toc519693271)

[4.5.1 Use of Java/OO Design Patterns 36](#_Toc519693272)

[4.5.2 Detailed Component View 37](#_Toc519693273)

[4.5.3 The Clients 37](#_Toc519693274)

[4.5.4 Servlet Framework – The Controller (Façade Pattern) 37](#_Toc519693275)

[4.5.5 JSP Templates – Composite Design Patterns 37](#_Toc519693276)

[4.5.6 BOS – Data Access Objects Design Pattern 38](#_Toc519693277)

[4.5.7 Value Objects – Value/Caching Pattern 38](#_Toc519693278)

[4.5.8 Logging Service 39](#_Toc519693279)

[4.6 PROCESS OVERVIEW OF THE CURRENT SYSTEM 40](#_Toc519693280)

[4.6.1 Login Tool 40](#_Toc519693281)

[4.6.2 My Class Tool 41](#_Toc519693282)

[4.6.3 Notification Tool 41](#_Toc519693283)

[4.6.4 Message Tool 41](#_Toc519693284)

[4.6.5 Backpack Tool 41](#_Toc519693285)

[4.6.6 My Classmate Tool 41](#_Toc519693286)

[4.6.7 My Progress Tool 41](#_Toc519693287)

[4.6.8 Subject Overview Tool 41](#_Toc519693288)

[4.6.9 Downloadable Material Tool 41](#_Toc519693289)

[4.7 JAVA USER INTERFACE PROGRAMS 42](#_Toc519693290)

[4.7.1 Login to E-Learning System 43](#_Toc519693291)

[CHAPTER FIVE 50](#_Toc519693292)

[CONCLUSION AND RECOMMENDATION 50](#_Toc519693293)

[5.0 INTRODUCTION 50](#_Toc519693294)

[5.1 CONCLUSION 50](#_Toc519693295)

[5.2 RECOMMENDATION 50](#_Toc519693296)

[REFERENCES 52](#_Toc519693297)

[APPENDIX Error! Bookmark not defined.](#_Toc519693298)

[Appendix A – Research Questionnaires 58](#_Toc519693299)

[Appendix B- Sample Code 64](#_Toc519693300)

# LIST OF FIGURES

[Figure 2.1: Technology Acceptance Model (TAM) 15](#_Toc519689150)

[Figure 2.2: Technology Acceptance Model 2 (TAM-2) 17](#_Toc519689151)

[Figure 3.1: Research Process 21](#_Toc519689152)

[Figure 4.1: Use Case Diagram 40](#_Toc519689153)

[Figure 4.2: Student/Lecturer Login Screen 44](#_Toc519689154)

[Figure 4.3: Administrators Login Screen 44](#_Toc519689155)

[Figure 4.4: My Class 45](#_Toc519689156)

[Figure 4.5: Notification 45](#_Toc519689157)

[Figure 4.6: Messages 46](#_Toc519689158)

[Figure 4.7: Backpack 47](#_Toc519689159)

[Figure 4.8: Teacher’s class 48](#_Toc519689160)

[Figure 4.9: Add Subject Screen 49](#_Toc519689161)

# LIST OF TABLES

[Table 3.1: Profile of Respondents 23](#_Toc519846839)

[Table 3.2: Technology Acceptance by Students 24](#_Toc519846840)

[Table 3.3: Technology Acceptance by Lecturers 25](#_Toc519846841)

[Table 3.4: Students- PEOU of Technology 27](#_Toc519846842)

[Table 3.5: Lecturers- PEOU of Technology 28](#_Toc519846843)

[Table 3.6: PU of Technology by Students and Lecturers in ATU 29](#_Toc519846844)

[Table 3.7: Contingency Table for Students 30](#_Toc519846845)

[Table 3.8: Contingency Table for Lecturers 31](#_Toc519846846)

[Table 4.1: Activity Table 34](#_Toc519846847)

[Table 4.1: Standard Function 43](#_Toc519846848)

[Table 4.2: User Inputs 43](#_Toc519846849)

[Table 4.3 User Inputs 49](#_Toc519846850)

# CHAPTER ONE

**INTRODUCTION**

## **BACKGROUND OF THE STUDY**

Globally, education is the key to the national development of every developed or developing country. Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs, and habits. Educational methods include storytelling, discussion, teaching, training, and directed research. The traditional mode of education which involves physical Face-to-Face (F2F) between teachers and students in a classroom or a similar location setting was the first mode of education (Shachar & Neumann, 2003; Gamliel & Davidovitz, 2005; Shen et al., 2007).

With the advent of the rapid and tremendous growth of Information and Communication Technology (ICT) in the past decades, the traditional F2F mode of education has rapidly migrated to educational modes that employ/utilize technology as part of teaching and learning processes. Some of these technological modes of education include:

* **Mobile Learning** (**M-Learning**)-Teaching and learning through mobile/smart devices such mobile phones and smart phones (Oyelere, Suhonen & Sutinen, 2016; Asabere, 2013)
* **Mobile Social Leaning** (**MSL**)-Collaborative (social) teaching and learning through mobile/smart devices (Xia et al., 2013; Yamin et al., 2016)
* **Electronic Learning** (**E-Learning**)-Teaching and learning through digital Personal Computers (Al-Adwan, A., Al-Adwan, A., & Smedley, 2013; Ansong et al., 2017; Almarabeh, 2014; Asabere & Enguah, 2012; Asabere, 2012) and
* **Distance Learning**-Teaching and learning at a different location/site/campus from the main site of an educational establishment (Tagoe & Abakah, 2014; Asabere & Enguah, 2012; Sampong, 2009; van Brakel & Chisenga, 2003).

Innovative modes of education through computer technology as mentioned above have become necessary and vital as a result of the fact that the F2F mode of education requires improvement such as:

* Making education more technological,
* Admitting more students due to lack of physical classrooms and
* Catering (support/substitute) for students currently in the working environments who may not be able to attend lectures/classes during the day, and
* Paving the way for teaching and learning to have different approaches and phases, thereby making education more interesting.

The migration of F2F or its combination with other modes of education requires critical research by the educational establishment wishing to utilize such technological educational modes (Asabere 2012; Trifonova, 2006). Because of the technological aspects in such educational modes, both teachers (lecturers) and students should be trained on how to use ICT, Internet and computers for teaching and learning activities respectively. As a consequence, the main stakeholders should be willing to accept technology as part of their education process (Asabere 2012; Trifonova, 2006).

E-Learning involves the use of computers or digital electronic devices as tools/facilities for the provision of teaching and learning activities in a particular educational institution (Moore, Dickson-Deane & Galyen, 2011). E-Learning is usually limited to the role of aiding self-paced learning and distance education, thus terms like online learning, web-based learning, distributed learning, networked are also used as a reference points for e-learning (Moore, Dickson-Deane & Galyen, 2011). Additionally, e-learning is one out of several concepts which is used for describing a host of new learning methodologies in parts of or in the entire learning process.

E-Learning is not confined to any particular part of the educational system rather the contrary, one of the advantages by e-learning is that it makes it possible to extend the reach of educational and training systems into new areas. Thus e-learning can be applied both in the formal educational system (public schools, colleges, universities etc.), as well as for vocational and technical training. It can also be used in both the public and private sectors of an economy. Through ICT, the provision of access to knowledge anywhere and anytime as well as opportunities for networking and communications for knowledge sharing, participation, and lifelong education is guaranteed (Buabeng-Andoh, 2012; Asabere, 2013, Asabere et al., 2017). With the aid of internet usage, e-learning has become vastly widespread and many universities are using it to support teaching and learning (Kanuka & Anderson, 2007a; Kanuka and Anderson, 2007b). Deng & Tavares (2013) also confirmed this assertion that the latest development of internet technologies has a lot of universities considering resources in e-learning system to support teaching and learning.

Teachers and lecturers in reputable and advanced tertiary institutions are facing different challenges than their predecessors in teaching students (professionals for tomorrow). In the past few decades, advances in academia have increased demands in academic faculty, resulting in less time for teaching than has previously been the case. This innovation that started in developed countries is rapidly becoming global. E-Learning has become more popular in developing countries (Tagoe, 2012; Ansong, Boateng & Boateng, 2017; Asabere & Enguah, 2012; Budu, Yinping & Mireku, 2018; Namisiko et al., 2014; Namisiko, Munialo & Nyongesa, 2014)

E-Learning can be used by lecturers to improve efficiency and effectiveness of education interventions in the face of social, scientific, and challenges. It gained popularity in the past decades. Consequently, e-learning has potential to transform Ghanaian technical universities. E-Learning is increasingly gaining universal acceptance as a possible means of enabling large number of student’s access to education. As mentioned above, the application of ICTs such as the Internet in education offers opportunities for educational institutions to expand their reach to learners anytime and anywhere (Buabeng-Andoh, 2012; Asabere, 2013, Asabere et al., 2017). In addition to accessibility, e-learning has the potential of increasing interactivity, collaboration and delivery of content which contribute to increasing learner satisfaction and reducing attrition rate in educational institutions ((Asabere & Enguah, 2012; Ansong et al., 2017; Tagoe & Abakah, 2014).

In Ghana, tertiary institutions such as University of Ghana (UG), Kwame Nkrumah University of Science and Technology and University of Cape Coast (UCC) have implemented different types of e-learning modes and this has benefited these institutions tremendously (Asabere & Enguah, 2012; Ansong et al., 2017; Tagoe & Abakah, 2014). However, the implementation or availability of e-learning in technical education, specifically Accra Technical University (ATU) in Ghana is very scarce (not available).

With the aid of the improved version of the TAM-2:Technology Acceptance Model – 2 (Venkatesh & Davis, 2000), this research work employs a mixed research method consisting of qualitative and quantitative approaches to verify and examine the benefits, drawbacks and implementation of an e-learning system in technical education in Ghana, using the current context of ATU as a case study. The aim of the study is to create awareness and realization about the benefits and disadvantages of an e-learning system in ATU. Furthermore, by studying and investigating different types of e-learning systems, we propose and strategically implement a relevant e-learning system for ATU.

## 1.1 PROBLEM STATEMENT

E-Learning has become the protagonist for change in the education sector with the rising numbers in student enrolments and the masses of potential students that are turned away each year due to lack of classrooms, accommodation and lecturers. At the beginning of every academic year, due to a high number of applicants, ATU faces a challenge of admitting all qualified students and also conducting teaching and providing research through ICT.

Admission statistics in ATU show that many students although qualified do not gain admission due to scarcity of academic resources. For example, in the 2017/2018 academic year, out of 5,664 applications received for full HND Full Time, 4,760 were qualified for admission but 3,798 registered. The difference between qualified and registered students depicts that in the 2017/2018 academic year, an approximation of 900 HND Full Time applicants were turned away due to limited academic resources.

The statistics shown above shows that some applicants are seriously disadvantages and don’t get access to tertiary education in ATU. Such applicants become stranded and their only choice is to put in measures that will enable them to try other technical universities in Ghana which may not be so different from ATU in terms of academic facilities. Additionally, in every academic year, the student enrollment numbers are also very high.

In summary, ATU is currently unable to meet the high demand for tertiary education, which has arisen due to rapid growth in population and the reduction of years for pre-tertiary education. Furthermore, there is an evident disparity between the existing academic facilities and physical infrastructure on one hand, and the increasing number of students admitted into tertiary institutions on the other. Additionally, there is evident disparity between the existing academic facilities and physical infrastructure and the access to these facilities by disabled students is an existing problem.

Consequently, it is very imperative to exploit the possibility of proposing, developing and implementing and e-learning system in ATU and that is what we seek to do in the research project.

### 1.1.1 **Research Questions**

* What is the current mode of education being practiced in ATU?
* What are the challenges of the current mode of education in ATU?
* What are the required steps to be taken in order to improve and computerize the current mode of education in ATU?

## 1.2 RESEARCH OBJECTIVES

The main objectives of this research work are as follows:

* To investigate the current mode of education being practiced in ATU.
* To verify and analyze if the current mode of education in ATU has some challenges.
* To propose and develop an electronic learning (e-learning) system for ATU.

## SIGNIFICANCE OF THE STUDY

Successful implementation of e-learning in ATU will provide another avenue to education apart from the current F2F. This means almost all qualified applicants will be admitted and many applicants will no longer be turned away to look elsewhere. Students will have access to learning when they want it, the time they want it (day or night), wherever they want it - at home, at work, in your local library. For many students this would open up a new, much more flexible and accessible world of learning that was previously closed to them due to disability or family circumstances, or perhaps due to the fact that the ATU has not got the physical facilities to admit and accommodate on its campus. In other words, geographical constraints to learning will be eradicated through e-learning at ATU. The availability of e-learning will bring learning to people at ATU.

Furthermore, successful implementation of e-learning in ATU would make learning exciting, engaging and compelling. Hard and boring subjects can now be made easier, more interesting and appealing with e-learning. So, for example, videos and documentaries of various courses or subjects which will give a better understanding to students can be uploaded by lecturers and displayed or shown through the e-learning system or a videoconferencing center.

## ORGANIZATION OF THE STUDY

The entire research project is divided into five chapters; a summary of the content contained in each chapter is briefly described below:

* **Chapter One-Introduction**: This chapter presents an outline of the research and it covers the background of the research, research problem, objectives of the study, research questions, significance of the research and the organization of the study.
* **Chapter Two-Literature Review**: Literature relevant to the study is reviewed in this chapter. Theories and models that form the foundation of e-learning adoption in universities are identified and discussed. Related Work to this research is also presented in this chapter.
* **Chapter Three-Methodology**: This chapter elaborates on the research methodological approach and highlights the research strategy and paradigms. There is a discussion on the sampling techniques employed as well as the sample size utilized. The instrument for data collection and the methods used as well as data analysis and presentation are expounded in this chapter.
* **Chapter Four-Proposed System** **and Implementation**: This chapter provides the steps involved and required to build/develop the proposed system and its implementation procedure.
* **Chapter Five-Conclusion and Recommendation**: Chapter Five summarizes this research work with conclusion and recommendations for the future.

# CHAPTER TWO

# LITERATURE REVIEW



## INTRODUCTION

In this section, we review literature and related work pertaining to the study. The review of e-learning literature concentrated on two key issues: (i) concept of e-learning (i) discussion of e-learning adoption and experiences in African countries, (ii) discussion of e-learning acceptance, trends and practices in Ghana (iii) types of e-learning, (iv) related work and perspectives of e-learning researchers, and (v) Theoretical Framework – Technology Acceptance Model - 2 (TAM-2). Consequently, in order to answer achieve our research objectives, the literature review focused on research papers related to e-learning acceptance and implementation in developing countries. Acceptance and implementation in the context of this study refers to establishing and utilizing e-learning systems for academic and educational purposes.

## 2.1 CONCEPT OF E-LEARNING

Information and Communication Technology (ICT) is considered as one of the most fundamental forces for change in the all sectors of our lives (Alam & Noor, 2009; Al-Adwan, Al-Adwan & Smedley, 2013; Gatautis, 2008). Today many students want to learn online and in turn acquire academic degrees from worldwide colleges and universities, but are sometimes constrained to limited educational modes and learning resources (Asabere et al., 2017; Ansong, Boateng & Boateng, 2017; Al-Adwan, Al-Adwan & Smedley, 2013). Consequently, many researchers encourage learning courses through innovative e-learning systems because it saves time and energy of students who reside far away from the universities or colleges they have enrolled (Ansong, Boateng & Boateng, 2017; Al-Adwan, Al-Adwan & Smedley, 2013; Almarabeh, 2014). Indeed, e-learning adoption is increasing in most universities and institutions of higher learning all around the world. E-learning which is also known as web-based learning, is defined as the delivery of education in a flexible and easy way through the use of internet to support individual learning or organizational performance goals (Clark & Mayer, 2011, Mayer, 2017; Asabere & Enguah, 2012).

E-learning is the method which allows people especially students to pursue courses from home or anywhere as he/she can access the internet, among other platforms such as peer-to-peer, client server, and web services (Clarkand & Mayer, 2011, Mayer, 2017; Asabere & Enguah, 2012; Ansong, Boateng & Boateng, 2017). There are several studies that have verified how e-learning tools affect the result of students. For example, Baris & Tomson (2013) described the influence of using electronic tools (e-tools) in the education process at a high school and concluded the positive influence of such tools on students. Furthermore, the e-learning allows students to access academic/learning information through personal computers while mobile learning (M-learning) allows users to access academic/learning information through mobile devices (Asabere, 2013; Asabere, 2012; Xia et al., 2013; Trifonova, 2006). Therefore, students could interact with their courses online via such technological platforms. However, the success of an e-learning system depends on the understanding of certain antecedent factors that influence the students’ acceptance and usage of such e-learning systems (Asabere & Enguah, 2012; Ansong, Boateng & Boateng, 2017; Asabere, 2012; Al-Adwan et al., 2013; Almarabeh, 2014).

## E-LEARNING ADOPTION AND EXPERIENCES IN AFRICAN COUNTRIES

Globally, countries which fall in the categories of low- and middle-income economies make up developing countries. Research has shown that countries in Africa mostly belong to the group of developing countries (Easterly & Levine, 1997; Gereffi, 2003; Nielsen, 2011). In Africa, various Governments have progressively shown interests in employing current Information and Communication Technologies (ICTs) in order to expand involvement in education in higher learning institutions (Ansong, Boateng & Boateng, 2017; Namisiko et al., 2014; Namisiko, Munialo & Nyongesa, 2014; Asabere et al., 2017). Available literature from Isaacs and Hollow (2012) revealed that by the end of 2012, 52% of 447 universities in Africa were using e-learning systems. Similarly, the study of Gakio (2006) illustrated that 47% of 54 tertiary institutions from 27 African countries have set up educational technologies in their institutions. E-learning interests in various educational establishments has emanated from the accessibility of Free Open Source Software (FOSS) and web 2.0 technologies (Ansong, Boateng & Boateng, 2017; Namisiko et al., 2014). Web 2.0 technologies that have expanded the needs of modern learners and broadened the participation of education to include: RSS, Wikis, Tagging, Blogs and Podcasts (Ansong, Boateng & Boateng, 2017; Namisiko et al., 2014; Namisiko, Munialo & Nyongesa, 2014; Asabere et al., 2017). Free and open-source software such as Moodle, Dokeos, EFRONT and Claroline have facilitated e-learning in universities in African countries (Selim, 2007, Ansong, Boateng & Boateng, 2017; Namisiko et al., 2014; Namisiko, Munialo & Nyongesa, 2014; Asabere et al., 2017).

## E-LEARNING IN GHANAIAN UNIVERSITIES

In Ghana, the traditional Face-to-Face (F2F) mode of education which usually transpires in a classroom in which a teacher/instructor/lecturer teaches students in a collaborating and interactive manner has been the norm (Asabere & Enguah, 2012; Ansong, Boateng & Boateng, 2017). In Ghana and other African countries, the adoption and implementation of e-learning by various tertiary educational establishments has become a necessity due to population increase and the disparity of the educational infrastructure and resources available. Consequently, the adoption and implementation of e-learning as an educational mode supplement will cater for the large number of people who qualify for educational opportunities but cannot gain access to these universities (Tagoe, 2012; Ansong, Boateng & Boateng, 2017; Asabere & Enguah, 2012; Budu, Yinping & Mireku, 2018; Namisiko et al., 2014; Namisiko, Munialo & Nyongesa, 2014).

Presently, some universities in Ghana have embraced distance learning approaches by locating lecture halls and classrooms at different locations and sites that are away from their main campuses through various business models (Tagoe, 2012; Ansong, Boateng & Boateng, 2017; Asabere & Enguah, 2012).

One of such models is the use of ICT through e-learning. The introduction of e-learning by these institutions in Ghana has really helped to improve both workers and non-workers’ access to higher education in Ghana. The proliferation of ICT has greatly improved access to tertiary education in Ghana by steering in other new educational modes such as e-learning and mobile learning which are very advantageous; however, mobile learning is rare in Ghana (Asabere, 2013; Asabere & Enguah, 2012, Annan, Ofori-Dwumfuo & Falch, 2012a; Annan, Ofori-Dwumfuo & Falch, 2012b).

The National Accreditation Board, Ghana (NAB-Ghana, 2018) is the certifying agency in Ghana for offering licenses and permits to all the universities to operate in the country. It is worth noting that almost all these institutions have adopted a form of e-learning in their curricula (Asabere & Enguah, 2012; Ansong, Boateng & Boateng, 2017). There are ten national public universities, six technical universities and about 50 private universities in Ghana (NAB-Ghana, 2018). Kwame Nkrumah University of Science and Technology, for instance, introduced “Moodle” – an open source and course management e-learning system in the second semester of the 2005–2006 academic year (Marfo & Okine, 2011). University of Ghana also introduced “The Sakai” in 2013 (Ansong, Boateng & Boateng, 2017)

## TYPES OF E-LEARNING

E-Learning operates with four different types of E-Learning methodologies in which a wide spectrum of learning is illustrated. The different types of E-Learning methodologies are namely (Falch, 2004; Danish Ministry of Science and Innovation, 2003):

* *E-Learning without Presence and Without Communication* (*E-Learning Mode A*)
* *E-Learning Without Presence and With Communication* (*E-Learning Mode B*)
* *E-Learning With Combination of Occasional Presence - Blended Learning* (*E-Learning Mode C*) *and*
* *E-Learning Used as a Tool in Classroom Teaching* (*E-Learning Mode D*).

### 2.4.1 E-Learning without Both Presence and Communication (E-Learning Mode A)

This type of mode involves an e-learning process whereby the lecturer/instructor and the students never meet physically. There is no discourse or no kind of interaction between students and the teacher. As a result of the processes involved in this type of e-learning mode, it will be difficult for a tertiary institution in Ghana to adopt and implement this type, because it is very inconvenient in terms of effective teaching and learning.

### 2.4.2 E-Learning without Presence and With Communication (E-Learning Mode B)

In this mode, the teacher and the students never meet physically, but there is dialogue between the students and the lecturer/instructor through the support of ICT based communication services, tools and facilities. E-Learning Mode B demands some type of technical/technological connectivity. Communication can either be asynchronous (e.g. e-mail communication) or synchronous (e.g. chat rooms). Communication can either be with a tutor or with fellow students. E-Learning Mode B is almost as flexible as E-Learning Mode B. As a tutor is involved in the learning process, the use of this type of e-learning mode will often demand the student to register as a participant, if he wants to receive advice from the tutor or teacher (Falch, 2004; Danish Ministry of Science and Innovation, 2003).

E-Learning Mode B can therefore be used for teaching, where reflection and dialogue is important for the learning process. E-Learning Mode B is often used in situations, where flexibility in time and space is important. For example, it is used for facilitating cross border teaching by American universities. It can be appropriate for some tertiary institutions depending on the facilities and costs available for the proposed e-learning System (Falch, 2004; Danish Ministry of Science and Innovation, 2003).

### 2.4.3 E-Learning with Combination of Occasional Presence: Blended Learning (E-learning Mode C)

Another mode of e-learning involves parts of the learning process taking place in a classroom and other parts being done elsewhere (e.g. at home or at work) using ICT based learning facilities and tools. In this mode, e-learning is combined with traditional class room teaching. A wide spectrum of modes is possible here. The ‘electronic’ part can be with or without communication, and it can either be a minor supplement to the traditional teaching, or the traditional teaching can be a minor supplement to the ‘electronic’ part of the course. Use of classroom teaching adds to the economic costs, but it also helps to make E-Learning more efficient, as it facilitates a dialogue between students and lecturer – also outside the classroom. E-Learning Mode C is suitable for implementation in Ghanaian tertiary institutions since it has advantages over Modes A and B and is more suitable and convenient for a tertiary institution’s teaching and learning environment (Falch, 2004; Danish Ministry of Science and Innovation, 2003).

### 2.4.4 E-Learning Used as a Tool in Classroom Teaching (E-Learning Mode D)

This type of E-Learning involves all teaching being done in a classroom, and where computers are used as a learning tool. E-Learning can also be used as a tool in the traditional classroom teaching. The major advantage here is that it enables the use of modern pedagogic teaching methods. For instance, use of games and scenarios in realistic settings. This model of E-Learning is very expensive, due to the fact that computers are used by the students as a learning tool. If a lot of students are admitted, it means a lot of computers have to be procured to meet the requirements of this model which will be very costly for the institution involved. It is more appropriate to use this model if the participating students are not many, and each of them can afford to have a computer (laptop). In any other case apart from this, too much cost will be incurred by the tertiary institution, if this model is implemented (Falch, 2004; Danish Ministry of Science and Innovation, 2003).

## CHALLENGES IN E-LEARNING

Lack of access, particularly in the rural communities of developing countries such as Ghana poses a significant challenge in realizing the full potential of ICT worldwide (Tagoe, 2012; Ansong, Boateng & Boateng, 2017; Asabere & Enguah, 2012; Budu, Yinping & Mireku, 2018; Namisiko et al., 2014; Namisiko, Munialo & Nyongesa, 2014). Deploying traditional wired infrastructures in remote, sparsely populated areas has been commercially unfeasible and has created a huge financial barrier to getting these communities connected to the internet. This limitation has created a “digital divide” a gap between those able to benefit from digital technology and those who cannot. Although socio-economic factors are the primary cause of the digital divide, additional factors including differing levels of literacy and technical skills, social and legal constraints, as well as access to relevant high quality content. Poor infrastructure can lead to unsavory experiences that can cause more damage than good to teachers, students and the learning experience. A community’s inability to use ICT effectively also contributes to the digital divide. Location, culture, age and background significantly influence the likelihood that users will embrace ICT and E-learning. For example, usage models that assume learners own their own PC’s (Tagoe, 2012; Ansong, Boateng & Boateng, 2017; Asabere & Enguah, 2012; Budu, Yinping & Mireku, 2018; Namisiko et al., 2014; Namisiko, Munialo & Nyongesa, 2014)

## BENEFITS OF E-LEARNING

E-learning has many benefits as well as disadvantages (Arkoful & Abaidoo, 2015; Keller and Cernerud, 2002). The following are some of the advantages of E-learning:

* **Overall Cost Reduction** is the single most influential factor in adopting e-learning. The elimination of costs associated with instructor's salaries, meeting room rentals, and student travel, lodging, and meals are directly quantifiable. The reduction of time spent away from the job by employees may be the most positive offshoot.
* **Consistent Delivery** of content is possible with asynchronous, self-paced e-learning.
* **Expert Knowledge** is communicated, but more importantly captured, with good e-learning and knowledge management systems.
* **On-demand Learning Availability** enables students to complete training conveniently at off-hours or from home.
* **Self-pacing** for slow or quick learners reduces stress and increases satisfaction.
* **Interactivity** engages users, pushing them rather than pulling them through training.
* **Learner Confidence** is achieved because refresher or quick reference materials are available and this reduces burden of responsibility of mastery.
* **Learning Times** are reduced for students because they do not have to attend lectures in the classroom almost every day which causes fatigue as it is with the traditional method of learning.
* **Portability** of training has become the strength of e-learning with the proliferation of enabled-Wi-Fi notebook computers and laptops.

### 2.6.1 Disadvantages of E-Learning

E-Learning is not however, the be all and end all to every training need. It does have limitations, among them are (Arkoful & Abaidoo, 2015; Keller & Cernerud, 2002):

* **The Up-Front Investment** required for an e-learning solution is larger due to development costs. Budgets, finance, accounts and cash flows will need to be available and negotiated.
* **Technological Issues** that play a factor include whether the existing technology infrastructure can accomplish the training goals, whether additional technology expenditures can be justified, and whether compatibility of all software and hardware can be achieved.
* **Inappropriate Content** for e-learning may exist according to some experts, though they are limited in number. The acquisition of skills that involve complex physical or emotional components (for example, juggling or mediation) cannot be augmented with e-learning.
* **Reduction of Social and Cultural Physical Interaction of Students** can be a drawback. The impersonality, suppression of communication mechanisms such as body language and elimination of peer-to-peer learning that are part of e-learning with advances in information and communications technologies will lessen social and cultural interaction of students as compared to traditional face-to-face education.
* **The Cultural Acceptance** is an issue in organizations where student demographics and psychographics may predispose them against using computers at all, let alone e-learning.

## THEORETICAL FRAMEWORK

In order to successfully implement e-learning, the stakeholders involved in such an educational mode i.e. teachers/instructors/lecturers, students as well as other relevant administrators should be conversant and familiar with technology usage. As a consequence, it is very important to select an appropriate framework which involves the concepts and ideologies regarding technology acceptance. Examples of such theoretical frameworks include: (i) Technology Acceptance Model (TAM) and (ii) Technology Acceptance Model 2 (TAM-2). A brief description of these frameworks are presented below (Davis, 1989; Venkatesh & Davis, 2000).

### 2.7.1 TAM

ICT adoption and use in workplaces and organizations remains a central concern of information systems research and practice. Despite impressive advances in software and hardware capabilities, the troubling problem of underutilization by the human organizations remains a high-priority research issue (Venkatesh & Davis, 2000). Substantial progress has been made over the last decade in explaining and predicting user acceptance of ICT at work. In particular, significant theoretical and empirical support has accumulated in favor of the Technology Acceptance Model (TAM) (Davis, 1989; Davis, Bagozzir & Warshaw, 1989). Numerous empirical studies have found that TAM consistently explains a substantial proportion of the variance (typically about 40%) in usage intentions and behavior, and that TAM compares favorably with alternative models such as the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) (Venkatesh & Davis, 2000; Davis, 1989; Davis, Bagozzir & Warshaw, 1989). TAM hypothesizes that an individual’s behavioral intention to use a system is determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using the system will enhance his or her job performance, and perceived ease of use, defined as the extent to which a person believes that using the system will be free of effort. TAM posits that the effects of external variables (e.g. system characteristics, development processes, training etc.) on intention to use are mediated by *Perceived Usefulness* (*PU*) and *Perceived Ease Of Use* (*PEOU*) (Venkatesh & Davis, 2000; Davis, 1989; Davis, Bagozzir & Warshaw, 1989). According to Davis et al. (1989), PEOUrefers tothe level to which users feel that they can save or minimize their efforts by using a specific technology*.* PU refers to the level to which users feel that they can improve and increase their job performance by using a specific technology.

TAM has been applied into many contexts and fields investigating user acceptance of information technology, including the World Wide Web (Lederer et al.,2000), mobile banking (Lule et al., 2012) and healthcare (Chau & Hu, 2002). However, along with the relationships suggested by TAM, many researchers have also examined the antecedents of both PEOU and PU (Porter & Donthu, 2006; Yu et al., 2003). Most importantly, the majority of technology acceptance models have been developed and modified in Western countries, particularly in Europe and South America and (Al-Adwan, Al-Adwan & Smedley, 2013).



Figure 2.1: Technology Acceptance Model (TAM)

Figure 2.1 shows the relationship between the components of TAM. This indicates that *PU* and *PEOU* jointly predict the *attitudes towards using technology*. *PU* also influences the user’s *Behavioural Intention* (BI) or Usage Behaviour in using technology. *Intention to Use* (ITU) also determines the actual use of technology.

With regards to the relationship between PU and Usage Behaviour, “*within organizational settings, people form intentions toward behaviours they believe will increase their job performance, over and above whatever positive or negative feelings may be evoked toward the behaviour per se*”. Additionally, the model posits that PEOU is likely to influence PU, where the increase of PEOU lead to improved performance. Consequently, PEOU has a direct influence on PU (Davis, 1989; Venkatesh & Davis, 2000; Davis, Bagozzir & Warshaw, 1989).

### 2.7.2 TAM-2

According to TAM (Davis, 1989; Davis, Bagozzir & Warshaw, 1989), PU is also influenced by PEOU because, other things being equal, the easier the system is to use the more useful it can be. Using TAM (Davis, 1989; Davis, Bagozzir & Warshaw, 1989) as the starting point, TAM-2 (Venkatesh & Davis, 2000) integrates additional theoretical concepts spanning social influence processes (subjective norm, voluntariness, and image) job relevance, output quality, result demonstrability, and PEOU. Since TAM-2 is an extension of TAM, this research project focuses more on TAM-2 (shown in Figure 2.2) and assess its applicability in the tertiary education industry in terms of e-learning adoption. Referring to Venkatesh & Davis, (2000), description of the concepts in TAM-2 are discussed below.

## 2.8 RELATED WORK

In this section, we present a review of existing e-learning systems in literature to substantiate the proposal of our e-learning method in ATU.

Al-Adwan, Al-Adwan & Smedley (2013) focused on the examination of students, who attempt to successfully adopt e-learning systems at universities in Jordan. They utilized TAM as a conceptual research framework for analysis in relation to e-learning adoption. The authors provided an indicator of students’ acceptance of e-learning in Jordan as well as identifying the important factors that would contribute to its successful use.



Figure 2.2: Technology Acceptance Model 2 (TAM-2)

Mwakisole et al. (2018) assessed the feasibility of implementing e-learning systems in a cloud-based infrastructure for secondary schools in Tanzania. Their study found that although e-learning implementation in the cloud for secondary schools in Tanzania is feasible, Internet cost had remained high-priced to many students.

Vululleh (2018) corroborated the extended technology acceptance model (TAM-2) by integrating two intrinsic motivation attributes, namely, quality of life and social influence in developing countries such as Liberia. Responses from the survey in the study were analyzed using the structural equation modeling. The results indicated that student’s behavioral intention to accept and use e-learning developing countries was significantly affected by components on TAM and some component of TAM-2.

Using a quantitative approach, Ansong, Boateng and Boateng (2017) explored the concept of e-learning adoption in the University of Ghana using a multi-stakeholder approach. Data analysis in this study revealed that in the University of Ghana, e-learning was yet to receive a university-wide adoption. Furthermore, the study also discovered that, the prevalent activity on the e-learning platform was “viewing marks and grades.”

Rajak et al. (2018) studied e-learning services acceptance in higher education institutions in Brunei Darussalam. The authors proposed various hypotheses and tested them using multiple regression analysis. Data analysis in this study confirmed that the lecturer’s characteristics, teaching materials, PEOU and the intention to use e-learning corresponds to the perceived benefits.

Adewole-Odeshi (2014) examined the attitude of students towards e-learning in selected south-west Nigerian universities. Specifically, the study looked at the relationship between attitude and e-learning with the application of Technology Acceptance Model (TAM). Findings in this study showed that students have a positive attitude towards e-learning because they find the system easy to use and useful for their course work. Also, attitude influences the intention to use an e-learning system.

Namisiko et al. (2014) sought to determine the application of Web 2.0 and Open Source Softwares in e-learning with specific reference to actual adoption, deployment and inclusion. The author utilized Descriptive Survey Design in a local Private University in Kenya to collect data about students on actual adoption, deployment and inclusion of Web 2.0 and Free Open Source Softwares in E-learning. They found out that Open Source Softwares were the least deployed and adopted technologies in e-learning.

Using empirical data from five tertiary institutions in Ghana, Budu, Yinping & Mireku (2018) developed an extended Technology Acceptance Model (TAM) by incorporating an external variable called self-efficacy. The authors examined the hypothesized model using Partial Least Squares Structural Equation Modelling (PLSSEM) technique through a Smart PLS version 12 software. The authors argued that perceived usefulness, perceived ease of use and self-efficacy influenced individual’s behavioral intentions to utilize e-learning systems in Ghana.

# CHAPTER THREE

**RESEARCH METHODOLOGY**

**3.0 INTRODUCTION**

This section elaborates on the methodology applied in the research project in order to collect/acquire the relevant data for effective analysis. Information regarding the population and sample of the study, research/data collection instrument as well as the results of the study are discussed in this section. This section also elaborates on detailed analysis of data which provides an insight into the findings of the study, accompanied by numerical and graphical representations of the data and interpretation of results.

## 3.1 RESEARCH METHODOLOGY AND DATA COLLECTION INSTRUMENT

The research methodology employed for this study was a mixed research approach consisting of quantitative (questionnaire) and a Build Computer Science approach for designing the proposed e-learning system. The questions which constituted the questionnaire were made up of both closed-ended and open-ended questions. Ethical issues were strictly considered in the questionnaire. Consequently, the questionnaires did not ask the participants to answer any personal questions.

The quantitative method which involved the administration of questionnaires was selected due to the benefit of reaching out and obtaining more information from a large number of people who are not situated at one place. Figure 3.1 illustrates the research process of this study.



Figure 3.1: Research Process

The questionnaire targeted both students and lecturers in order to identify the possibility of adopting technology for an e-learning system in ATU. The questions were distributed by means of printed paper material (hard copy) to both lecturers and students. Each questionnaire for lecturers and students consisted of eleven (22) main questions with three (3) subdivisions consisting of Demography (two questions), Department and Lecturing/Learning Information (four questions) and Technology Acceptance/Adoption for Teaching/Learning (sixteen questions).

## 3.2 VALIDITY AND RELIABILITY OF RESEARCH INSTRUMENT

Validity and reliability are two important factors that have to be considered when developing and evaluating any research instrument (e.g. questionnaire) for use in a study. Due to the fact that the TAM-2 framework for our proposed e-learning system consists of four (4) main components (*PEOU*, *PU*, intentions to use and usage behavior) and involves a large population (students and lecturers), we employed questionnaires as a research instrument for gathering enough data that is required to guarantee validity and reliability.

Specifically, regarding the issue of validity, we considered content validity and construct validity. Content validity in our research instrument was verified by the extent to which items in our questionnaire represents the content we wish to measure (Litwin & Fink, 1995; Liu, 2010; Lamar, 2012). Furthermore, construct validity in our research instrument was validated by the extent to which our questionnaire precisely represents a construct such as students and lecturers’ belief or attitude in relation to teaching and learning using the technology (Litwin & Fink, 1995; Liu, 2010; Lamar, 2012). In terms of reliability, we considered internal consistency reliability and test-retest. In terms of internal consistency reliability, we substantiated and verified the consistency of the score of individual items with scores of a set of items in our questionnaire. Additionally, in relation to test-retest, we corroborated and confirmed the correlation of scores from one administration of our questionnaire to another (Litwin & Fink, 1995; Liu, 2010; Lamar, 2012).

## 3.3 POPULATION, SAMPLING TECHNIQUE AND SAMPLE OF THE STUDY

The participants considered in the study involved students and lecturers in ATU. ATU offers part-time (evening school) and full-time (regular school) sessions for Higher National Diploma (HND) and Degree (Bachelor of Technology) programmes. Accra Technical University is divided into three (3) main schools/faculties. The population that was considered were full-time lecturers and students in the School of Applied Sciences and Arts (SASA). The full-time category of lecturers and students were considered because they stay longer on campus and they form the majority of the population size that uses ATU’s resources.

## 3.4 DATA COLLECTION AND ANALYSIS

Samples of students and lecturers were conveniently sampled from SASA. The target population that was initially considered were full-time Higher National Diploma (HND) students form three different academic departments namely, SLT-Science Laboratory Technology (60 students, representing 31.8%, from a population size of 100), FDT-Fashion, Design and Textiles (40 students, representing 21%, from a population size of 80), HCIM-Hotel Catering and Institutional Management (40 students, representing 21%, from a population size of 70), CPS-Computer Science (30 students representing 15.7%, from a population size of 70) and MS-Mathematics and Statistics (20 students, representing 10.5%, from a population size of 30). This resulted in a total target population of 350 students (*N* = 350) and a sample size (*n* = 190). Two hundred (200) questionnaires were administered to students and seventeen (15) questionnaires were administered to lecturers. We received ninety (190) questionnaires from the students representing 95% response rate and twelve (14) questionnaires from lecturers representing 93.3% response rate. These response rates showed that we received enough questionnaires for data analysis.

In order to ensure the reliability and validity of our sample size for students we utilized a standard formula/equation shown in (1) below from Kothari (2004) as follows:

 (1)

where *n* = Sample Size, *Z* = Confidence Level, *p* = Probability of Success, *q* = 1-*p*, *N* = Population and e = Level of Precision. We therefore computed our estimated sample size (*n*) using equation (1). In our computation for *n*, we employed the following in (1), *Z* = 1.96, *p* = 5% (0.05), *q* = 1-0.05 = 0.95, *N* = 350 and e = 0.02. This computation is shown in equation (2) below.

 (2)

The result of equation (2) shows the computation our estimated sample size as 198.35. However, 8 questionnaires that were incompletely answered had to be removed from the 198 questionnaires received which enabled us to use the remaining 190 as the sample size shown in Table 3.1 for effective data analysis.

Additionally, in relation to lecturers, the distribution of the respondents over the various departments in SASA are as follows: SLT-Science Laboratory Technology (2 lecturers plus Head of Department, representing 21.4%), FDT-Fashion, Design and Textiles (2 lecturers plus Head of Department, representing 21.4%), HCIM-Hotel Catering and Institutional Management (2 lecturers plus Head of Department, representing 21.4%), CPS-Computer Science (2 lecturers plus Head of Department, representing 21.4%) and MS-Mathematics and Statistics (1 lecturer plus Head of Department, representing 14.3%). In all, one hundred and ninety (190) students and fourteen (14) lecturers were considered for the study. Statistical Package for Social Sciences (SPSS) was utilized to analyze the quantitative data received. Results of the study are presented in descriptive statistics, and frequencies and percentages below.

Table 3.1: Profile of Respondents

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variable |  | Students | |  |  | Lecturers |  |
|  | **Category** | **N** | | **%** | **Category** | **N** | **%** |
| **Gender** | Male | 103 | | 54.2 | Male | 11 | 78.6 |
|  | Female | 87 | | 45.8 | Female | 3 | 21.4 |
|  | **Total** | **190** | | **100.0** | **Total** | **14** | **100.0** |
|  | 21-25years | 128 | | 67.4 | 36-40years | 5 | 35.7 |
|  | 15-20years | 44 | | 23.2 | 41-45years | 4 | 28.6 |
| **Age Group** | 26-30years | 12 | | 6.3 | 31-35years | 3 | 21.4 |
|  | 31-35years | 5 | | 2.6 | >55years | 2 | 14.2 |
|  | 36-40years | 1 | | 0.5 |  |  |  |
|  | **Total** | **190** | | **100.0** | **Total** | **14** | **100.0** |
|  | WASSCE | 159 | | 83.7 | PhD | 6 | 42.9 |
| **Highest Qualification** | Other | 20 | | 10.5 | MSc | 5 | 35.7 |
| SSCE | 11 | | 5.8 | MPhil | 3 | 21.4 |
|  | **Total** | | **190** | **100.0** | **Total** | **14** | **100.0** |
| **Department** | SLT | | 60 | 31.8% | SLT | 3 | 21.4 |
| FDT | | 40 | 21% | FDT | 3 | 21.4 |
| HCIM | | 40 | 21% | HCIM | 3 | 21.4 |
| CPS | | 30 | 15.7% | CPS | 3 | 21.4 |
| MS | | 20 | 10.5% | MS | 2 | 14.4 |
|  | **Total** | | **190** | **100.0** | **Total** | **14** | **100.0** |

## 3.5 RESULTS OF THE STUDY

### 3.5.1 Demography and Profile of Respondents Results of the Study

With reference to students, 54.2% (103) were males and the remaining 45.8% (87) were females (Table 3.1). Furthermore, the results in Table 3.1 show that, majority of the student respondents in this study were within the age group of 21-25 as they formed about 67.4% (128) of the total number of students engaged followed by 15-20 years representing 23.3%. Table 3.1 also illustrates that about 3.1% representing 6 students were more than 31 years of age. In terms of qualification of students, majority (159) of them were had WASSCE qualification representing 83.7%. Students with SSCE qualification constituted approximately 11 (5.8%). Furthermore, 20 students used other forms of qualifications to enter into the university which represented 10.5%. In relation to the respondents from lecturers, 11 of them were males representing 78.6% and the remaining 3 were females representing 21.4%. Additionally, 5 lecturers were within the age group of 36-40 (35.7%), 3 lecturers were within the age group of 41-45 (21.4%) and 2 lecturers were more than 55 years of age (14.2%). In terms of lecturer qualifications, 6 lecturers hold PhDs (42.9%), 5 lecturers hold MSc Degrees (35.7%) and 3 lecturers hold MPhil Degrees (21.4%) in various areas of specialization.

Table 3.2: Technology Acceptance by Students

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Category | N | % |
|  | Face-to face lecture room | 177 | 93.2 |
| **Educational Mode Experience at ATU?** | Electronic learning | 10 | 5.3 |
|  | Mobile learning | 3 | 1.6 |
|  | **Total** | **190** | **100** |
|  | Yes | 149 | 78.4 |
| **Do Your Lecturers Use Technology to Teach?** | No | 40 | 21.1 |
|  | Don't know | 1 | 0.5 |
|  | **Total** | **190** | **100** |
|  | LCD projector | 132 | 69.5 |
|  | None | 51 | 26.8 |
| **Technologies use for Learning** | Electronic learning management system | 5 | 2.6 |
|  | Mobile device learning platform | 2 | 1.1 |
|  | **Total** | **190** | **100** |
|  | 1year | 135 | 71.1 |
| **How Long Have you Used This Technology?** | 2-3years | 55 | 28.9 |
|  | **Total** | **190** | **100** |
|  | Positive/ I appreciate Technology | 179 | 94.2 |
| **Your General Attitude Toward the use of Technology to Learn** | Negative / I don’t appreciate technology | 11 | 5.8 |
|  | **Total** | **190** | **100** |

### 3.5.2 Technology Acceptance of Lecturers and Students in ATU

The results in the Table 3.2 below displays frequency analysis of the technology acceptance tools for the students. Lecturers and students involved in the study were asked series of questions and their responses are depicted in Tables 3.2 and 3.3. Results in Table 3.2 show that, 93.2% representing 177 students confirmed that, their mode of teaching and learning at the ATU is mainly face to face lecture room (F2F). Ten (10) student respondents (5.3%) affirmed that, some lecturers occasionally use electronic learning approach in lecturing whereas, the remaining 3 students (1.6%) stated that, that some lecturers use mobile learning in the delivery of their lecturers. Furthermore, 149 students (78.4%) stated that, their lecturers use technology in facilitating their courses in the lecture hall. However, 40 students (21.1%) stated that there is no usage of technology by lecturers in facilitating their lectures and 1 student (0.5%) did not know whether, there is the usage of technology in teaching by their lecturers.

The results in Table 3.2 also shows that, 69.5% representing 132 students stated that their lecturers use LCD Projector in teaching them in lecture halls. In the same category, 51 students (26.8%) stated that none of their lectures use any form of technology in teaching them. Additionally, 7 students representing 3.7%, stated that e-learning systems and mobile device learning platform usage was present in ATU. This is a clear/vivid indication that such systems are not well applied by the lectures in ATU. A view of Table 3.2 shows that majority of the student respondents stated that, the usage of technology in teaching and learning by their lectures has been in place for one (1) year which constituted 71.1% of the total responses. In the same category, 55 students (28.9%) stated that their lecturers have used such technologies for 2-3 years.

Table 3.3: Technology Acceptance by Lecturers

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Category | N | % |
| **Educational Mode you Apply to Teach?** | Face-To Face Lecture Room | 14 | 100 |
|  | **Total** | **14** | **100** |
| **Does ATU Employ Technology as a Mode of Teaching?** | No | 9 | 64.3 |
| Yes | 5 | 35.7 |
|  | **Total** | **14** | **100** |
| **Is it Compulsory for Lecturers to use Technology**  **for Teaching?** | No | 12 | 85.7 |
| Yes | 1 | 7.1 |
| I Don't Know | 1 | 7.1 |
|  | **Total** | **14** | **100** |
| **Types of Technologies used by Lecturers?** | LCD Projector | 14 | 100 |
|  | **Total** | **14** | **100** |
|  | 1-5years | 11 | 78.6 |
| **For how Long Have you Used Technology to Teach?** | 6-10years | 2 | 14.3 |
|  | 11-15years | 1 | 7.1 |
|  | **Total** | **14** | **100** |
| **Your General Attitude Toward the use of Technology to Teach?** | Positive/ I Appreciate Technology | 14 | 100 |
|  | **Total** | **14** | **100** |

Considering the attitudes of the students towards the use of technology to learn, 179 students (94.2%) affirmed that, it is Positive and they would appreciate the usage of technology in teaching and learning whereas the remaining 11 (5.8%) had a Negative view about the usage of technology in teaching and learning and consequently would not appreciate technology usage for learning. One the side of the lecturers, they stated that, the mode of teaching and learning is the use of the F2F approach. The lecturers were asked whether the university employs technology as mode of teaching, and the responses indicate that, 64.3% of them representing 9 were on the view that, there is no such technique and the remaining 35.7% (5) made it known that, there is the usage of technology in teaching and learning at the university. Though the lectures either agreed or disagreed over the usage of technology as a mode of teaching at the university, majority (12) representing 85.7% stated that, it is not compulsory for lecturers to adopt such technique in the university.

The results shown in Table 3.3 validates that, all the 14 lecturers use the LCD projector as a type of technology in teaching. Some of the lecturers stated that, they have used this technology for about 5 years as indicated by 78.6% (11) of the lecturers. In relation to the same LCD projector usage, 3 lectures stated that, they have used this technology for the over 6 years now.

One of the ways to know whether lectures would like to use technologies in teaching in ATU was to ask them, their general attitude toward the use of technology in teaching and the responses provided by lectures was absolute 100% as they all stated that, it is positive and they would appreciate technology usage if such systems are in place to enhance teaching and learning at the ATU.

In summary, the results regarding technological views of students and lecturers in terms of teaching and learning, which is depicted in Tables 3.2 and 3.3 validate that both students and lectures would appreciate the usage of technology to facilitate teaching and learning if systems such as e-learning are available. We are currently in an era that calls for modern ways of teaching and learning, lectures must therefore be equipped very well to use technology to impart knowledge to their students and students must also be prepared to adopt such technologies to enhance their learning abilities so as to be effective and efficient in their areas of study.

### 3.5.3 Perceived Ease of Use (PEOU) of Technology by Students and Lectures

The results in the Table 3.4 shows the responses provided by the respondents when they were asked to state how they perceived ease of technology usage (*PEOU*) in teaching and learning. From the analysis of the data gathered, 163 students (85.8%) stated that the use of technology could minimize their effort in learning. The remaining 27 students (14.2%) stated that, when lecturers use technology in teaching them, they appreciate such lectures in most cases, more than when technology is not used. Technology has come to stay and as a matter of fact, there is the need to embrace its usage. The respondents were asked the extent at which technology has improved their academic performance and the results show that about 181 of them (95.2%) could attest to the fact that, technology has improved their academic performance.

Table 3.4: Students- PEOU of Technology

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Category | N | % |
| **Can you use Technology With Minimal Effort?** | Yes | 163 | 85.8 |
| No | 27 | 14.2 |
|  | **Total** | **190** | **100** |
| **Extent to Which Technology Could Improve Your Performance?** | Strongly Agree | 130 | 68.4 |
| Agree | 51 | 26.8 |
| Disagree | 4 | 2.1 |
| Strongly Disagree | 3 | 1.6 |
|  | Neutral | 2 | 1.1 |
|  | **Total** | **190** | **100** |
| **Extent at Which Technology Could Free You From Some Effort in Learning Activities?** | Strongly Agree | 104 | 54.7 |
| Agree | 73 | 38.4 |
| Disagree | 8 | 4.2 |
| Strongly Disagree | 3 | 1.6 |
| Neutral | 2 | 1.1 |
|  | **Total** | **190** | **100** |
| **Do any of Your Colleague Students use Technology to Learn?** | Yes | 143 | 75.3 |
| Don’t Know | 27 | 14.2 |
| No | 20 | 10.5 |
|  | **Total** | **190** | **100** |

One of the advantages of the usage of technology is to off load some of the activities that one has to perform manually, the results obtained indicate that, technology could free students from stress especially in their learning processes as this category was indicated by 177 students (93.1%). Furthermore, student respondents were on the view that, their colleagues use technology in enhancing their learning. This information was provided by 143 students (75.3%). Twenty-seven (27) students representing 14.2% also stated that they don’t know whether their colleagues use technology in learning. The remaining 20 students (10.5%) stated that their colleagues are not using any form of technology in learning.

In relation to lecturer respondents as shown in Table 3.5, 13 lecturers (92.9%) confirmed that technology usage could minimize their effort regarding the areas they teach in lecture halls. This is an indication that the introduction of technologies in teaching could enhance the work load of the lectures, especially in preparation of lecture notes, ability to be at home and have your lectures and other benefit of using such technologies. The results in Table 3.5 clearly shows that all lectures strongly agreed that technology could improve their performance as lectures in ATU which could free them from some effort of teaching activities as indicated by all the lectures. Ten (10) of the lecturers representing 71.4% stated that, some of their colleague lectures in ATU use technology to impact knowledge to students. However, the four (4) remaining lecturers (21.4%) asserted that their colleague lectures do not use any means of technology to teach in lecture halls.

Table 3.5: Lecturers- PEOU of Technology

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Category | N | % |
| **Can you use Technology with Minimal Effort?** | Yes | 13 | 92.9 |
| No | 1 | 7.1 |
|  | **Total** | **14** | **100** |
|  |  |  |  |
| **Extent to Which Technology Could Improve Your Performance?** | Strongly Agree | 14 | 100 |
|  | **Total** | **14** | **100** |
| **Extent at Which Technology Could Free you From Some Effort in Teaching Activities?** | Yes | 14 | 100 |
|  | **Total** | **14** | **100** |
| **Do any of Your Colleague Lecturers use Technology to Teach?** | Yes | 10 | 71.4 |
| No | 4 | 28.6 |
|  | **Total** | **14** | **100** |

### 

### 3.5.4 Perceived Usefulness (PU) of Technology by Students and Lectures in ATU as a Medium for Teaching and Learning

Data analysis involving responses of students and lecturers regarding the *PU* and acceptability of technology as a medium for teaching and learning was also conducted. Table 3.6 illustrates the results pertaining to technology knowledge and acceptance by students and lecturers in ATU. A summary of results in Table 3.6 depict that both students and lecturers understand and know the importance of technology in current education trends. As a consequence, most of the students and lecturers were willing to accept technology, thereby paving way for an e-learning system.

## 3.6 INFERENTIAL STATISTICS

The data analysis also included some inferential statistics computations which involved hypothesis testing of students and lecturers. Results of these tests are illustrated in Tables 3.7 and 3.8 below.

Table 3.6: PU of Technology by Students and Lecturers in ATU

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Student | | | Lecturer | | |
| **Variable** | **Category** | **N** | **%** | **Category** | **N** | **%** |
| **Does your Colleagues Influence you to Also use Technology to Learn/ Teach?** | Yes | 146 | 76.8 | **Yes** | **14** | **100** |
| No | 44 | 23.2 | **No** | **0** | **0** |
|  | **Total** | **190** | **100** | **Total** | **14** | **100** |
| **Would you Make Effort to Accept and**  **Adopt Technology if Introduced?** | Yes | 182 | 95.8 | **Yes** | **14** | **100** |
| No | 8 | 4.2 | **No** | **0** | **0** |
|  | **Total** | **190** | **100** | **Total** | **14** | **100** |
| **Have you Heard of ICT for Education?** | Yes | 171 | 90 | Yes | 13 | 92.9 |
| No | 19 | 10 | No | 1 | 7.1 |
|  | **Total** | **190** | **100** | **Total** | **14** | **100** |
| **Have you Ever Heard of the Term E-learning?** | Yes | 171 | 90 | Yes | 13 | 92.9 |
| No | 19 | 10 | No | 1 | 7.1 |
|  | **Total** | **190** | **100** | **Total** | **14** | **100** |
| **Would you Accept E-Learning as a Teaching/Learning Methodology?** | Yes | 163 | 85.8 | Yes | 13 | 92.9 |
| No | 27 | 14.2 | No | 1 | 7.1 |
|  | **Total** | **190** | **100** | **Total** | **14** | **100** |
| **Would you like to accept technology and be introduced to E-learning as part of teaching /learning processes?** | Yes | 137 | 72.1 | Yes | 14 | 100 |
| No | 53 | 27.9 | No | 0 | 0 |
|  | **Total** | **190** | **100** | **Total** | **14** | **100** |

### 

### 3.6.1 Hypotheses Testing (Student)

* **Null (HO)**: There is significant difference between students who said they have heard of e-learning and are willing to accept it as a teaching methodology at the ATU.
* **Alternative (HA)**: There is no significant difference between students who said they have heard of e-learning and are willing to accept it as a teaching methodology at the ATU.

The results in the contingency Table 3.7 below depicts the association between the whether respondents (students) have heard of e-learning and if they would accept it as a teaching methodology when introduced. The results show that about 90% representing 171 students have heard of the term e-learning as against 10% representing 19 students stating that they have not heard of the term e-learning. Among those who said they heard of the e-learning, 83.7% (154) asserted that, they would accept the e-learning methodology if it is introduced by ATU and among those who said they have not heard of the term e-learning, 4.7% representing 9 students confirmed that, though they have not heard of it, when it is introduced, they would embrace it since it would enhance teaching and learning.

In all about 85.8% representing 163 students were eager to accept such technological ways of teaching and learning. As a result, to ascertain whether the relation between the data set in the contingency table is not due to change, a chi-square analysis was performed. At a *p-value* of 0.05, and with a df of 1.000, the result of the chi-square X21.00 = 25.560. Given that the critical value from the chi-square table at df of 1.000 and probability of 0.05 is 0.000. The results show that, there is a statistical and significant difference between the levels of the responses provided by the students involving the two variables as indicted in Table 3.7.

Table 3.7: Contingency Table for Students

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | Would you Accept E-Learning as a Teaching Methodology by Your Lecturers? | | Total |
| **Yes** | **No** |
| **Have you Ever Heard of the Term**  **E-learning?** | **Yes** | 154 | 17 | 171 |
| **No** | 9 | 10 | 19 |
| **Total** | | 163 | 27 | 190 |
|  |  |  |
| **Chi-square () value** | | *25.560* |  |  |
| **Df** | | *1.000* |  |  |
| **p-value** | | *0.000* |  |  |
| **Correlation ()** | | *0.370* |  |  |

Correlation analyses using the Pearson (*p*) correlation was performed to determine the extent of the association between variables and the results shows that there is about 37% association between the two categorical variables at 5% significance level. This means that students who were engaged in the study are ready for such technological advancement as a means of enhancing teaching and learning.

Table 3.8: Contingency Table for Lecturers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | Would you Accept E-Learning as a Teaching Methodology? | | Total |
| Yes | No |
| **Have you Ever Heard of the Term E-learning?** | Yes | 13 | 1 | 14 |
| **Total** | | 13 | 1 | 14 |

### 3.6.2 Hypotheses Testing (Lecturers)

* **Null (HO)**: There is significant difference between lecturers who said they have heard of e-learning and are willing to accept it as a teaching methodology at the ATU.
* **Alternative (HA)**: There is no significant difference between lecturers who said they have heard of e-learning and are willing to accept it as a teaching methodology at the ATU.

In relation to lecturers, all 14 lecturers stated that they have heard of the term e-learning and among those who have heard of it, 92.9% (13) stated that, they would accept as medium to enhance their teaching activities in ATU. Though the number of lectures involved are not many, there is an indication that lecturers in the ATU would welcome the concept of e-learning as a teaching methodology when introduced. Based on the results as shown in Table 3.8, there is evidence of total acceptability by the lecturers engaged in the study.

# CHAPTER FOUR

# **PROPOSED SYSTEM AND IMPLEMENTATION**

## 4.0 INTRODUCTION

An E-learning system is a web-based system by which electronic education can be carried out over the Internet or Intranet. This chapter describes the setup of the proposed system.

The following topics are discussed in detail in this chapter:

* Software and framework used.
* System architecture.
* Different modules/tools developed in this system

## 4.1 SYSTEM IMPLEMENTATION

This new system has been carefully tested and the result has tallied with expected output. Under this view, both systems are run parallel to ensure that the needs of the institution are achieved. The program used in designing the new system is on the Java-based, client/server type software model. The system is implemented using Java/J2EE technologies. It includes windows as the operating system, MySQL as the backend.

### 4.1.1 Java/J2ee

Java is an object-oriented programming language (OOPs). With Java complete applications can be built, featuring accelerated 3D graphics and other multimedia features to strong cryptography and network connectivity. On the web, Java can be used on the client side to create applets and on the server side to create dynamic web pages using Servlets and Java Server Pages (JSP).

### 4.1.2 Bea Web Logic Server

It is Java application server. It is a light weight development server. Fast cycle times with rapid develop/deploy/debug cycles.

### 4.1.3 MySQL

The database is designed and implemented using MySQL v4.1. MySQL is free and scalable.

### 4.1.4 Bootstrap

Is the most popular HTML, CSS and JavaScript framework for developing responsive, mobile-first website.

### 4.1.5 Php

Is a server scripting language and a powerful tool for making dynamic and interactive web pages. PHP is a widely-used, free, and efficient alternative to competitors such as Microsoft’s ASP.

### 4.1.6 Sublime Text 3

It is a sophisticated text editor foe code, markup and prose

### 4.1.7 Cascading Style Sheet

Cascading style sheet is a style sheets language used to describe the presentation of a document written in a markup language like HTML.

## 4.2 DATABASE IMPLEMENTATION

The following tables represent changes in the application database that are intended to meet the requirements of the E Learning System. Each field with a special use will be identified by type of use. Possible types are:

* UK – Unique Key for table
* FK – Foreign Key joining the information to another table

The following rules will apply to all tables and columns created, unless otherwise stated for a specific column;

* All columns will be created to require values in the column. Some columns will be populated with NULL values.
* All numeric columns will be filled with 0 or 0.0
* All alphanumeric columns with the exception of indicators will be filled with spaces.
* All indicator columns will have a default value of ‘Y’ (Yes).
* All alphanumeric columns will be defined as character columns (char) rather than variable character columns (varchar).

## **OVERVIEW OF DATABASE TABLES**

The following table presents the database tables that will be affected by this distance learning system.

Table 4.1: Activity Table

|  |  |  |
| --- | --- | --- |
| **TABLE NAME** | **Current Status** | **Description** |
| Activity log | New | This table contains all the actions of the admin |
| Answer | New | This table contains all the answers of the quiz |
| Assignment | New | This table contains all the assignments uploaded |
| Class | New | This table contains the name of the classes |
| Class quiz | New | This table contains the quiz given to the class and the time frame |
| Class\_subject\_overview | New | This table contains information about the subject for the class |
| Content | New | This table contains the comments |
| Department | New | This contains the list of departments |
| Event | New | This table contains the events |
| Files | New | This table contains the uploaded files by the admin |
| Message | New | This table contains the messages |
| Message sent | New | This table contain the sent messages |
| Notification | New | This table contain notifications |
| Notification read | New | This table contains the read notifications |
| Notification\_read\_teacher | New | This table contains the notification read by the teacher |
| Question type | New | This contains the type of questions |
| Quiz | New | This table contains the type of Quiz |
| Quiz Question | New | This table contains the type quiz questions |
| School year | New | This table contains the school year |
| Student | New | This table contains the students in the class |
| Student assignment | New | This table contains the assignments of the students |
| Student backpack | New | This table contains the students backpack |
| Student\_class\_quiz | New | This table contains the class quiz of the student |
| Subject | New | This table contains the subject of the students |
| Teacher | New | This table contains the teachers |
| Teacher class | New | This table contains the teachers class |
| Teacher backpack | New | This table contains the teachers backpack |
| Teacher\_class\_announcemnt | New | This table contains the announcement by the teacher to the class |
| Teacher\_class\_Students | New | This table contains the students in the class of the teacher |
| Teacher\_notification | New | This table contains the notification by the teacher to the class |
| Teacher\_shared | New | This table contains the shared files by the teacher |
| Users | New | This table contains the names of the administrators |
| User log | New | This table contains the administrators logged in and out |

## 4.4 ARCHITECTURE OF THE SYSTEM

This system architecture uses object-design principles and encompasses Java web application running on BEA Web Logic server. In the approach of building this system, J2EE is adapted as a fundamental platform. J2EE is defined by Sun Microsystems Company to enable solutions for developing, deploying and managing multi-tier, server-centric applications. J2EE provides e-business oriented, and multi-tier application architecture that supports web-based applications. This section explains the architecture of the software technologies used to build the system and the architecture of the present system with design patterns.

A client makes an HTTP connection through URL. Web Logic Server handles the request sent for static HTML pages, Servlets and JSPs. Servlets and JSPs are executed on Web Logic Server. The browser requests access the web logic server directly. Web Logic server connects to the backend services on behalf of client request. The connection to the backend is done through the Java Database Connectivity (JDBC) connections.

* The **client tier** consists of web browser. It is a program used to build highly interactive graphical user interfaces with JSP pages. The programs in client tier can access web logic Server services using standard J2EE APIs .
* The **middle tier** contains web logic Server. The Web Logic Server distributes client requests and connects to the back-end using JDBC calls.
* The **backend tier** contains a database system. The backend tier services are accessible to the client browser through Web Logic Server. A JDBC connection pool, defined in Web Logic Server, opens predefined database connections.

## 4.5 PRESENT SYSTEM FRAMEWORK

This system is implemented using various design patterns of the J2EE industry. The framework of this system provides scalable and feasible architectural constructs so as to plug in the appropriate business code for new tools. The application creates a standard for development. It provides supports for users’ security with composite user roles and security constraints. This section explains the design patterns used and different components of the application architecture.

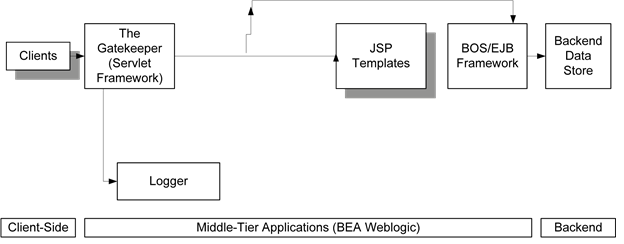
### 4.5.1 Use of Java/OO Design Patterns

Design patterns are the backbone of any well-defined architecture, and more importantly, of an application framework. The use of accepted design patterns ensures the highest level of reuse for each of the different facets comprising the system framework. Rather than attempting to rediscover these patterns, the framework implements them, and this system includes considerable effort to ensure the cohesiveness among the patterns.

### 4.5.2 Detailed Component View

This online application consists of seven (7) major components: the Servlet, Lookup, Security, BOS, Reusable Tag libraries, JSP and the Logger. The architecture uses object-design principles as well as the Model-View-Controller architecture.

Design and implementation helps application developers create and assemble the online applications more easily by providing libraries of UI and non-UI components that work together and it accomplishes an application’s fundamental tasks, i.e., the frameworks allow the developers focusing on the business logic rather than developing the code to address technical issues

Figure 4.2: Illustrates the High-Level Architecture of the System

### 4.5.3 The Clients

This is an Internet application, and therefore the application is optimized to run on Internet like Explorer v5.5 and up only.

### 4.5.4 Servlet Framework – The Controller (Façade Pattern)

Using a single servlet as the entry point to business functionality, this “sub-framework” combines the use of JSP and Java code, default security semantics, and an object cache to provide for the handling and routing of all presentation logic as well as business logic invocation. The framework is a Servlet-based framework. It serves as a single point of entry in this application and it controls the work-flow of the application by facilitating the use of a group customized application façades to handle specific business logic handling and page redirection and/or forwarding followingthe data retrieval. The framework is featured with logging capabilities.

### 4.5.5 JSP Templates – Composite Design Patterns

Use composite views that are composed of multiple sub-views. Each component of the JSP template may be included dynamically into the whole. The layout of the page may be managed independently of the content. The Framework provides sets of JSP Tag (using JSP’s Custom Tag extension libraries) to allow the creation of JSP templates. The JSP Tag will interpret the input and call the framework in order to achieve a particular goal. In addition, the JSP will be using a set of standardized tags, as mentioned, for server-side processing in order to accelerate development, e.g. forms processing, use of resource bundles, search/results display, field validations, etc.

### 4.5.6 BOS (Business Object Service )

BOS encapsulates all access to a data source. This access includes connection management, as well as capabilities to store and retrieve data. The BOS (Business Object Service) provides a layer to encapsulate the data storage and retrieval functionality. They are the bridges between the customized application facade and the back-end data store.

* The BOS layer will handle the transactions to the database via a series of DAO (Data Access Objects).
* Within the BOS framework, there are two kind of objects:
* DAOs that expose methods to retrieve and manipulate records from the database; Value objects that transport data between the tiers.
* Each DAO class implements basic data retrieval and manipulation methods. These methods make the actual JDBC calls. In addition, each DAO class has its own specific methods, which populate and assemble the corresponding value objects, perform specific searches etc.

### 4.5.7 Value Objects – Value/Caching Pattern

* This pattern encapsulates business data and provides access methods to the data. A single method call will send or receive such an object in an effort to obtain or provide business data.
* The Value Objects are JavaBeans following the value object pattern. They are serializable and their purpose is to transport data from the BOS layer to the customized application façade.
* Typically, a value object maps the underlying relational table from the database with both getter and setter methods. Child objects from the relationships are implemented as Collections in the parent value object.
* The status of the data in the object is represented by is Updated, is Deleted and is New flags.

### 4.5.8 Logging Service

The Logging Service provides an application with a simple to use, yet flexible and robust mechanism for logging output to multiple destinations. Property driven parameters allows an application to easily modify the semantics of logging without changing any of the applications code.

## 4.6 DATAFLOW DIAGRAM OF THE PROPOSED SYSTEM

Instructor/Student login

Message

Backpack

Class

Notification

My Classmate

Quiz

Class Calendar

Announcement

Assignment

Downloadable Materials

Subject overview

My Progress

Figure 4.1: Use Case Diagram

### **4.6.1 Login Tool**

This tool will validate user/instructor/lecturer credentials. If valid, it allows them to enter into the system else it gives a login fail message.

### **4.6.2** My Class Tool

This tool allows a user with admin role to create/edit/view/delete class details. Only user with admin privilege has access to this tool.

### **4.6.3** Notification Tool

User with instructor create/edit/view/delete notification and student role can view all notification.

### **4.6.4** Message Tool

Through this tool the instructor and students can publish messages to either to the teachers and students. Both students and instructors can create/edit messages. Both the instructors and students can view the messages. In the search page, users can search for any messages and view the details.

### **4.6.5** Backpack Tool

User with instructor view backpack and student role can view all backpack.

### **4.6.6** My Classmate Tool

User with student role can view his/her registered classmate. When the user logs into the system only his/her registered courses can be viewed through this tool.

### **4.6.7** My Progress Tool

Instructors can add grades to the students. Only instructors can create/edit my progress details. Students can only view his/her progress. Through this tool the instructors or student can view any particular assignment and quiz and see his/her grades. Students can view only his/her progress.

### **4.6.8** Subject Overview Tool

Instructors can add an overview of the subject to the students. Only instructors can create/edit the subject overview. Students can only view his/her subject overview.

### **4.6.9 Downloadable** Material Tool

Through this tool instructors can create learning materials to his/her courses. Only instructors can create/edit downloadable material details. Both the instructor and student have permission to view the downloadable material. Through the search page users can search for any particular downloadable and view details. Users can upload any document to the dedicated server. Users can also download any document to their local machine.

#### 4.6.1.0 Assignment Tool

Through this tool instructors can create new assignments. Instructors can add short answer questions, essay questions, multiple choices, true or false or blanks. Only instructors can create/edit assignment details. Students can answer the questions. Both the instructor and student have permission to view the assignment. Through the search page users can search for any particular assignment and view details. Users can upload any document to the dedicated server. Users can also download any document to their local machine.

## 

## 4.7 JAVA USER INTERFACE PROGRAMS

This section describes the high-level technical design of the Java screens that allows users to mold, with certain restrictions, how and what is sent to the application. The screens adjust to the access level of the user restricting or allowing the execution of some actions. Most of the screens have a set of buttons that always perform the same action with the corresponding adjustment related to the task been performed. The standard function of each button is described below:

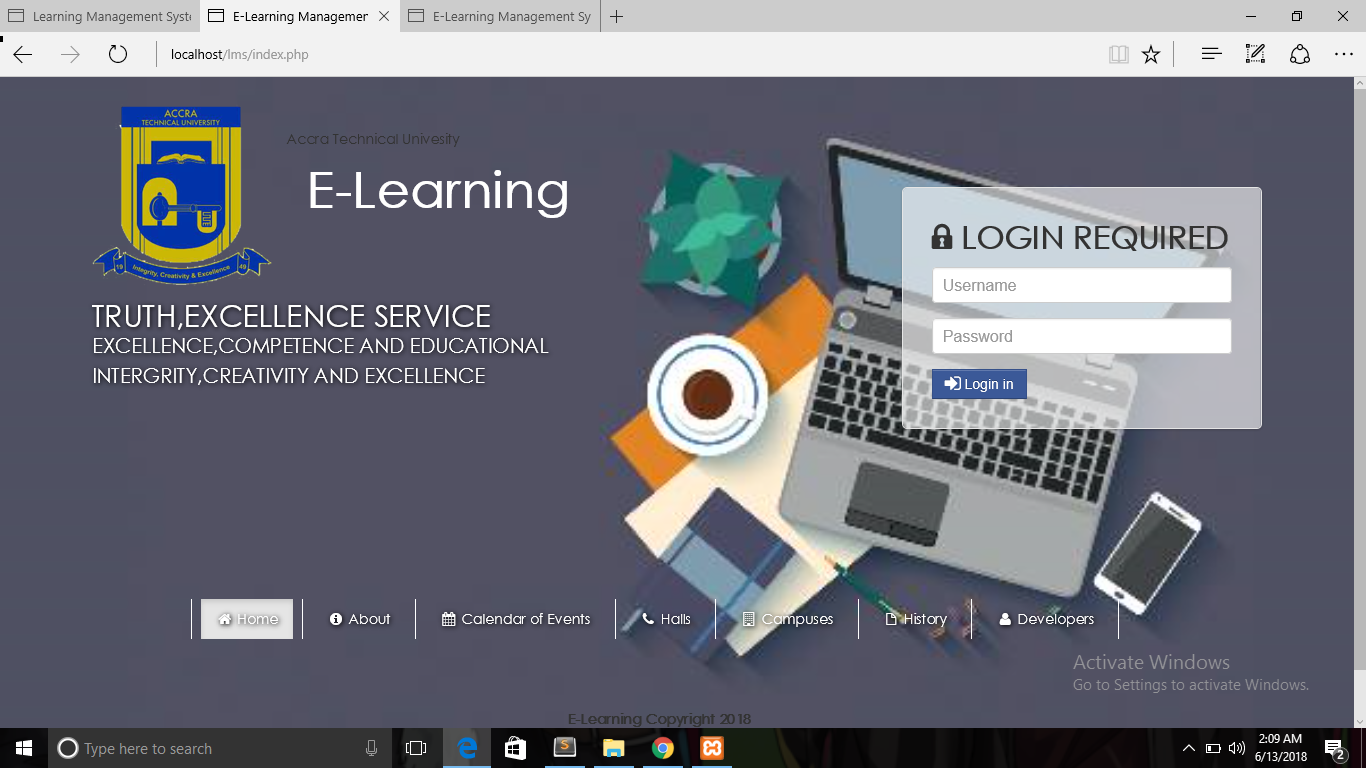


Figure 4.2: Student/Lecturer Login Screen

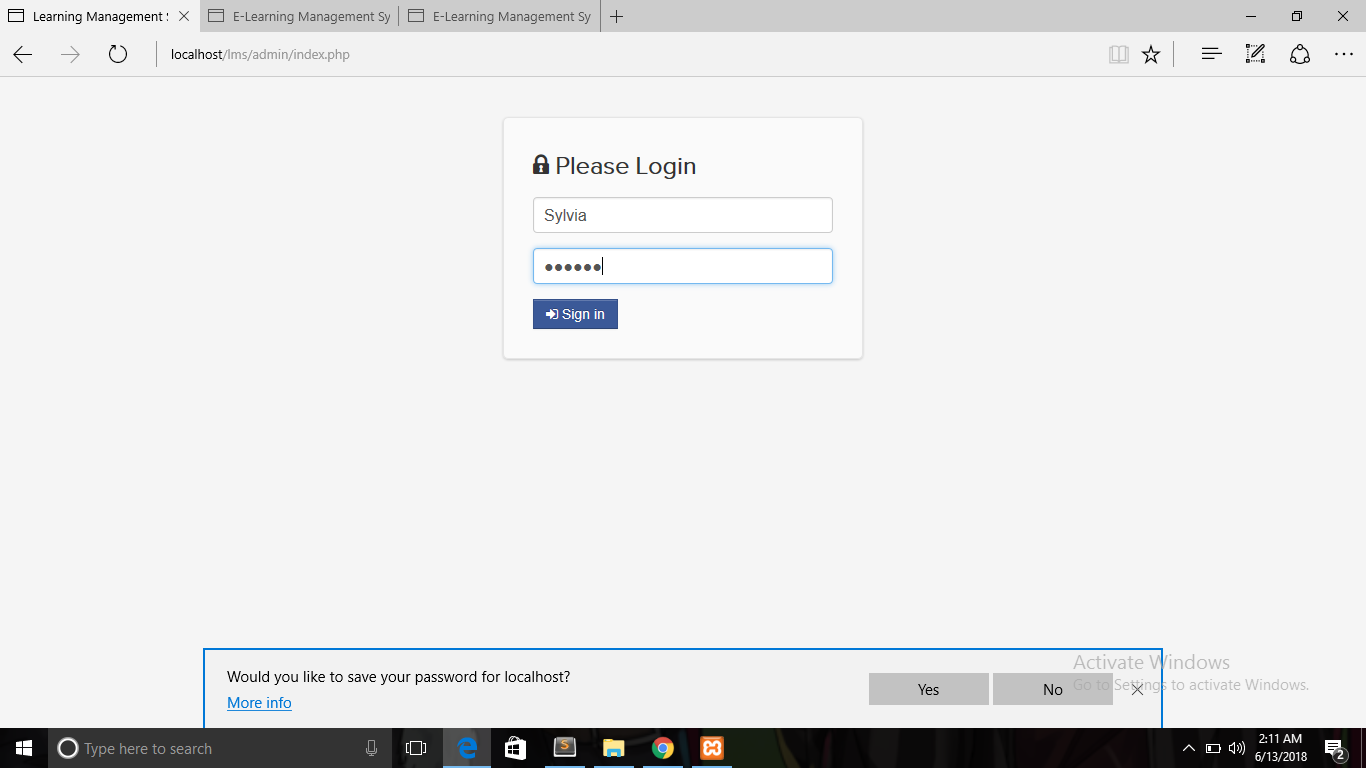
****

Figure 4.3: Administrators Login Screen

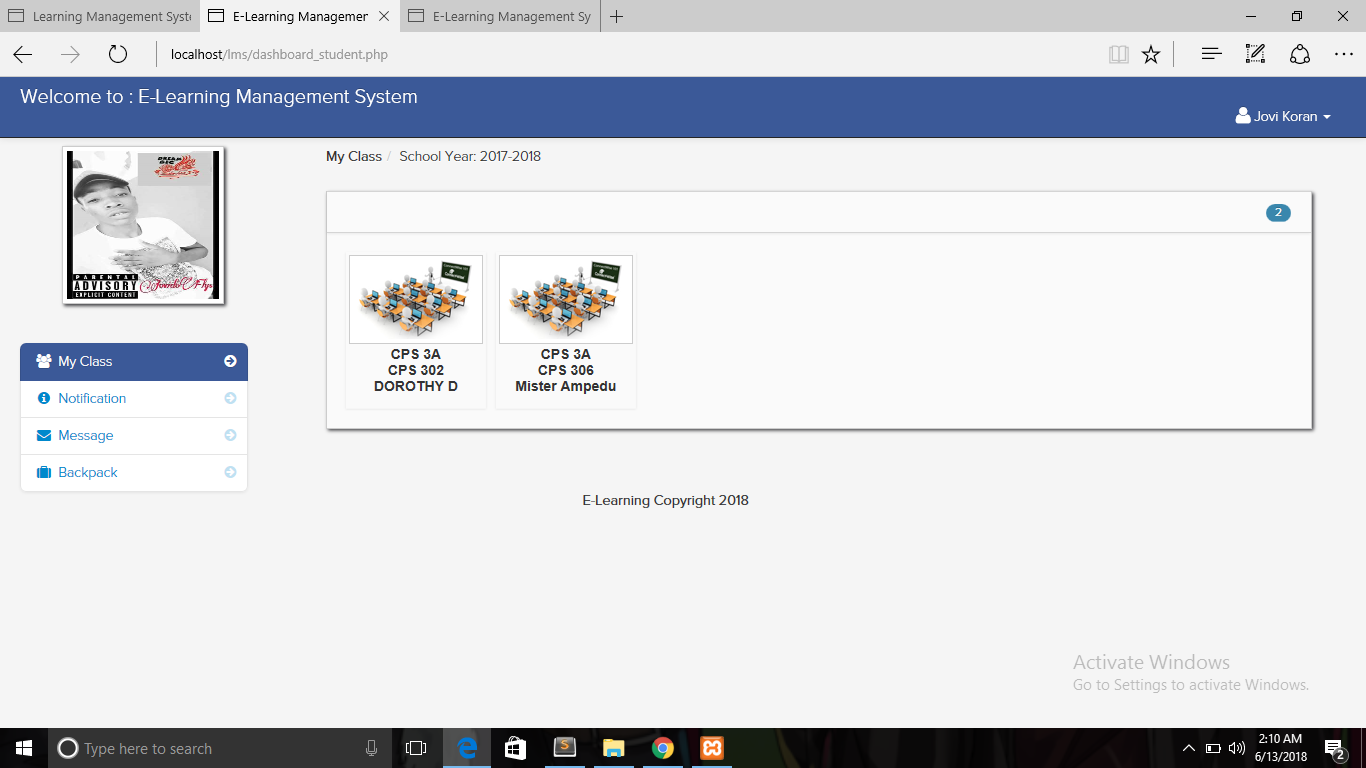


Figure 4.4: My Class

This allows the user to view the class name, course name and with all his classmates

* **Functional Description**

Students gets to this screen by selecting students>my class.

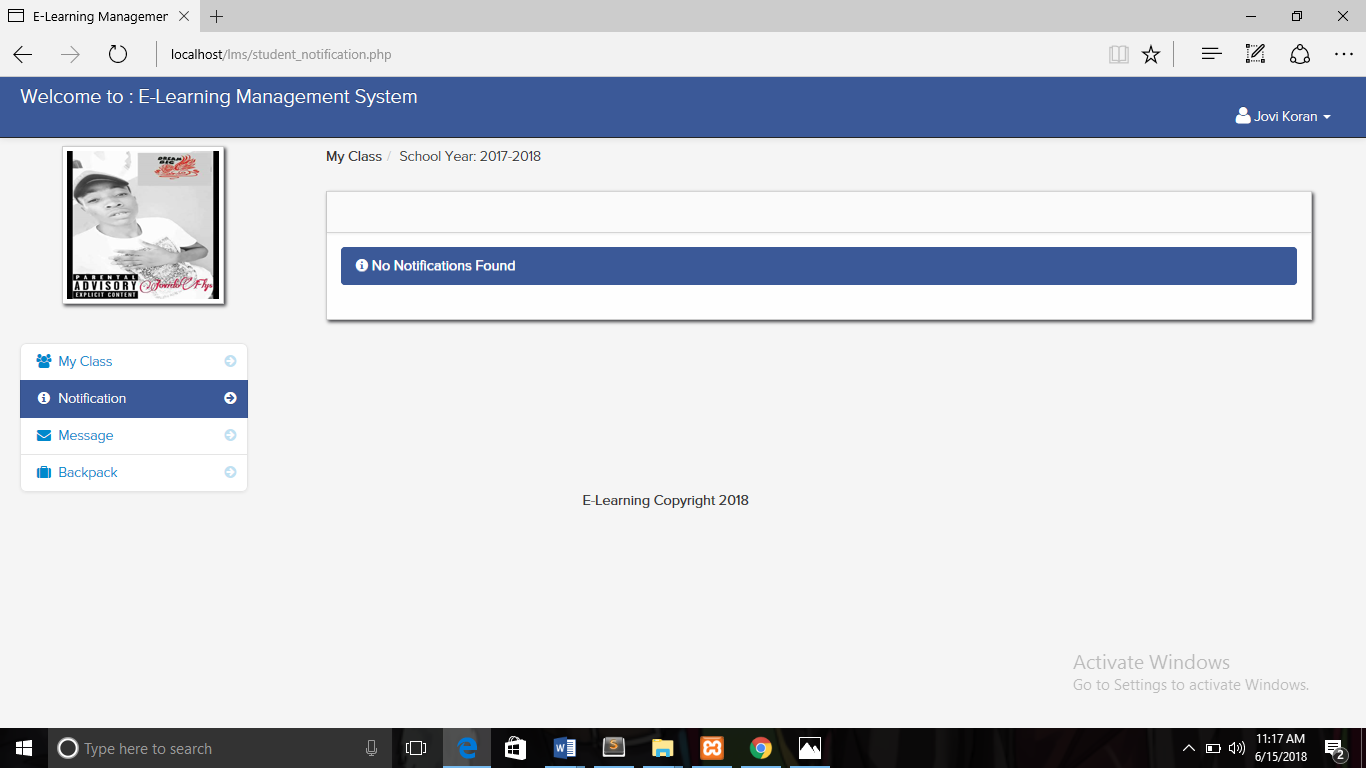


Figure 4.5: Notification

This allows the students to view notifications.

**Functional Description**

Students gets to this screen by selecting students>notification.

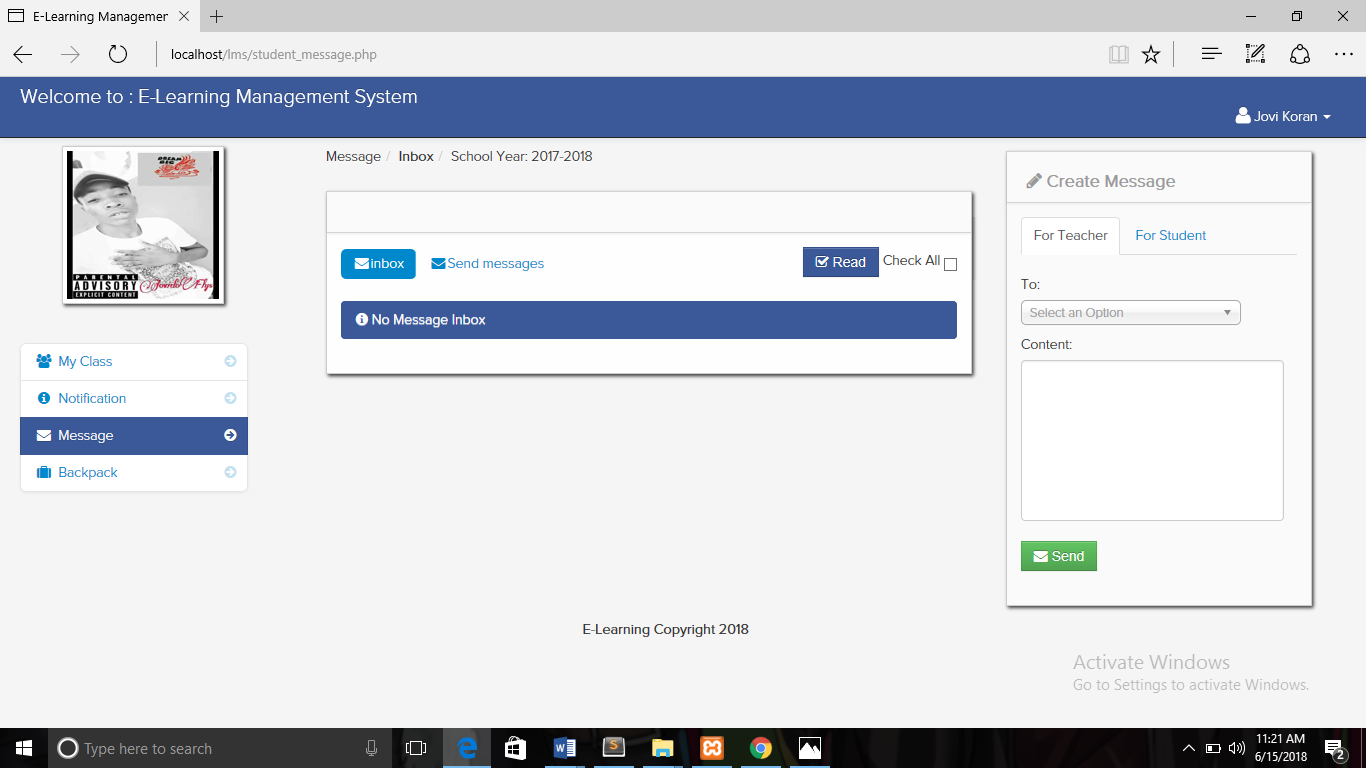


Figure 4.6: Messages

# CHAPTER FIVE

# CONCLUSION AND RECOMMENDATION

## 5.0 INTRODUCTION

The previous chapters presented the introduction to the study, review of literature, research framework, the methodology, study context, analysis and discussion of findings. This research study has explored the nature and determinants of e-learning adoption in Accra Technical University. This concluding chapter presents the summary of the study and presents the contribution to knowledge. The chapter begins by reviewing the research questions as outlined in Chapter one and how the questions were addressed by the study. Following this, there is a discussion on the study‘s contribution to knowledge in terms of application of theory, offering rich insight and drawing specific implications for research and practice

## 5.1 CONCLUSION

The rapid growth and proliferation of ICT in education has enabled the use of technology as a tool for teaching and learning. This proliferation has paved the way for educational institutions to employ other modes of education involving ICT such as e-learning and m-learning. In order to promote and inspire students and lecturers to adopt e-learning in ATU, this research project utilized a quantitative approach (questionnaire) which was developed using components of the TAM-2 framework and administered to one hundred and ninety (190) students and fourteen (14) lecturers in ATU. Results of the study revealed that most of the lecturer and student respondents are willing to embrace technology as part of teaching and learning in ATU. Additionally, the proposed e-learning system is appropriate for incorporating ICT in education with the current F2F education mode in ATU.

A limitation of this research study is the population size in relation to the number of schools in ATU as well as Technical Universities in Ghana. In order to further substantiate the proposed e-learning system in this paper, further research, evaluation and implementation in many other Technical Universities in Ghana is very necessary, vital and relevant. Since this research work is limited to ATU, future work will focus on increasing the population size through the promotion of further research design, amplification and development of a workbook for the proposed e-learning system so that many other tertiary institutions technical universities in Ghana can use it to encourage and motivate their lecturers and students to integrate ICT in education.

## 5.2 RECOMMENDATION

The planning and implementation of an e-learning strategy involves multiple dimensions that need to be taken together for the project to succeed. It is therefore recommended that;

* An exploration of the available ICT infrastructure at ATU is determined and an elaborate plan drawn and implemented to provide and maintain ICT infrastructure at the university.
* Wireless facilities should be extended by ATU to non-residential student areas for them to have access to the intranet facilities offered by ATU to reduce the consumption of bandwidth needed by the e-learning system.
* Educational e-learning workshops should be organized regularly for students and lecturers of ATU to bring awareness about the e-learning system to them.
* An elaborate e-learning policy must be drawn out and used to implement e-learning at ATU.
* A reward system must be developed for lecturers who blend e-learning into their face to face lectures as a way to motivate lecturers to use the e-learning system.
* Adequate and well-trained ICT staff must be employed by the university to augment its existing ICT staff to help implement e-learning at ATU.
* E-learning should be adopted in all Ghanaian universities to augment and highly impact teaching and learning given the ever-increasing enrolment figures of most universities.

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# 

# Appendix a

**RESEARCH QUESTIONNAIRES**

**ACCRA TECHNICAL UNIVERSITY**

**DEPARTMENT OF COMPUTER SCIENCE**

**QUESTIONNAIRE FOR LECTURERS**

**INTRODUCTION**

We are HND final year students from the Department of Computer Science, Accra Technical University, undertaking a research on the topic “**Exploiting the Integration of E-Learning in Technical Education: Story of Accra Technical University (ATU), Ghana**”. Our research seeks to investigate the possibility of proposing and developing and e-learning system for ATU. We therefore need candid answers from you through this questionnaire to enable us answer our research questions and achieve our research. Please note that the information you provide will be ethically and strictly kept confidential and anonymous.

**INSTRUCTIONS**

**Kindly answer the questions below by ticking (√) or cross (X) your appropriate answer. Please do not write your name or any other personal information.**

1. **SECTION A: Demography**
2. **Gender**: Male **[ ]** Female **[ ]**
3. **Age**: 25-30 years **[ ]** 31-35 years **[ ]** 36-40 years **[ ]** 41-45 years **[ ]**  46-50 years **[ ]** 51-55 years **[ ]** Above 55 years **[ ]**
4. **SECTION B: Department and Lecturing/Teaching Information**

Please what is the name of your Department ………...…………….………………………………

Please list at least 3-4 courses you lecture/teach in an academic year………………… ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. What is your highest qualification? MSc **[ ]** MPhil **[ ]** PhD **[ ]**
2. How long have you been teaching in ATU
   1. years **[ ]** 6-10 years **[ ]** 11-15 years **[ ]** 16-20 years **[ ]** Above 20 years **[ ]**
3. Residence: On ATU Campus/Apartments on Campus **[ ]** Off ATU Campus **[ ]**
4. Which educational mode of teaching do you apply teaching activities?

Face-to-Face in the Lecture Room **[ ]** Electronic Learning **[ ]** Mobile Learning **[ ]**

1. **SECTION C: Technology Acceptance as a Tool for Teaching/Lecturing (TAM2)**
2. Is the use of technology employed as a teaching methodology present in ATU?

Yes **[ ]** No **[ ]** I Don’t Know **[ ]**

1. Is it compulsory/mandatory for every lecturer to use technology to teach his/her students in ATU? Yes **[ ]** No **[ ]** I Don’t Know **[ ]**
2. If **Yes** to **7**, which of these types of technologies do you usually use to teach or lecturer your students? Presentation with LCD Projector **[ ]** Electronic Learning Management System (ELMS) **[ ]** Mobile/Smart Device Learning Platform **[ ]**

Others, please specify…………………………………………………………………......

1. For how long have you used technology to teach (experience in using technology to teach)? 1-5 years **[ ]** 6-10 years **[ ]** 11-15 years **[ ]** Above 16 years **[ ]**
2. What is your general attitude towards the use of technology to teach?

Positive/I appreciate technology **[ ]** Negative/I don’t appreciate technology **[ ]**

1. Can you use technology with minimal effort? Yes **[ ]** No **[ ]**
2. To what extent do you believe that using technology in teaching will enhance your job performance? Strongly Agree **[ ]** Agree **[ ]** Disagree **[ ]** Strongly Disagree **[ ]**  Neutral **[ ]**
3. To what extent do you believe that using technology to teach will free you from some efforts in your teaching activities? Strongly Agree **[ ]** Agree **[ ]** Disagree **[ ]** Strongly Disagree **[ ]**  Neutral **[ ]**
4. Do any of your colleague lecturers use technology to teach? Yes **[ ]** No **[ ]** I Don’t Know **[ ]**
5. If **Yes** to **15**, how many of them use technology to teach? ………………………………
6. If **Yes** to **15**, does this influence you to also use technology to teach your students?

Yes **[ ]** No **[ ]**

1. If **No** to **7**, would you make efforts to accept and adopt technology in ATU if it is introduced? Yes **[ ]** No **[ ]**
2. Have you heard of the phrase/term ICT for Education? Yes **[ ]** No **[ ]**
3. Have you ever heard of the term E-Learning? Yes **[ ]** No **[ ]**
4. If **Yes** to **20**, would you accept e-learning as a teaching methodology for your students in ATU? Yes **[ ]** No **[ ]**
5. If **No** to **20**, would you like to accept technology and be introduced to E-Learning as part of your pedagogy and teaching methodology? Yes **[ ]** No **[ ]**

Thank you very much for your attention.

**ACCRA TECHNICAL UNIVERSITY**

**DEPARTMENT OF COMPUTER SCIENCE**

**QUESTIONNAIRE FOR STUDENTS**

**INTRODUCTION**

We are HND final year students from the Department of Computer Science, Accra Technical University, undertaking a research on the topic “**Exploiting the Integration of E-Learning in Technical Education: Story of Accra Technical University (ATU), Ghana**”. Our research seeks to investigate the possibility of proposing and developing and e-learning system for ATU, as a target population. We therefore need candid answers from you through this questionnaire to enable us answer our research questions and achieve our research. Please note that the information you provide will be ethically and strictly kept confidential and anonymous.

**INSTRUCTIONS**

**Kindly answer the questions below by ticking (√) or cross (X) your appropriate answer. Please do not write your name or any other personal information.**

1. **SECTION A: Demography**
2. **Gender**: Male **[ ]** Female **[ ]**
3. **Age**: 15-20 years **[ ]** 21-25 years **[ ]** 26-30 years **[ ]** 31-35- years **[ ]**  36-40 years **[ ]** 41-45 years **[ ]** Above 46 years **[ ]**
4. **SECTION B: Department and Lecturing/Teaching Information**

Please what is the name of your Department ………...…………….………………………………

Please list at least 3-4 courses you have been taught in an academic year………………… ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. What is your highest qualification? SSCE **[ ]** WASSCE **[ ]** Other **[ ]**
2. What is your current HND Level? First Year/Level 100 **[ ]** Second Year/Level 200 **[ ]** Third Year/Level 300 **[ ]**
3. Residence: On ATU Campus/Hostel **[ ]** Off ATU Campus **[ ]**
4. Which educational mode do you undertake/experience in ATU?

Face-to-Face in the Lecture Room **[ ]** Electronic Learning **[ ]** Mobile Learning **[ ]**

1. **SECTION C: Technology Acceptance as a Tool for Learning (TAM2)**
2. Do any of your lecturers use technology to teach you in the lecture room?

Yes **[ ]** No **[ ]** I Don’t Know **[ ]**

1. If **Yes** to **7**, which of these types of technologies do your lecturer(s) use to teach you?

Presentation with LCD Projector **[ ]** Electronic Learning Management System (ELMS) **[ ]** Mobile/Smart Device Learning Platform **[ ]**

Others, please specify…………………………………………………………………......

1. If **Yes** to **7**, for how long have you used technology to learn (experience in using technology to learn)? 1 year **[ ]** 2-3 years **[ ]**
2. What is your general attitude towards the use of technology to learn?

Positive/I appreciate technology **[ ]** Negative/I don’t appreciate technology **[ ]**

1. Can you use technology with minimal effort?Yes **[ ]** No **[ ]**
2. To what extent do you believe that using technology in learning will enhance your academic performance?Strongly Agree **[ ]** Agree **[ ]** Disagree **[ ]** Strongly Disagree **[ ]**  Neutral **[ ]**
3. To what extent do you believe that using technology to learning will free you from some efforts in your learning activities?Strongly Agree **[ ]** Agree **[ ]** Disagree **[ ]** Strongly Disagree **[ ]**  Neutral **[ ]**
4. Do any of your colleague students use technology to learn? Yes **[ ]** No **[ ]** I Don’t Know **[ ]**
5. If **Yes** to **14**, how many of them use technology to learn? ………………………………
6. If **Yes** to **14**, does this influence you to also use technology to learn? Yes **[ ]** No **[ ]**
7. If **No** to **7**, would you make efforts to accept and adopt technology in ATU if it is introduced? Yes **[ ]** No **[ ]**
8. Have you heard of phrase/term ICT for Education? Yes **[ ]** No **[ ]**
9. Have you ever heard of the term E-Learning? Yes **[ ]** No **[ ]**
10. If **Yes** to **18**, would you accept e-learning as a teaching methodology by your lecturers? Yes **[ ]** No **[ ]**
11. If **No** to **18**, would you like to accept technology and be introduced to E-Learning as part of your learning processes in ATU? Yes **[ ]** No **[ ]**

Thank you very much for your attention.

# Appendix b

**SAMPLE CODE**

<?php

include('admin/dbcon.php');

session\_start();

$username = $\_POST['username'];

$password = $\_POST['password'];

/\* student \*/

$sql=mysqli\_query($con,"SELECT \* from student where username='$username' and password='$password'");

// $query = "SELECT \* FROM student WHERE username='$username' AND password='$password'";

// $result = mysqli\_query($query)or die(mysqli\_error());

$row = mysqli\_fetch\_array($sql);

$num\_row = mysqli\_num\_rows($sql);

/\* teacher \*/

$query\_teacher = mysqli\_query($con,"SELECT \* FROM teacher WHERE username='$username' AND password='$password'")or die(mysqli\_error());

$num\_row\_teacher = mysqli\_num\_rows($query\_teacher);

$row\_teahcer = mysqli\_fetch\_array($query\_teacher);

if($num\_row) {

$\_SESSION['id']=$row['student\_id'];

echo 'student';

}else if ($num\_row\_teacher > 0){

$\_SESSION['id']=$row\_teahcer['teacher\_id'];

echo 'true';

}else{

echo 'false';

}

<?php

include('admin/dbcon.php');

session\_start();

$username = $\_POST['username'];

$password = $\_POST['password'];

/\* student \*/

$sql=mysqli\_query($con,"SELECT \* from student where username='$username' and password='$password'");

// $query = "SELECT \* FROM student WHERE username='$username' AND password='$password'";

// $result = mysqli\_query($query)or die(mysqli\_error());

$row = mysqli\_fetch\_array($sql);

$num\_row = mysqli\_num\_rows($sql);

/\* teacher \*/

$query\_teacher = mysqli\_query($con,"SELECT \* FROM teacher WHERE username='$username' AND password='$password'")or die(mysqli\_error());

$num\_row\_teacher = mysqli\_num\_rows($query\_teacher);

$row\_teahcer = mysqli\_fetch\_array($query\_teacher);

if($num\_row) {

$\_SESSION['id']=$row['student\_id'];

echo 'student';

}else if ($num\_row\_teacher > 0){

$\_SESSION['id']=$row\_teahcer['teacher\_id'];

echo 'true';

}else{

echo 'false';

}

?>

?>