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Title: **ICT in Education: Adoption of Moodle as a Learning Management System (LMS) at Public Universities in Uganda – A Case of Gulu University.**

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Abstract:

This study tries to examine the challenges associated with implementation of LMS by assessing the readiness and perception of teaching staffs in adopting LMS at public universities in Uganda. A case of Gulu University was used. Data was collected using interviews and questionnaires from randomly sampled teaching staffs. Data was analyzed both quantitatively and through use of descriptive statistics with the aid of Statistical package for social sciences (SPSS).

Findings indicate that the is low level of readiness among teaching staffs in adopting LMS. The findings however show that a positive perception towards the use of the LMS exists. Challenges for the low readiness included among others, inadequate e-learning facilities, lack of training for the staffs, lack of commitment by both the staffs and administration and poor ICT support services.

The study recommends an architecture that utilizes web mirroring and synchronization mechanisms to mitigate on the problem associated with low internet connectivity. It also recommends that staffs be trained and the institution employs more ICT support staffs.

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Table of Contents

List of Figures

iii

List of Tables

List of Acronyms

ASTD .... : *American Society of Training and Development*
BSU .... : *Building Stronger Universities*
CMS .... : *Course Management System*
DC ....: *Dublin Core*
DOI ....: *Diffusion of Innovation*
HEI .... : *Higher educational institution*
ICT ....: *Information and Communication Technology*
LMS.. :*Learning Management System*
LO .... : *Learning Objects*
LOM .... : *Learning Object Metadata*
LRM ....: *Learning Resource Metadata*
Moodle .... : *Modular object-oriented dynamic learning environment*
SCORM .... : *Sharable Content Object Reference Model*
TAM .... : *Technology Acceptance Model*
TRA .... *Theory of Reasoned Action*
UTAUT .... : *Unified Theory of Acceptance and Use of Technology*

INTRODUCTION

This study attempts to examine the readiness and perceptions of teaching staffs in developing countries in adopting a Learning Management System (LMS). The study is based on a specific case of Gulu University, Uganda, where the researcher spent a month for data collection.

The paper starts with introducing 'e-learning' and LMS and brings forward the problem statement and the main purpose of the study. The first chapter also comprises of a brief introduction to the theoretical framework. Subsequently, literature review on e-learning, LMS and relevant concepts are presented in the second chapter. The literature review highlights the e-learning readiness models and technology acceptance models which are core models for this study. This is followed by the methodology which is the third chapter, it presents the approaches and data collection methods. Afterwards, chapter four presents the data from the field simultaneously with the analysis and discussion from them. The last chapter is a summary of the thesis and a conclusion to the study which is followed by recommendations.

Background

Information and Communication Technology (ICT) has been embraced as a key enabler of social-economic development across the world. It has brought about improvements in different sectors of society such as health, agriculture, entertainment and education. In the education sector, a number of technologies have been used and embraced as drivers towards improved learning. For instance, there are tools that support learning and cover a range of applications such as emails, social media, VoIP services, video conferencing (Govender, Dhurup, & Mudaly, 2014). Other tools that have been used include podcasts, recorded videos and message forums. Generally, the use of such have been claimed to improve learning and is known as e-learning (Begicevic & Divjak, 2006; Ssekakubo, Suleman, & Marsden, 2011).

According to Voogt and Knezek (2008), e-learning is of utmost importance and presents an effective mode of learning and as such schools should adopt and blend it into their learning mix. Similarly, Chun (2008) writes that e-learning provides easier and more convenient access to those who are unable to attend traditional face-to-face classes. Furthermore, there exists

other advantages such as asynchronous training, training at individual pace, just-in-time training, and cost-effectiveness that lure organizations towards e-learning (Powell, 2000). Thus, it is clear that educational institutions have observed e-learning as an ideal channel for delivering educational content.

According to Georgouli et al. (2008), "LMSs are the most representative e-learning applications". A significant trend in most educational institutions have been adoption of LMS to facilitate teaching and learning through the use of internet. LMSs are often described interchangeably as course management systems (CMS), learning platform and learning content management system (Unwin et al., 2010). LMS uses various technologies to offer an online platform where courses can be planned, facilitated and managed (Wang & Chen, 2009). A majority of higher learning institutions in sub Saharan Africa have installed LMS (Mtebe, 2015b). The most widely used LMS in Africa include Modular object-oriented dynamic learning environment (Moodle), BlackBoard, KEWL (Knowledge Environment for Web-based Learning) and Sakai (Unwin et al., 2010).

In the context of Uganda, LMS has been implemented by a number of institutions. According to statistics from Moodle.Net, there are 46 registered Moodle sites in Uganda as of April, 2017 (Moodle.Net Courses and Content, 2017). However, LMS has not been used to realize the full potential in fostering teaching and learning. For example, Makerere University, the first University to implement LMS in Uganda in 2002 is still struggling to attain the minimal educational benefits from implementing eLearning (Kahiigi, Hansson, Danielson, Tusubira, & Vesisenaho, 2011).

Some of the research related to the adoption and use of ICT in education in Uganda among others include; Muyinda et al. (2012) who proposed a framework for developing and evaluating mLearning object applications and environments, similarly Kituyi and Tusubira (2013) designed a framework for integrating e-learning in Higher educational institutions (HEI) in developing countries and, Mbabazi and Ali (2016) who assessed the level of user satisfaction and usability issues associated with LMS in Uganda. This shows that there is growing concern among scholars in line with potential of adoption and use of e-learning in Uganda.

Problem statement

While most institutions of higher learning in developed countries have successfully implemented e-learning systems like LMS, its adoption and use in many institutions in developing countries like Uganda has failed (Usoro & Abid, 2009). This has been as a result of many challenges which can be broadly categorized into infrastructural, technological, sociological, environmental and educational. According to Odunaike et al,. (2013), lack of assessment of e-learning readiness by different institutions has been a primary reason for the failure of e-learning implementations in developing countries. Muganda (2006) on the study of e-learning implementation at University of Nairobi, identified factors that determine e-learning readiness as; provision of Internet, more computers and training of lecturers on e-learning. It is important for institutions to undertake readiness assessments as they are important in allowing institutions to design systems and put in place the appropriate measures that are required for its success (Oketch et al., 2014).

However, the readiness of lecturers alone is not sufficient enough for the adoption and use of LMS. According to Broadley (2012), the perception and attitude of teachers towards e-learning is a crucial factor in e-learning implementation. It is therefore important to understand the extent to which the teachers perceive e-learning as an important tool to enhance learning. Borotis & Poulymenakou (2004) points out that e-learning readiness helps an instructional designer to design e-learning strategies and experiences comprehensively and helps a lecturer to effectively deliver learning experiences to students. As such, this study examines the readiness and perceptions of teaching staffs at Gulu University towards the use of LMS

Motivation of the study

The motivation for carrying out this study emanates from my experience of using Moodle at Aalborg university and the experience I encountered during a visit to my former university (Gulu University) during the summer of 2016. My main concern was that with all advantages attributed to the use of LMS, this system was not being embraced at Gulu university.

Gulu university is one of the public universities in Uganda which implemented LMS with support from DANIDA under the Building Stronger Universities (BSU) programme. According to information obtained from the Technology Planning Officer, Gulu university, since the implementation of the Gulu University e-learning platform, only a few teaching staffs have been seen actively using the platform. This shows that the system is underutilized and often ignored by the teaching staff. With the flexibility of the ICTE course, I deemed it right to focus on the use of technology in education by assessing the readiness and perception of the lecturers towards the use of LMS at Gulu university.

Hence, the focus of this study is to investigate the readiness and perception of teaching staff in Gulu University towards the use of Moodle as a learning management system (LMS). As a result, the study presents recommendations for proper implementation of LMS in developing countries.

Aims of the study

The following are the aims of the study:

1. To determine the key enablers and challenges in adoption of LMS by teaching staff.
2. To examine the readiness of teaching staff in adopting LMS for instruction delivery.
3. To assess the perception of lecturers in using LMS in delivering instructions to students.

Research Questions

In order to understand the readiness and perception of teaching staff regarding LMS use at Gulu university, specific questions need to be answered. Following are the research questions that guides the entire study:

1. What are the existing challenges and enablers in adoption of LMS by the teaching staff?
2. What is the level of readiness among teaching staff to adopt LMS?
3. What is the perception of teaching staff towards using LMS in delivering instructions to students?

Limitation of the study

As this research is a part of an academic program the researcher was expected to finish the entire study within a time span of four months. The limitations were concerned to the instrumentation, sampling, and response rate. The study is based on a survey that was not pilot tested due to time constraints which may have introduced errors in the data and thus data analysis.

Regarding the response rate, this study was only limited to a sample size of (n=46) to measure readiness to adopt and use LMS and (n=21) to measure perception towards use of LMS. This sample may not necessarily reflect the patterns of perception across the entire population of teaching staff. In order to maximize accuracy and increase generalizability of the results, larger samples would have been appropriate.

Also, the research was conducted at only Gulu university, therefore the findings may only be comparable to a similar population group. Qualitative and quantitative studies in other universities would have enriched the results of the study and provided a better understanding of the adoption of LMS by teaching staff.

Theoretical basis

The theories used in this study as the theoretical framework includes three (3) e-learning readiness models and Rogers Diffusion of Innovation (DOI) theory. The three e-learning models used in the study include Chapnick (2000), Psycharis (2005) and (Aydin & Tasci, 2005). Whereas the e-learning readiness models were used to assess how ready the teaching staffs were towards the adoption and use of LMS, Roger's DOI was used to test those already using LMS and find out about their perception towards its use. These frameworks are described in Chapter 2 of this paper.

Chapter summary

This chapter described the background of the study. It gave an overview of the use of technology in education and the different tools employed. It highlighted the theoretical basis that was used to undertake the study. The limitations identified during the course of this study are also presented.

REVIEW OF EMPIRICAL AND THEORETICAL LITERATURE

Introduction

This chapter gives an in-depth understanding of the use of technology in education. It briefly discusses about LMS as a key technology employed by most institutions of higher learning and its benefits and barriers towards implementation are clearly stipulated. Furthermore, the chapter exhibits different theoretical models to assess the readiness and adoption of eLearning. Simultaneously, the theories of technology adoption are critically evaluated and the best model and constructs for this study is identified.

Review of empirical literature

ICT in Education

ICT in education is defined as the use of technologies such as computers, projectors, television, radio, YouTube videos, internet and learning management systems to transfer information to the intended recipients, students (Rodi, Kohun, & DeLorenzo, 2013; Sharma, Goh, Sun, & Ho, 2014).

ICT has been seen as a key tool in improving the quality of education in different countries around the world. This has been because it enhances both the teaching and learning process. Besides facilitating delivery of instructions, ICT has also promoted better learning (Sharma et al., 2014). According Zhang et al. (2016), "the purpose of the ICT in education is to cultivate innovative talents and implement the modernization of education". In a bid to hasten education reform and contribute to competitiveness, countries around the world have embarked on deploying ICT in education (Zhang et al., 2016). It has been a trend that most universities around the world have been encouraging the use of technology to facilitate educational delivery (Rodi et al., 2013).

There has always been an assumption that technology mediated education provide opportunities for communication and collaboration, problem solving and thus competencies to be competitive in the 21st century. This has led to an increase in the technology investments in schools worldwide by more than a hundred fold in the last two decades (Ping, Zhao, Tondeur, Chai, & Tsai, 2013). It is argued by (Sharma et al., 2014) that in order for

developing countries to promote better learning, the current pedagogy should be enhanced by using ICT. However, the existence of the digital divide between the developed and developing countries presents a challenge to the adoption of technology. This digital divide is both in terms of physical resources and capabilities of teachers to utilise ICT resources (Newby, Hite, Hite, & Mugimu, 2013).

The adoption of ICT in education in Uganda has been faced with a number of problems. These same problems are faced by most developing countries. These include among others – high bandwidth costs, poorly developed ICT infrastructures and, unreliable supply of electricity (Farrell, 2007).

E-learning

E-learning has been defined as the learning supported or enhanced through the application of ICT (Ssekakubo et al., 2011). It has also been defined as a mode of learning aimed at improving the quality of teaching and learning through the use of ICT (Begicevic & Divjak, 2006).

The Commission on Technology and Adult Learning, 2001 defines e-learning as the delivery of instructional content or learning experiences by electronic technology. E-learning requires that the learners use the internet, collaborate with peers and interact with the trainer for support (Schreurs, Ehler, & Moreau, n.d.). Today, e-learning is mostly based on fast internet, modern web 2.0 technologies, mobile technology and social networks (Dečman, 2015). However, for such technology to improve productivity in the learning environment, it should be accepted and used by the lecturer.

It is evident that many higher educational institutions around the world have become involved in using the Internet and web 2.0 technologies to execute education as blended learning or online learning. This is because the implementation of e-learning plays a big role in the advancement of higher education (Begicevic & Divjak, 2006). As such, the area of e-learning technology acceptance has become so relevant in recent years (Dečman, 2015).

E-learning comes with advantages such as better visualization and simulation. Furthermore, it encourages innovation and multimedia capabilities (Begicevic & Divjak, 2006). Stressing the advantages of e-learning, Ajegbomogun et al. (2016) assert that e-learning plays an important role in allowing communication between the learners through the sharing of thoughts on learning materials with convenience of the learners. However, for successful implementation of e-learning, it is crucial for higher education institutions to assess their readiness. This should be done in order to enable the institution formulate and achievable strategy (Mosa, Naz'ri, & Ibrrahim, 2016).

Status of e-learning in Africa

There has been a tremendous increase in the adoption of e-learning tools like LMS in sub-Saharan Africa over the last decade. This has been done in a bid to improve the quality of education and increase access to education through blended and distance learning (Mtebe & Kondoro, 2016). There have also been a series of ongoing projects in Africa with the aim of introducing computers to different schools and networking various academic institutions in a bid to improve research and improve on the use of ICT to transform business practices (Unwin et al., 2010). However, most of such initiatives tend to fail either totally or partially (Ssekakubo et al., 2011).

According to Unwin et al. (2010), the use of internet and computers in the education sector in Africa for learning is very much in its infancy. A study by Makokha and Mutisya (2016) also affirms that e-learning was still in its infant stage in Kenya. This was partly attributed to the fact that a majority of universities lack ICT infrastructure and skills. Most schools in Africa face a big problem in acquiring and effectively using ICT tools to effect e-learning (Newby et al., 2013). Also, there exists a challenge in network access which makes deployment of even simple internet based tasks unpleasant(Azarias, Brian, & Yidnekachew, 2010; Unwin et al., 2010).

Findings by Kamba (2009) in a study to uncover the benefits and challenges of implementing e-learning in Nigerian Universities showed that there exists high awareness of e-learning among the universities. However, he noted that the prime factors for the failure to

successfully implement e-learning was lack of commitment and investment to develop e-learning.

Studies by Kafyulilo and Keengwe (2013) have indicated that there exists limited use of technology in teaching and learning in Tanzania. The study asserts that factors limiting the adoption and use of LMS in developing countries are not limited to technological knowledge and inadequate technological tools but also include both social and psychological factors.

It is evident from literature that e-learning is being embraced in most countries in Africa for example; Nigeria (Kamba, 2009), Tanzania (Kafyulilo & Keengwe, 2013), Kenya (Makokha and Mutisya, 2016), Uganda (Farrell, 2007) and South Africa (Mtebe and Kondoro, 2016),

Learning Management Systems (LMS)

What are LMSs?

There exist many definitions of LMS. According to Unwin et al. (2010), LMS is a 'software application or web-based technology that is used to plan, deliver or access a particular learning process'. LMSs are also defined as web-based software application platforms that use web technologies and the internet services to support: online course creation, maintenance and delivery; student enrolment and management; and education administration and student performance reporting (Dagger et al., 2007). According to Adzharuddin and Ling (2013) LMS in the higher learning institutions is simply an online portal that connects lectures and students.

Other terms are often used synonymous to LMS include content management system, course management systems, learning platform and learning content management system (Unwin et al., 2010). Many of the LMSs are web based. This facilitates anytime, anywhere access to learning content and administration. According to Black et al (2007), they rely on synchronous and asynchronous technologies to facilitate access to learning materials and administration.

Though designed primarily for online educational delivery, LMSs also incorporate additional features. For example, it is used as a repository of course materials including PowerPoint presentations, lecture notes and videos (Rodi et al., 2013) .

A number of LMS have been developed. LMS can be categorized into applications including virtual learning environments, course management systems, and collaborative learning environments (Monarch Media, 2010). Examples of LMS include but not limited to some commercial systems like BlackBoard and WebCT and open source LMS like Moodle, Atutor, Sakai and Kewl. Open source LMSs are built on extendable frameworks that makes it possible for implementers to modify the LMS to suit their specific needs (Dagger et al., 2007). Some of the commercial systems have adopted similar approaches. For example, WebCT has the PowerLinks kit while Blackboard uses Building Blocks. This was traditionally not available to the commercial sector (Dagger et al., 2007).

According to Dagger et al., (2007), there exists three generations of LMS: the first generation, second generation and the next generation LMS. The first generation was Monolithic and supported content-only interoperations. Standards during this generation included Dublin Core (DC), IMS Learning Resource Metadata (LRM), and IEEE Learning Object Metadata (LOM). These three generations are shown in figure 1 below.
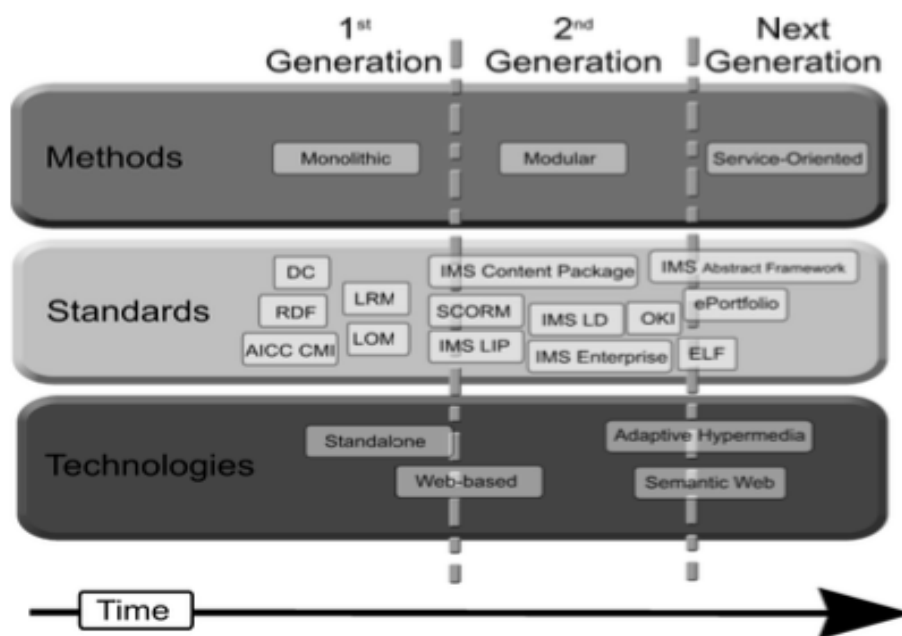

Figure 1:Generations of LMS (Dagger et al., 2007)

The current generation, which is the second generation, is largely modular. It takes account of different users and use groups and associated profiles and focus not only on sharing

content, but also sharing learning objects (LO) and learner information (Dagger et al., 2007). Standards that have emerged during this generation include Sharable Content Object Reference Model (SCORM), IMS Learning Design, IMS LIP, IMS Enterprise, OKI, IMS Content Package.

The focus of the next generation is personalization and letting consumers choose the right combination of services for their requirements – (service oriented) (Ssekakubo, Suleman, & Marsden, 2013). LMSs come embedded with features that allow sharing of learning resources between instructors and students through the Internet. Also embedded on these systems are features for both synchronous and asynchronous communication between the teachers and the students (Ssekakubo et al., 2013).

The top open-source LMS options provide: Feature-rich toolsets; Enterprise-grade stability, scalability, and security; a high degree of control and flexibility; and generally lower long-term costs than the commercial option (Monarch Media, 2010). According to the American Society of Training and Development (ASTD), a robust LMS should be able to at a minimum do the following: Centralize and automate administration; Offer self-service and self-guided services (such as learner self-registration for courses); Rapidly assemble and deliver learning content; Consolidate training initiatives on a scalable web-based platform; Support portability and standards, such as SCORM; and Personalize content and enable knowledge reuse

According to Monarch Media (2010), the functionality of most LMS include:
Content management; rebranding and customization options; user management tools; assessment creation, grading, and tracking features; collaboration tools, such as email, wikis, discussion boards, and chat; reporting and analytics about the system and course usage, learner progress, assessment results; security features limiting access to authorized people and roles. LMSs are typically server-centred, delivering lessons to the student via a general purpose web browser (Johnson et al., 2006).

Institutions that use LMS normally choose from one of the three server solutions. The first solution is reliance on a commercial service provider that hosts the service. In the second category, the institution hosts the service for internal use while the last category involves the

institution hosting the service for internal use as a service for other institutions (Flate, Journal, Contents, & Paulsen, 2003). Gulu University like most other universities in developing countries prefer the first category. The LMS service is hosted by a commercial cloud solution provider. They normally decide to go with this because of the vast advantages that come with cloud computing. However, it is not always true. Most institutions that have taken the first category of server solutions always experience some problems with limited access (Flate et al., 2003).

On the other hand, institutions that have chosen to host LMS for internal use, experience few problems and claim that the systems are stable and reliable (Flate et al., 2003). Such institutions are normally those with high internal competencies and larger institutions that can operate commercial LMS locally. With high costs of implementing such systems internally, many institutions in developing countries prefer cloud services.

Benefits of LMS

LMS comes with a number of benefits. Firstly, through the electronic distribution of materials, LMS enables learners to remotely access materials without necessarily waiting for the materials to be dispensed during class time (Adzharuddin & Ling, 2013). LMS also enables learners to access a range of materials electronically thereby supplementing the traditional pedagogy of learning through books and face-to-face meetings with lecturers (Unwin et al., 2010). This is so beneficial to mostly distance based students as they are able to access materials anywhere and at any point in time.

On the side of teachers, LMS provides tools for them to organize and structure their teaching materials thus saving time in preparing their teaching (Unwin et al., 2010). It also provides a platform for teachers and students to interact outside classroom through different forums (Adzharuddin & Ling, 2013). In fact, most African countries have realized the benefit of using LMS. According to a study by Unwin et al. (2010), 49% of 358 respondents from 25 countries were using various LMS in their institutions. However, a study by Rodi et al. (2013) indicates that the traditional face-to-face education with attendance requirements is marginally more effective than the use of technologically focused LMS. This shows that there is no consensus among scholars on the issue of e-learning.

Barriers towards the implementation of LMS in developing countries

Many e-learning initiatives in developing countries often fail. According to Ssekakubo et al. (2011), the majority of LMS-supported e-learning initiatives in developing countries do not fulfill their potentials despite their potential to support both blended learning and learning that is entirely delivered online. This has been as a result of a number of barriers which can be categorized under technical, social, environmental, economical, and environmental. Economically, the cost of implementing LMS is high due costs required for Hosting the service, maintenance, training of staff etc. However, the emergency of Open Source LMS has to some extent reduced such costs. Unlike commercial LMS where annual license, maintenance, or subscription fees are charged based on number of users in an organization (Monarch Media, 2010), organization employing open source LMS mainly incur costs on hosting, training and maintenance. Even with such relatively low costs accompanied with implementation of Open Source LMS, some institutions are not in position to implement LMS.

Also, there exists a problem of complexity of LMS systems. These systems normally offer an overwhelming amount of functions to a broad range of users. Such user group include students, teachers, administrators etc. Each of these user groups also has their specific requirements (Konstantinidis, Papadopoulos, Tsiatsos, & Demetriadis, 2011).

Black et al. (2007) considered technical problems as the biggest barrier to implementing open source LMS in developing countries. This is because a majority of LMS tools are entirely based on web environments which require both synchronous and asynchronous technologies to utilize the different functionalities of the system like access to learning materials and administration.

Findings by Unwin et al. (2010), indicate that the main factors that limits the use of LMSs in Africa were low connectivity, unreliable connectivity and lack of e-learning policy in institutions. Another barrier to the adoption of eLearning is the fact that most computer laboratories in developing countries are poorly equipped with computers and other facilities. Unwin et al. (2010) noticed that: "The reality on the ground when visiting most African

universities and schools is that computer laboratories remain largely empty, and where LMSs are used at all they are only utilised in the most basic of ways".

Bhartu and Whelan (2007) also points out that poor technological infrastructure and internet accessibility remain a problem in developing countries. Accordingly, essential components to implementation of LMS like computers, electricity and network connectivity are still insufficient in developing countries.

Even with low bandwidth in most institutions, innovative solutions have been proposed. For example, creation of a university based intranet within the control of the university's management instead of relying on external internet can enable usage of LMS within the university premises (Unwin et al., 2010). However, with such an infrastructure, students and lectures will not be in position to access LMS outside the university premises. Also, access to information available globally will be limited by the use of intranet. As such, more reliable solutions should be developed.

Moodle as a LMS

Moodle (Modular Object-Oriented Dynamic Learning Environment) is an open source LMS written in PHP that supports social constructivist learning. It is readily available as a freeware. The original and first Moodle was developed by Martin Dougiamas based on pedagogical principles. It was designed "to provide educators, administrators and learners with single robust, secure and integrated system that create personalized learning environments" (Moodle Pty Ltd, 2016).

Moodle can be customized in any way to suite individual needs. It has a modular set up and interoperable design that allows developers to create plugins and integrate external applications to achieve specific functionalities. Moodle is simple, lightweight, efficient, compatible, low-tech browser interface and easy to install on Windows, Unix, Linux, FreeBSD, OS X and any platform that supports PHP and requires only one database.

Moodle is based on a number of e-learning standards namely (Moodle Pty Ltd, 2016):

Sharable Content Object Reference Model (SCORM) which is a collection of e-learning standards and specifications that define communications between client side content and server side leaning management system, as well as how externally authored content should be packaged in order to integrate with the LMS effectively.

Also, Moodle incorporates the AICC HACP standard for CMI. The Aviation Industry Computer-Based Training Committee (AICC) developed this standard. It is used to call externally authored content and assessment packages. IMS content packages can also be imported into Moodle. Lastly, Learning Tools Interoperability (LTI) is a standard way of integrating rich leaning applications with educational platforms. Moodle uses the External tool activity to act as a 'LTI consumer' as a standard, and will act as an 'LTI provider' using a plugin.

The basic structure of Moodle is organized around courses which are pages and areas within Moodle where learning resources and activities can be presented to students by teachers. Courses in Moodle can contain content for different time periods depending on the teacher or establishment. For example, a course can contain content for semester, year or a single session. Also, courses can be used by one teacher or shared by a group of teachers. These courses are organized into categories.

The state of LMS usage in Uganda

In recent years, there has been a growing implementation of LMS in learning environments across the universe. In Uganda, most public universities have embraced the use of LMS. The institutions that are currently using LMS in Uganda include among others Makerere University, Cavendish University, International University of East Africa, Uganda Christian University and Muni University (Mbabazi & Ali, 2016; Moodle.Net Courses and Content, 2017). According to Ssekakubo et al. (2011) and Unwin et al.(2010), the most popular LMS deployed in most institutions are: Blackboard, Moodle, Atutor, Sakai and Kewl.

Besides Gulu University's Moodle site (https://www.guluelearning.ac.ug/), there exists 45 other registered Moodle sites in Uganda as of April, 2017 (Moodle.Net Courses and Content, 2017). It is evident from the number of active Moodle sites that most institutions are adopting LMS. However, the site doesn't show the activity on such sites. As put by Mtebe and

Kondoro (2016), the number of users who access these systems on a daily basis is relatively low across many institutions. Figure 2 below shows some of the institutions of higher learning in Uganda that are using LMS.

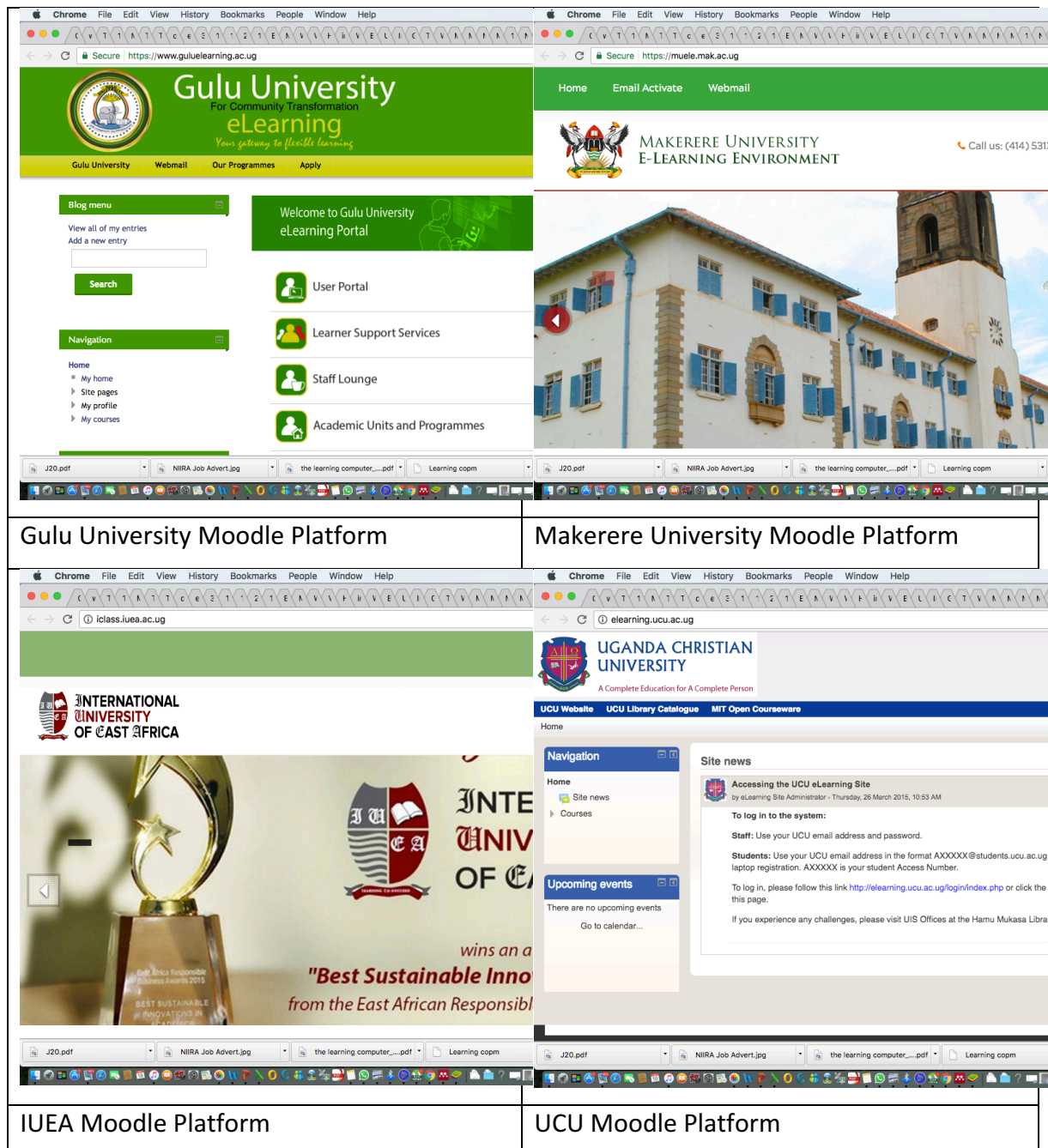| Gulu University Moodle Platform | Makerere University Moodle Platform |
| IUEA Moodle Platform | UCU Moodle Platform |

Figure 2: Moodle Platforms of selected universities in Uganda

Strategies to improve accessibility of LMS in developing countries

Various strategies have been proposed on how to improve accessibility of eLearning in developing countries. For example Mtebe (2015a) proposed seven strategies namely; improving usability, uploading quality of learning materials, enhancing support services,

reviewing relevant policies, increasing awareness, complementing LMS with social media and making use of mobile applications. Mtebe and Kondoro (2016) proposed the use of Mobile Moodle after their research finding that a majority (70%) of students in Uganda and South Africa own mobile phones with Internet connections. However, for student to be able to access Moodle with this method, they needed to be connected to the Internet all the time. As seen earlier in the literature, access to Internet remains a major barrier to the adoption of Moodle in developing countries.

Improving reliability, accessibility and performance of web services

Since LMS is a web service, this section provides some of the solutions that have been used to improve on accessibility of webs services in low bandwidth conditions.

There have been numerous concerns in regards to reduced reliability and performance of web services. To counteract this concern, web mirroring has been used (Liu, Jia, Li, & Lee, 2003). Holt (2003) defines a mirror as a server that replicates the contents of another server.

According to Holt (2003), "The traffic generated by busy World Wide sites affects server performance, but the server bottlenecks can be avoided by load balancing document requests across a number of co-located mirrors". Mirroring comes with the advantage that a user requesting files from a mirror that is closer than the primary Web Server can reduce propagation delays in fetching documents thereby reducing the download time (Liu, Jia, Li, & Lee, 2003; Holt, 2003). Mirroring enables clients to always find the requested content at the mirrored server (Liu et al., 2003).

However, before taking a decision to undertake web mirroring, the content owner must take proper decisions to avoid exaggerated costs from ISPs and unsatisfactory performance at the end of the mirroring (Liu et al., 2003).

For the case of LMS, a number of solutions have been proposed. These include the use of Mobile e-learning or "M-learning" which focuses on the use of PDAs and Cellular phones for supporting and delivering some elements of the teaching and learning process (Johnson et al., 2007) . However, cellular phones come with a disadvantage of short transmission range

and restricted interface   (Johnson et al., 2007). This limits their potential of being used for extending boundaries of e-learning in developing countries.

Johnson et al. (2007) Proposed a network architecture called the IMMEDIATE network architecture which employed FTP as its gateway, controlling access to the course repository. According to them, "most functionality resides at the student end the only materials that need to be transferred across the network are messages and updated learning or system management files". Since most updates were short text files which consisted of messages and help updates, it was easy for such files to be transferred over slow internet connections. In scenarios of very slow or unreliable internet services, they proposed that larger files could be updated by use of alternative media like CD or DVD disks or satellite.
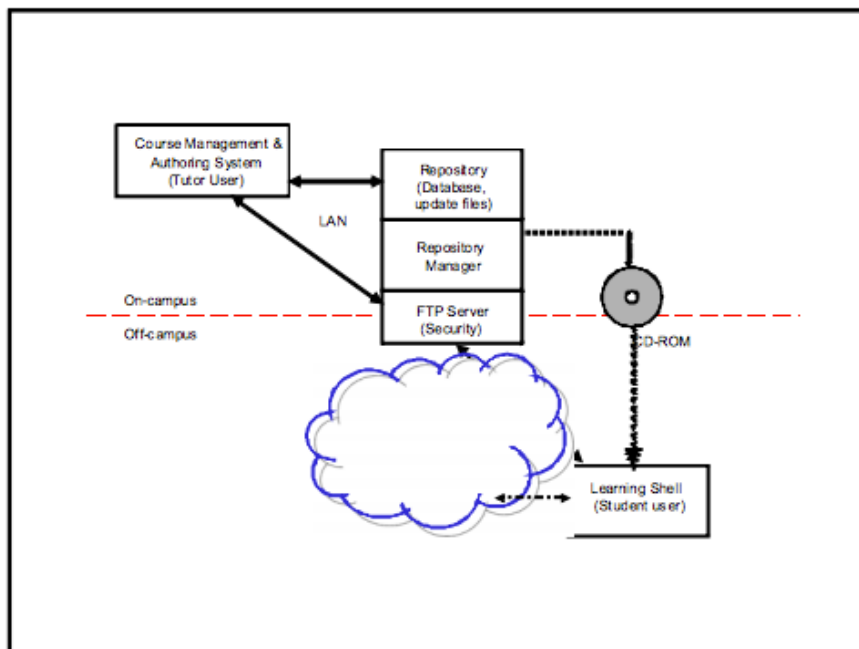
Figure 3: IMMEDIATE Network architecture (Johnson et al., 2007)

A similar scheme is provided by Castro & Ferreira (2010). The scheme involves both the local server and the main server (cloud server). Databases are mirrored on both the local and main server. It uses a synchronization technique which makes access to the main server possible in normal conditions, keeping local resources when internet connection is broken and updating modifications when connection is reestablished. This scheme is illustrated in figure 4 below. The exchange of data between the local and primary server is based on Rsync algorithm. The

rsync algorithm works by copying directories, files and their contents as accurate as possible, preserving permissions, modes and timestamps.
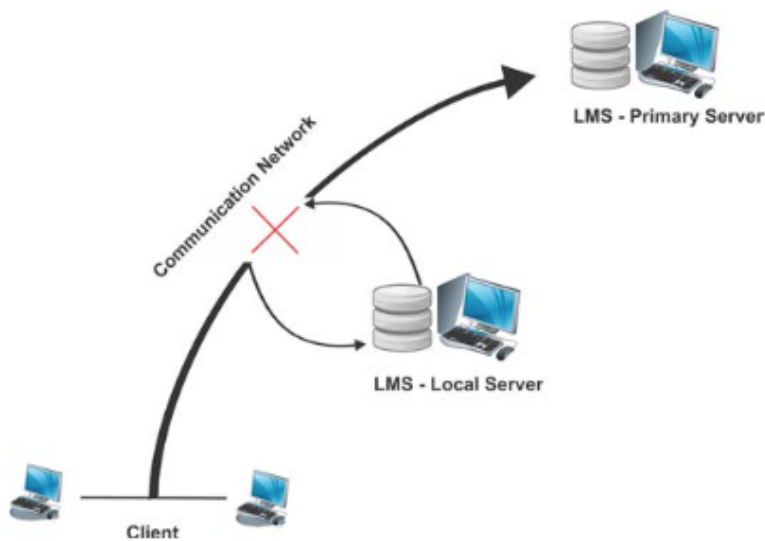
Figure 4: Simple contingency scheme (Castro & Ferreira, 2010)

Review of theoretical literature

This section presents a review of literature related to different theories that have been used in ascertaining the readiness of institutions in adopting e-learning. It also presents the different technology acceptance models.

E-learning readiness models

There are different factors that affect the implementation of e-learning in the education sector. However, readiness is a critical factor towards the success of any e-learning initiative (Mosa et al., 2016). This sub section presents a review of various e-readiness models that have been used in assessing the readiness of institutions in adopting e-learning.

Chapnick (2000) developed an instrument for assessing organisational readiness for e-learning. According to her, there are many factors that ought to be considered to assess readiness. In this model, there are 66 factors grouped in 8 categories: Psychological, sociological, environmental, human resources, financial readiness, technological skill (aptitude), equipment and content readiness. Chapnick states that her model helps to answer

3 main questions; (1) 'can we do this?'. (2) 'If we can do this, how the heck are we going to?', and (3) 'What are the outcomes and how do we measure them?'.

According to Chapnick (2000), Psychological readiness considers the individual's state of mind as it impacts the outcome of the e-learning initiative; Sociological readiness on the other hand considers the interpersonal aspects of the environment in which the program will be implemented; Environmental readiness considers the large-scale forces operating on the stakeholders both inside and outside the organization; Human resource readiness considers the availability and design of the human-support system; Financial readiness considers the budget size and allocation process; Technological skill (aptitude) readiness considers observable and measurable technical competencies; Equipment readiness considers the question of the proper equipment possession; Content readiness considers the subject matter and goals of the instruction.

In assessing the readiness, Chapnick (2000) utilise multiple choice questions and respondents are expected to select only one response to represent situation of their organisations. Point values are allocated to each response and graded at the end of administering the questionnaire. The lower the total grade, the readier a given company is. Besides helping assess how ready a given company is for e-learning, this model also reveals what area needs improvement.

Also, another scholar, Psycharis (2005): suggests three large categories resources, education and environment with each category containing certain criteria. The resources category is made up of technological readiness, economic readiness and human resource readiness. Technological readiness investigates the available technological systems that are provided and how they are used; economic readiness examines the willingness of an organisation to invest in e-learning and the human resource readiness examines the knowledge and the skills of the employees. It checks if the employee has the necessary basic skills and if they feel at ease with used technology.

Education encapsulates both readiness of content and educational readiness. It examines if the educational content is available, structured and reusable. Educational readiness looks at

the learning and educational needs of employees. And lastly Environment includes entrepreneurial readiness, leadership readiness and readiness of culture.

Aydın and Tasci (2005) undertook a study to assess the readiness of companies in Turkey for e-learning. In this study, Aydın and Tasci (2005) based on Rogers diffusion of innovation theory as their theoretical background and identified four factors namely; technology, innovation, people and self-development. They also suggested that each of the four factors is made up of three different constructs namely; resources, skills and attitudes.

Like the previous instruments discussed, technology plays a vital part in the e-learning readiness. According to Aydın and Tasci (2005), "Any assessment tool should include identification of the hardware available in the company". Thus, the instrument includes questions on hardware capabilities of the companies and easy access to computers and internet. Also questions on employees' computer and internet capabilities are asked.

Innovation as a factor proposed by Aydın and Tasci (2005) involves examining of past experiences of the employees as far as an innovation is concerned. However, for institutions that are interfacing with an innovation for the first time, this factor can't be applicable.   The people factor on the other hand deals characteristics of the employees. It looks at such attributes like the education of the employees. Aydın and Tasci (2005) postulates that individuals with a high level of education is more likely to adopt an innovation than the others. The last factor, self-development looks at the individual development with in a company. This can be in terms of the company establishing a budget for organisation and individual development and also attitude of employees towards developing themselves.

Besides the above three instruments used in measuring e-learning readiness, there exists a number of other instruments such as Haney (2002), Minton (2000) and so forth which can be used to measure organizational readiness to successfully implement e-learning. However, not all instruments work out in different systems. According to Rogers (2003), every system has its own norms that can be effective in diffusing innovation in its system.

According to the three e-learning readiness models discussed above, there are various variables that can be used to measure readiness of e-learning. However, some variables are recurring in most of the models. The different variables are summarized in table 1 below.

Chapnick (2000)	Psycharis (2005)	(Aydın & Tasci, 2005)
- Technological skill - Equipment - Psychological - Sociological - Environmental - Human resources - Financial readiness - Content readiness	- Technological readiness, - Economic readiness - Human resource readiness - Readiness of content - Educational readiness - Entrepreneurial readiness - Leadership readiness - Readiness of Culture	- Technology - Innovation - People - Self-development

Table 1: Summary of factors identified from the models.

From the variables in table 1 above, the study focused on five (5) variables identified as the most important to be considered in the e-learning readiness assessment. The selection of the variables is according to both the frequency and relevance in assessing lecturers. The selected variables are; technology readiness, Sociological readiness, Environmental readiness, Psychological readiness, and educational readiness.

As shown in table 1 above, technology is the most emphasized variable. It appears in all the three reviewed models. This clearly shows that it is the most important factor as far as e-learning readiness is concerned. Rogers (2003) also establishes that technology is one of the

vital factors without which the adaptation of an innovation within an organization will be unsuccessful.

There are two components of technology according to Rogers namely; hardware and software. Hardware referes to the physical components while softwares is the information aspect that enables execution of tasks. The hardware part of involves the physical components that will facilitate the usage of e-learning (e.g., servers and networks) along with equipments (e.g., computers) for the end users to access and use the e-learning services(Aydın & Tasci, 2005). Without appropriate equipment and easy accecss, implementation of eLearning becomes hard, if not impossible (Oliver & Towers, 2000).

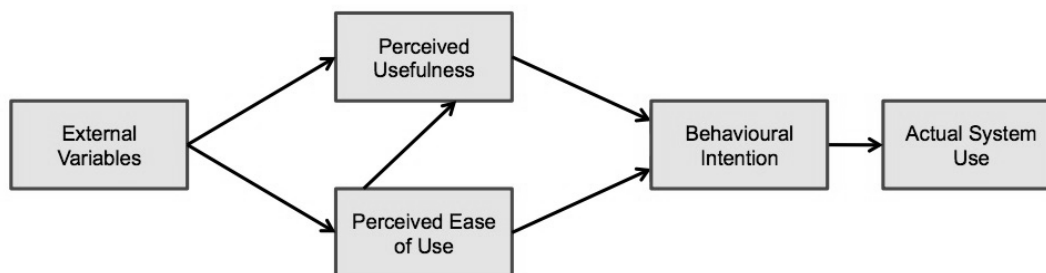**Technology acceptance and use models**

There exist a number of models related to technology acceptance and use. These models include among others; the theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behaviour, Rogers' Diffusion of innovation theory, the model of PC utilization the innovation diffusion model, the social cognitive theory and the unified theory of acceptance and use of technology. These theories are briefly described in the following below.

Theory of reasoned action (TRA)

The theory of reasoned action (TRA) was proposed by Fishbein and Ajzen (1975) and is considered to be a very useful model to predict and explain the human behaviour in variety of domains (Chen, Gillenson & Sherrell, 2002). Fisbein and Ajzen theorised that intentions are a function of two basic determinants: Attitude towards behaviour and Subjective norms of behaviour. This theory defines attitude as "an individual's positive or negative feelings (evaluative affect) about performing the target behaviour" (Fisbein and Ajzen 1975, p. 216) whereas subjective norm is defined as "the person's perception that most people who are important to him think he should or should not perform the behaviour in question" (Fisbein and Ajzen 1975, p. 302). One weakness with this theory is that it only describes the drivers of an individual's behaviour, and not how decisions are made by an individual to adopt or reject an innovation (Botha & Atkins, 2005).

Technology Acceptance Model (TAM)

Davis proposed Technology Acceptance Model (TAM) in 1986. TAM is considered an extension of TRA. TAM was proposed to explain why a user rejects or accepts information technology. TAM is popular choice among many scholars for investigating acceptance of any new technology primarily because of its robustness and parsimonious nature. It uses two variables, perceived usefulness and perceived ease of use which are hypothesized to be fundamental determinants of user acceptance. According to Davis (Davis, 1989), users' unwillingness to accept and use available systems affects the performance gains of the system. Davis (Davis, 1989) defines perceived usefulness, as "the degree to which a person believes that using a particular system would enhance his or her job performance" while perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort". TAM is depicted in figure 5 below.

Figure 5: Final version of Technology Acceptance Model (TAM). Source (Davis, 1989)

Researchers like Tarhini et al. (2013), Kybartaite (2010) and Morrisson and Nzuki (2016) have used TAM in assessing the acceptance of e-learning in different institutions.

However, according to Dečman (2015), relying on TAM to explain decisions and behaviour fully across a wide range of technology adoption situations is unreasonable due to its simplicity. TAM has been augmented many times. A number of new variables have been introduced to explain why parts of the model work the way they do. These variables include among others: age, gender, voluntariness, training, innovativeness, anxiety, etc.

Vankatesh & Davis (1996) also ascertained that there are external variables that influence perceived usefulness and perceived ease of use. These include "system characteristics, training, user involvement in design, and the nature of the implementation process". These external variables are indicated in figure 6 below
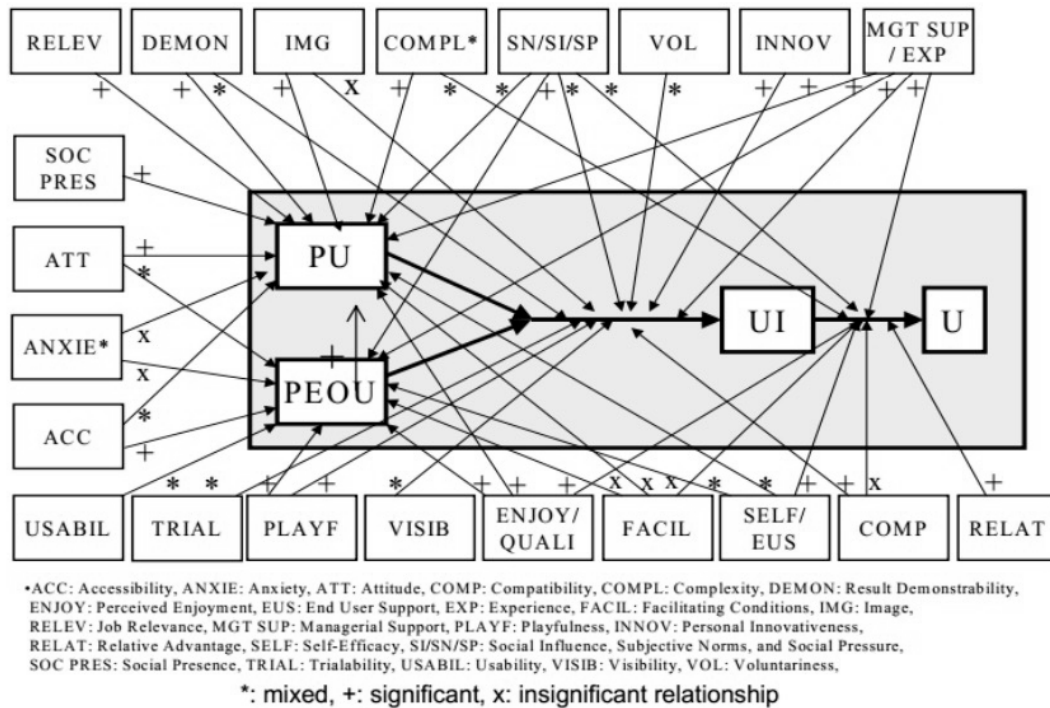

•ACC: Accessibility, ANXIE: Anxiety, ATT: Attitude, COMP: Compatibility, COMPL: Complexity, DEMON: Result Demonstrability, ENJOY: Perceived Enjoyment, EUS: End User Support, EXP: Experience, FACIL: Facilitating Conditions, IMG: Image, RELEV: Job Relevance, MGT SUP: Managerial Support, PLAYF: Playfulness, INNOV: Personal Innovativeness, RELAT: Relative Advantage, SELF: Self-Efficacy, SI/SN/SP: Social Influence, Subjective Norms, and Social Pressure, SOC PRES: Social Presence, TRIAL: Trialability, USABIL: Usability, VISIB: Visibility, VOL: Voluntariness,

*: mixed, +: significant, x: insignificant relationship

Figure 6: Relationship between external variables and major TAM variables. Source: Lee et al (2003)

Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkateshet al. (2003) studied 8 different models and formulated the Unified Theory of Acceptance and Use of Technology (UTAUT). According to Venkateshet al. (2003), "UTAUT provides a useful tool for managers needing to assess the likelihood of success for new technology introductions and helps them understand the drivers of acceptance in order to proactively design interventions (including training, marketing etc.), targeted at populations of users that may be less inclined to adopt and use technology". UTAUT aims at explaining the impact of user intensions towards the use of a technology or a system and his or her usage behaviour. UTAUT postulates four core constructs as direct determinants of technology

acceptance and use: performance expectancy, effort expectance, social influence, and facilitating conditions. The theory further suggests that the effect of these four constructs is moderated by other variables: age, gender, experience and voluntariness of use.

Rogers Diffusion of Innovation Theory

Another theory that has been widely used to study acceptance of technology is Diffusion of innovation theory. It views four characteristics as determinants of IT usage and adoption. These include; the innovation, communication channels, time and a social system. According to Rogers, diffusion of innovation is "a social process in which subjectively perceived information about a new idea is communicated person to person" (p. xx). This theory explains the probability of new ideas being adopted or abandoned by members of a given social system (Penjor, 2016). This paper will base on only the innovation as a determinant of IT usage and adoption.

An innovation is defined as an idea, practice, behaviour or object that is perceived by the individual to be "new" (Rogers, 2003). According to Rogers (2003), the newness of an innovation maybe defined in terms of knowledge, attitude or decision to adopt. As far as this research is concerned, the innovation is the Moodle LMS being used at Gulu University. Diffusion is *"the process to communicate an innovation through certain communication channels over time among the members of a social system"* (Rogers, 2003)
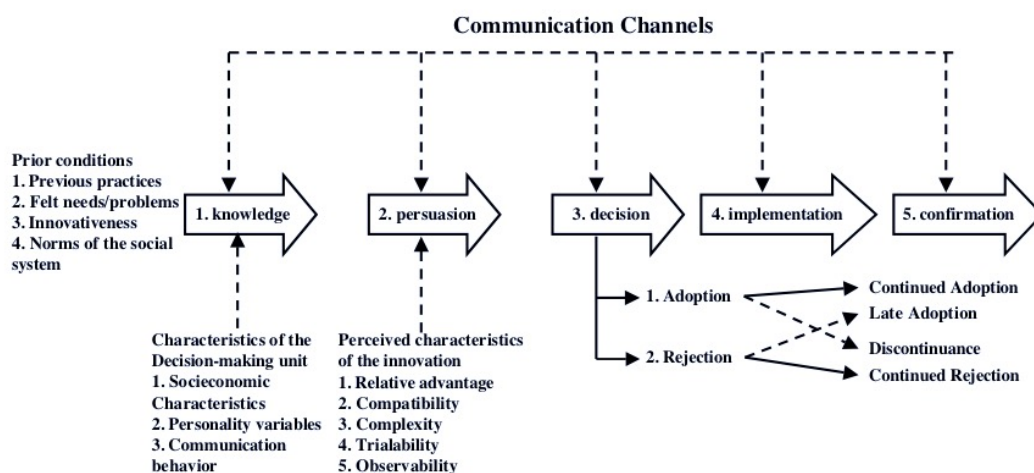

Figure 7 : Components of Rogers Diffusion of Innovation theory (Rogers, 2003)

According to (Rogers, 2003), the rate of adoption of innovations is dependent on the type of innovation, type of adopters and opinion leaders. In this case, the lecturers at Gulu University have been identified as opinion leaders as far as adoption of e-learning is concerned. They largely influence other users like the students to adopt LMS. As such, the Diffusion of innovation (DOI) theory provides the framework to analyse patterns of staff technology adoption in higher education (Zayim et al., 2006). Therefore, the adoption of LMS in higher education can be explained through Rogers' Diffusion of Innovations theory.

DoI postulates that the adoption of a technology in any social system cannot be at the same time. It depends on the attitude of the population that has been divided into five categories
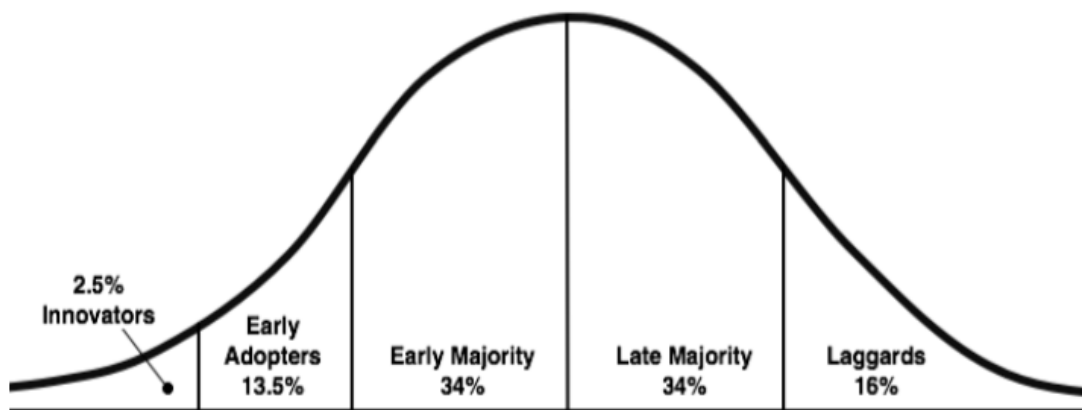
Figure 8: Various categories of Adopters (Rogers, 2003)

Innovators are the venturesome who are interested in the technical aspects, and are risk takers.

Early Adopters are respected and considered as change agents with the greatest degree of opinion about the new ideas. They examine the innovation as regards its benefits and are willing to try it out, provide help and advice to other adopters.

The *Early Majority* is deliberate and more concerned with professionalism. They are willing to adopt the innovation once the majority in society has adopted it.

The *Late Majority* is sceptical and believes less in new ideas and always makes sure that there

are people ready to solve their problems before adoption.

Laggards are most likely to stick to the "old and traditional" ways. They are very critical towards adopting new ideas, and innovation is accepted only if it becomes tradition.

Rogers (2003) identified five attributes that influence attitudes or decisions of an individual during the innovation adoption process. The five attributes include: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability and (5) observability. According to Rogers (2003), individual's perceptions of these characteristics predict the rate of adoption of innovations. Rogers defined the rate of adoption as "the relative speed with which an innovation is adopted by members of a social system". These five attributes proposed by Rogers are significant predictors of the rate of adoption (Sahin, 2006). The five attributes have explained 49-87% of the variance in the rate of adoption of innovations (Roger, 2003).

Rogers (2003) maintains that the proposed 5 attributes were conceptually distinct, supported by literature and allows for maximum generality across studies of perceived attributes. These attributes are explained below;

Relative advantage: This looks at the degree to which an individual perceives an innovation to be superior to the existing practice. The benefits can be in terms of efficiency, quality, reliability, economic profitability and social prestige. Relative advantage represents the benefits from adopting an innovation. There is a positive relationship between relative advantage of an innovation as perceived by members of a social system and the rate of adoption.

Compatibility: This looks at the degree to which the innovation is perceived as consistent with the existing values, felt needs, ways of working, and past experiences of the individual. The greater the compatibility, the faster the adoption. A lack of compatibility negatively affects innovation

Complexity: This relates to the ease of understanding and use of an innovation. Individuals tend to adopt more simple innovations rather than the complex ones. This therefore means that excessive complexity of an innovation is an obstacle to its adoption

Trialability: The perceived possibility to experiment and test the innovation on a limited basis

to allow users to understand the benefits of it. The more the trialability, the faster the adoption of an innovation.

Observability: The degree to which the results of an innovation are visible to others. When an innovation is observable by those considering adoption, the adoption becomes faster.

According to Rogers (2003), an individual's perception of the attributes of an innovation, not the attributes as classified by experts of change agents, affect its rate of adoption. The probability of new ideas being adopted or abandoned by members of a given culture in the social system is explained by Rogers' (2003) Diffusion of Innovations (DOI) theory. Rogers's theory is widely used as a framework for technology adoption and is composed by a number of factors that influence the motivation of users to facilitate the rate of adoption (Sahin, 2006)

In conclusion, the study based on the e-learning readiness models and Rogers Diffusion of innovation theory to design instruments that were used in the data collection and analysis. The choice of the theories used was as a result of their relevance in the study. The next chapter gives a detailed overview of how the study was carried out.

METHODOLOGY

Introduction

This section gives a detailed description of the research methodology and data collection methods used to generate the empirical data from the field.

The study adopted a mixed methods approach in order to establish and determine the level of readiness among the lecturers at Gulu University to adopt LMS. The data was collected in both qualitative and quantitative evidence. The interviews, informal conversations and observation generated qualitative data, which provided views of the respondents. The Questions in the interviews were categorised as Knowledge about LMS, Potential strengths in adopting LMS, barriers in adopting LMS, and Probable solutions. On the other hand, questionnaires were circulated among the respondents which produced substantial amount of quantitative data. The questionnaires were developed through rigorous theoretical review on e-learning readiness models and technology acceptance models. Such data was analysed using SPSS.

Study area

This study was carried out at Gulu University one of the 11 Public Universities in Uganda. The university consists of a total of five (5) faculties namely: Faculty of Science, Education and Humanities, Medicine, Agriculture and Environment, Business and Development Studies. It also has two (2) institutes namely: institute of research and graduate studies; and institute of peace and strategic studies. Gulu University is made up of three (3) campuses with the main campus being located approximately 5 Kilometers, by road, north-east of the central business district of Gulu, the largest city in Northern Uganda.

As of January, 2016, the university consisted of a total of 241 teaching staffs (Saturday Vision, 2016). This study was carried out at the main campus of the university. The university has a LMS known as Gulu University e-learning. It is the LMS which this study investigates and is part of the open source Moodle. This LMS was obtained and customized in-house at Gulu University.

Change in research

The research was designed to explore the readiness level and perception of teaching staffs towards the LMS adoption in Gulu University. However, it was during the data collection process that researcher identified that there was a great challenge in the technological aspect in the University, which was directly associated with the study area. Therefore, the research extended from focusing only at teaching staffs to incorporating the technological solution for the problem.

Context and Sampling of participants

The participants in the study covers both staffs who have been familiarised with the LMS and those who have never been. While the sampling was done randomly, it was made sure that the participants were diverse in terms of faculties and institutes they belonged to.

All the names of the participants have been anonymised in order to respect the privacy of the participant and also to avoid any conflicts that can arise through the data. A total of 6 respondents participated in the interviews. They are noted as interviewee 1 – interviewee 6. Among them, two had been introduced to the LMS while four had never been presented to the LMS. Also, 45 respondents answered the survey questionnaires. These included 21 lecturers who have used the LMS and 24 who have never used the system.

The researcher had a great opportunity to attend a 5 days' workshop called ''Acting with Technology'' organised by the eLearning Lab, Aalborg University and Gulu University. The workshop was attended by 16 lecturers who as a part of the workshop lecturers were all asked to use the Gulu University eLearning platform (LMS) and they openly gave their views about the LMS.

Table 2 provides a brief overview of number of participants recorded in different phases of data collection:

Phase	Method	No. of respondents	Output
1	Interview	6	Qualitative data
2	Survey questionnaires	45	Qualitative and Qualitative data
3	Open discussions in a Workshop	16	Qualitative data

Table 2: Summary of number of participants for different phases of data collection

Data collection procedures

The first phase of data collection was interview, the face to face interviews were carried out individually with 6 lecturers at Gulu University. Semi structured questions were used in the interviews and responses were recorded and also noted as field notes. Further the interviews aided in designing the questionnaires that were used in later phase. As mentioned earlier, the researcher attended a five days' workshop on e-learning and made observations about the use of LMS at Gulu university.

Feedback from these interviews were recorded and partly used in designing the survey questionnaire.

Both electronic and paper based questionnaires were used in this survey. The electronic copy of the questionnaire was designed using Google Forms. A group email of the teaching staffs was then obtained from the web administrator at Gulu University. The electronic questionnaire was sent out to these lecturers. All the respondents in this survey were guaranteed confidentiality and to enforce this, identification fields like name and email were left out in the questionnaires.

The data collection was done between 27th February and 17th April. A total of 45 responses were got.

Construct definitions

The constructs defined below were obtained from Rogers' DoI and three (3) e-readiness models; Chapnick (2000), Psycharis (2005) and Aydin & Tasci (2005). These constructs were used in designing the survey questionnaires. Selection of these constructs was after critically

32

analysing their relevance in the field of e-learning and application to teaching staff as the key participants in this study. These constructs are defined in table 3 below.

Factor	Definition
Psychological readiness	This factor considers the individual's state of mind as it impacts the outcome of the e-learning initiative.
Sociological readiness	This factor considers the interpersonal aspects of the environment in which the program will be implemented.
Environmental readiness	This factor considers the large-scale forces operating on the stakeholders both inside and outside the organization
Technological readiness	This factor considers observable and measurable technical competencies and proper equipment possession
Educational readiness	Here the researcher looked at the learning and educational needs of employees.
Relative advantage:	The degree to which an individual perceives an innovation to be superior to the existing practice.
Compatibility	The degree to which the innovation is perceived as consistent with the existing values, felt needs, ways of working, and past experiences of the individual
Complexity:	The ease of understanding and use of an innovation.
Trialability	The perceived possibility to experiment and test the innovation on a limited basis to allow users to understand the benefits of it.
Observability	The degree to which the results of an innovation are visible to others.

Table 3: Constructs used for measuring readiness and perception of teaching staffs towards the use of LMS

Questionnaire design

The questionnaire was subdivided into 4 main sections namely;

Demographic information (Gender, Age, Faculty and Academic rank).

e-learning readiness: This section had statements to test all the 5 factors used to measure the e-learning readiness. These factors include technological, social, psychological, environmental and educational readiness. The answers to the statements attributed to these factors were based on 2 scales (Yes and No).

Attitude of respondents: This section was used to find out about the attitude of the respondents who have used the Gulu university e-learning platform. Rogers' DOI theory was the basis for developing this section of the questionnaire. It consisted of statements to test all the five predictors from Rogers' DOI theory. Unlike the e-learning readiness section, this section used a 5 Likert scale for the statements (Strongly disagree, disagree, not sure, agree, and strongly agree). This section also had questions to test how the use of LMS have affected the intentions of the respondents to continue using it.

In this section, both positively and negatively worded questions were used. Negatively worded questions were used in order to minimize response bias or response set. According to Nunnally (1967),it is important to use both negatively and positively worded items when measuring the same construct. This is also meant to check that the respondents were reading the questionnaire in a thoughtful manner. However, in the analysis phase, reverse scoring was used for the case of the negatively worded questions.

The indicators used for each construct are given in the table below

Construct	Indicator
Relative Advantage	-Moodle improves my efficiency when I use them. -There are enough advantages of Moodle (LMS for me to consider using them. -Moodle (LMS) help me better manage my time. -Mistakes are more likely to occur with Moodle (LMS) usage than with manual operations.
Compatibility	-I do not need Moodle (LMS) in my work

	-Moodle (LMS) makes lecturers redundant -It bothers me to use Moodle (LMS) when I could do my work manually) *-I worry about the privacy of my information when using moodle. *** *-I worry that moodle (LMS) is not secure enough to protect my personal information. **
Trialability	-It was easy to use moodle (LMS) more frequently after trying them out. -A trial convinced me that using moodle (LMS) was better than using the manual system -It did not take me much time to try Moodle before I finally accepted its use -It's better to experiment with ICTs before adopting them.
Observability	-I was influenced by what I observed as the benefits of using moodle (LMS) -I observed other using LMS and saw the advantages of doing so. -Observing LMS users before using LMS is unnecessary -I have seen how others use LMS before using them.
Complexity	-Moodle (LMS) is complicated to learn -Moodle (LMS) is difficult to understand and use -Moodle (LMS) if convenient to use -Moodle (LMS) if confusing -It is easy to use Moodle (LMS) even if one has not used them before.

Table 4: Constructs and Indicators used to assess the perception of teaching staffs towards use of LMS

The indicators marked * were left out by the researcher in the analysis of the data collected.

Barriers and solutions: The last section asked questions to capture the barriers to the adoption of LMS and the way forward.

35

Data analysis

The collected data was extracted from both Google Form and the printed questionnaires, coded and imported into statistical package for the social sciences (SPSS). Descriptive statistics (means, standard deviations, percentages) were used to summarize and describe the data collected from the respondents. Standard deviation was used to indicate the variability of the responses.

Prior to analysis, negatively worded questions used in the questionnaire were reverse scored.

Assessment method

The assessment of our findings on the readiness to adopt and use LMS based on Aydin & Tasci's (2005) Assessment model. Modifications were made to this assessment model to make it fit to the two scales used by the researcher.
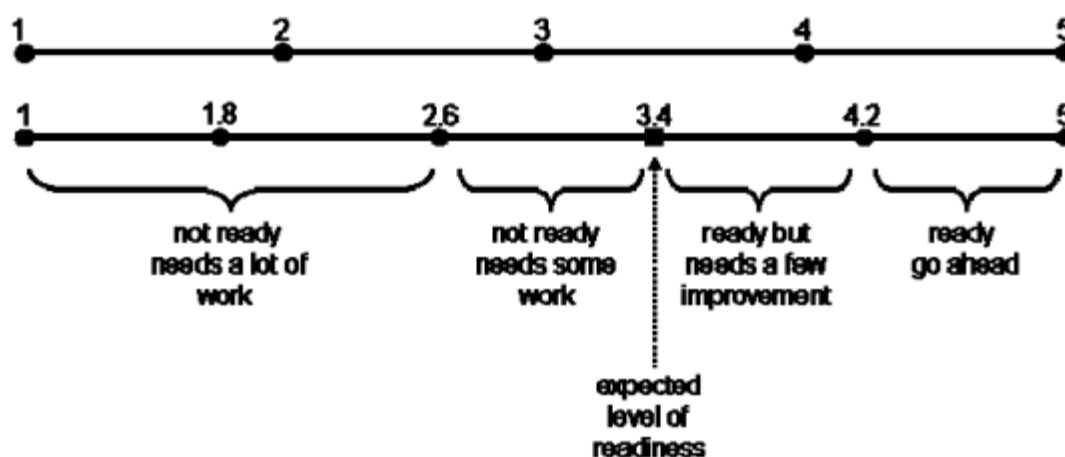

Figure 9: Assessment model according to Aydin & Tasci's (2005)

To translate this scale into our new scale, we employ the principles of normalisation. In normalisation, a variable (univariate distribution) **V** with observed **minOld** and **maxOld** values can be rescaled to range **minNew** to **maxNew** by the following formula:

$$V' = \frac{(maxNew - minNew)}{(maxOld - minOld)} * (V - minOld) + minNew$$

The formula was used in Microsoft excel together with all the variables and the output was as in the table 5.

36

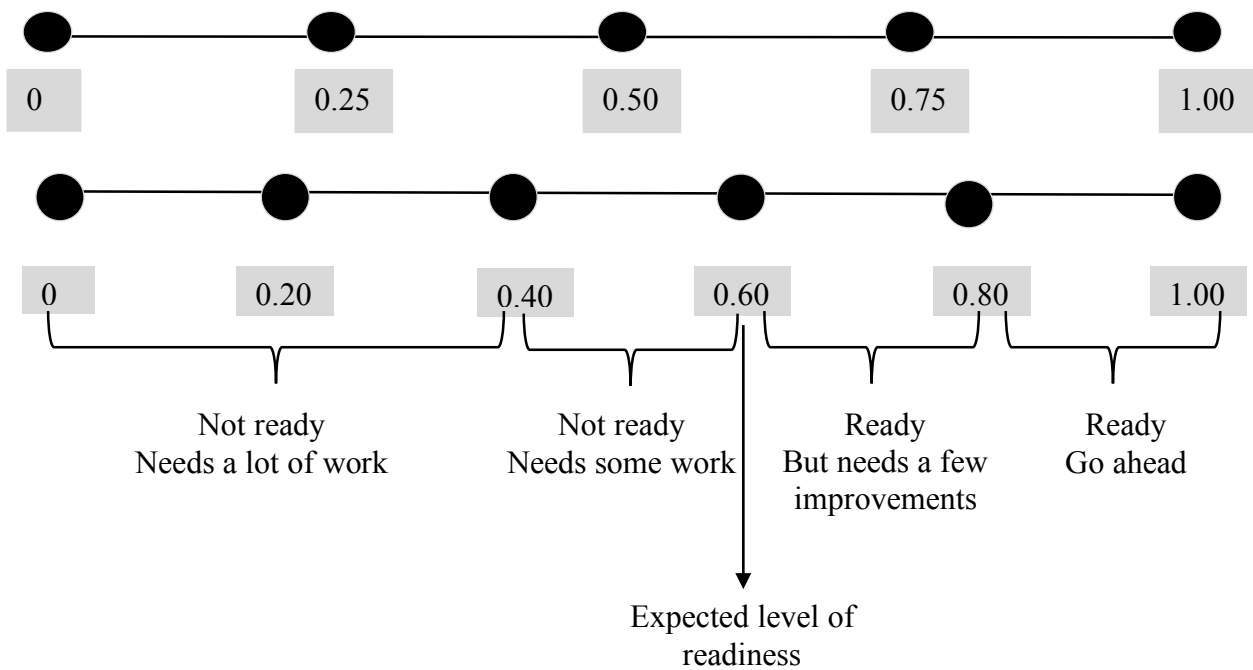| MaxOld	5					MaxNew	1
MinOld	1					MinNew	0
ValuesOld1	1	2	3	4	5		
ValuesNew1	0.00	0.25	0.50	0.75	1.00		
ValuesOld2	1	1.8	2.6	3.4	4.2	5	
ValuesNew2	0.00	0.20	0.40	0.60	0.80	1.00	

Table 5: Scale conversion

Figure 10: Proposed Assessment model used in the study

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Introduction

This chapter presents the results of the data analysis and findings from the interviews, workshop and questionnaires. The first section presents the findings from the interviews. The second section presents the observations and findings from the workshop. The third section presents the quantitative data from the questionnaires. The last section presents the discussion of the results.

Results from the Interviews

Interviews were carried out face to face with six respondents at the primary stage of data collection. Questions were posed to the respondents in regards to the following areas; knowledge about e-learning and LMS, readiness to adopt and use LMS, opportunities and barriers towards implementation of LMS, and way forward towards proper implementation of LMS at Gulu University. A summary of the interviewees is shown in table 6 below

Interviewee	Faculty	Sex	Used LMS	Willing to use
1	Science	Male	Yes	Yes
2	Business	Male	No	Yes
3	Business	Female	No	Yes
4	Education	Male	Yes	Yes
5	Science	Male	No	No
6	Agriculture	Male	No	Yes

Table 6: Summary of Interviewees

For the question "*What does e-learning mean to you?".* All the respondents showed they had basic knowledge about e-learning. The similar response was that e-learning is a technology to facilitate learning. For instance, one respondent described e-learning as: *"… delivering content to students using technology" (interviewee 4)*. While, two respondents brought in the concept of LMS to describe e-learning as the use of internet to deliver content to students. When asked about opportunities for adoption of LMS at the University, all respondents except one were in support of LMS. Those in support gave different advantages of adopting the system at Gulu University which among others included; quick access to academic

resources by both learners and teachers, improvement in the quality of teaching and learning, improvement in students' participation in the learning process, fostering of collaboration between both students and the teaching staff, and competitiveness with other universities.

The respondent who didn't support LMS argued that the course he facilitates is practical in nature and requires students to always be physically available in class. He argues that LMS will increase the rate of absenteeism as students will assume that the online content is enough for their education and thus miss out on the practical aspects.

For the interview question, "*Are you willing to adopt and use LMS to facilitate your teaching?*". Out of six respondents, five were willing to adopt LMS while one as stated earlier preferred the traditional classroom based teaching for his course. Meanwhile, on the issue of "readiness of teaching staff at Gulu University to adopt and use LMS", the arguments provided by the respondents were similar. Most of them argued that while the teaching staff and students may be ready to start using LMS, there exists some constraints with in the university that should be addressed. The common concern among the respondent was low bandwidth in the university that is required to operate the system. One of the respondents recalled his experience of using internet at school and at one of the hotels in the town, "*I easily accessed the platform during one of the workshops at Churchill Courts last year. This is not the case while at the university. The internet here is very unpredictable. It's on now and after a few minutes it either becomes slow or totally off*" (interviewee 4).

On the other hand, the issue about insufficient LMS tools appeared frequently during the interviews. For an example, a respondent from the faculty of business shared his frustration on inadequate resources at university which constrains application of LMS "*Our faculty has no computer lab of its own. We rely on the labs at the faculty of Science for undertaking computer related courses. Besides, some of our students do not own personal computers. This will make the use of the online system a bit hard*" (interviewee 3).

Furthermore, respondents provided perceived solutions for proper adoption and use of LMS in the university, which included the following points:

- High bandwidth internet in the university

- Provision of modems and monthly data subscriptions in case of urgent needs.

- Proper information and adequate training to the teaching staffs regarding LMS

- Involvement of teaching staff in the development of the LMS to improve on its functionality.

- Adequate computer lab for different faculties to avoid congestion and reliance on the few available computers

- Students should be encouraged to purchase laptops and if possible the administration should make it mandatory for all new students to own laptops prior to start of any academic programme

Observations and results from the workshop

As mentioned in the methodology section, the researcher had participated in a workshop titled as 'Acting with Technology'. This section presents the data from the observation and discussions.

The issues discussed in the workshop were mostly similar to the responses received from the interviews. Most of the participants attributed low internet bandwidth and inadequate resources for the small-scale adoption and use of the LMS. Also, the majority affirmed that they have never received any training on the use of the LMS. Some of the participants were made to try out the LMS during the workshop which convinced them that it can be used with minimal instructions.

On the basis of the observation made by the researcher at the university, the internet speed is inconsistent throughout the day. While the speed is faster during off hours and the lunch break period of 1PM-2PM, it is relatively slow during the working hours of the university. Thus, slow internet can be attributed to high traffic congestion during the working hours. Moreover, the researcher has witnessed people struggling to load the university e-learning platform because of the mentioned reasons.

Results from the Survey Questionnaires

The findings from the questionnaires are discussed according to the four sections in the questionnaire. These sections include:

- Demographic factors / Respondent characteristics
- e-learning readiness
- Attitude towards use of LMS
- Barriers and solutions towards adoption and use of LMS

Respondent Characteristics

In order to sample as objectively as possible, two categories of lecturers were considered. The first category was those who have experienced with the LMS (21 lecturers) while the second category comprised of those who have never experienced the LMS (24 lecturers) resulting in a total of 45 selected teaching staff. This diversity in the sample enabled the researcher to get views from both the two groups and thus to avoid the biasness that could come during the presentation of views from only one group. The respondent in the first category were selected as they are registered in the Gulu University e-learning platform. Furthermore, during the workshop, all the lecturers were introduced to the LMS and some were selected to participate in the survey. It is important to note that the principle of random sample was used as it provides the best opportunity to generalise the results to the population.

Gender and age distribution

Out of all the 45 respondents in the survey, 35 were male while 10 were female. This shows that both male and female teaching staffs were represented in the survey. However, the discrepancy in the frequency could be because of the high number of men to women teaching at institutions of higher learning in Uganda.

Respondents were also from different age groups from 26-30 to 50. A majority of them were between the age of 36-40. Overall there was a uniform distribution of the age groups. A summary of the gender and age distribution is given in table 7.

Gender * age Cross tabulation								
		age						Total
		26-30	31-35	36-40	41-45	46-50	Above 50	
Gender	Male	5	4	8	8	2	8	35
	Female	2	2	4	1	0	1	10
Total		7	6	12	9	2	9	45

Table 7: Gender and age of respondents.

Faculty

In order to get an inclusive overview of how LMS is perceived at Gulu University, the perspective of respondents from all the faculties were sought through the use of the questionnaires. The distribution of the respondents is shown in table 8 below.

Faculty	Frequency	Percent
Agriculture & Environment	12	26.7
Business & Development Studies	8	17.8
Education & Humanities	6	13.3
Medicine	3	6.7
Peace & Strategic Studies	5	11.1
Research & Graduate Studies	1	2.2
Science	10	22.2
Total	45	100.0

Table 8: Distribution of the respondents according to their faculty

Academic rank/Designation

The pie chart in figure 11 shows the distribution of the teaching staff who responded to the questionnaires according to academic rank. This distribution of the respondents was expected since the university has few professors compared to lecturers, senior lecturers and graduate trainees.
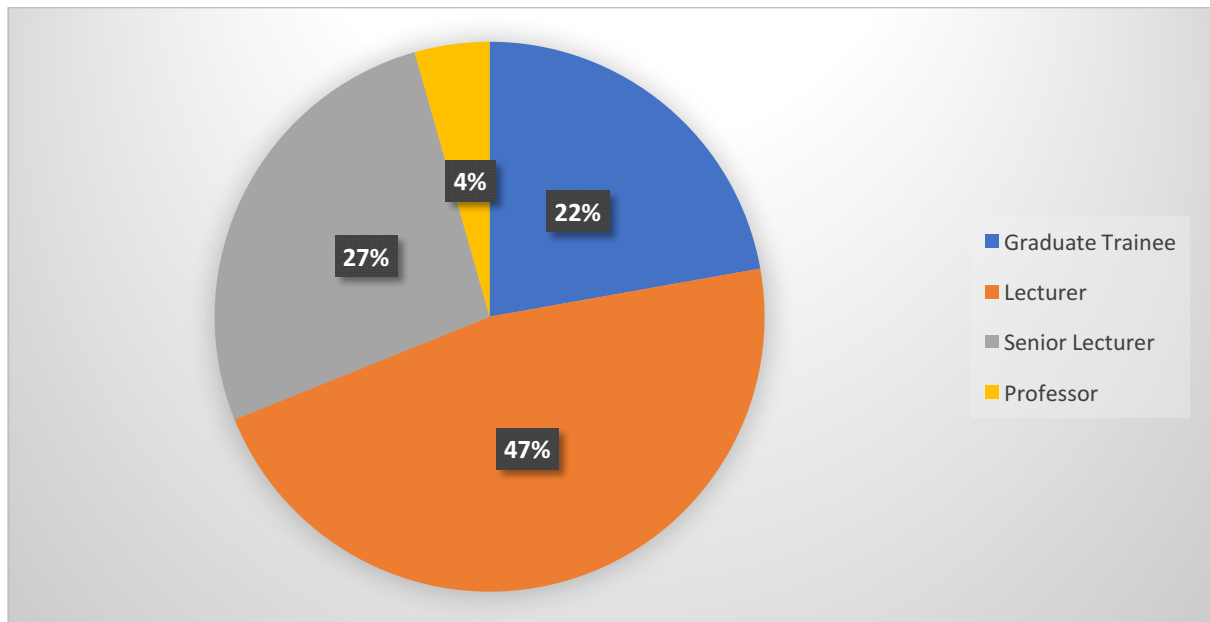
Figure 11:Academic Rank of Lecturers

The next section presents data concerning the five e-learning readiness factors namely; technological, psychological, sociological, environmental and educational.

Readiness of teaching staff at Gulu University in adopting LMS for instruction delivery.

As explained in the methodology, this section of the questionnaire tested readiness using indicators whose responses were attributed to 2 scales (0-No and 1-Yes). From the data, the mean value for the readiness of the five factors was 0.56578 **~0.56**. Table 9 below shows a summary of the mean scores by individual factors.

Descriptive Statistics		
	N	Mean
Technological readiness	45	0.6808
Psychological readiness	45	0.7370
Sociological readiness	45	0.3333
Environmental readiness	45	0.4222
Educational readiness	45	0.6556
Average		**0.56578**

Table 9: Mean scores of readiness

According to the analysis tool for e-learning readiness described in the methodology, this readiness average (0.56) falls between 0.40 and 0.60 and thus signifies that overall, the respondents are not yet ready to use the LMS and some work needs to be done.
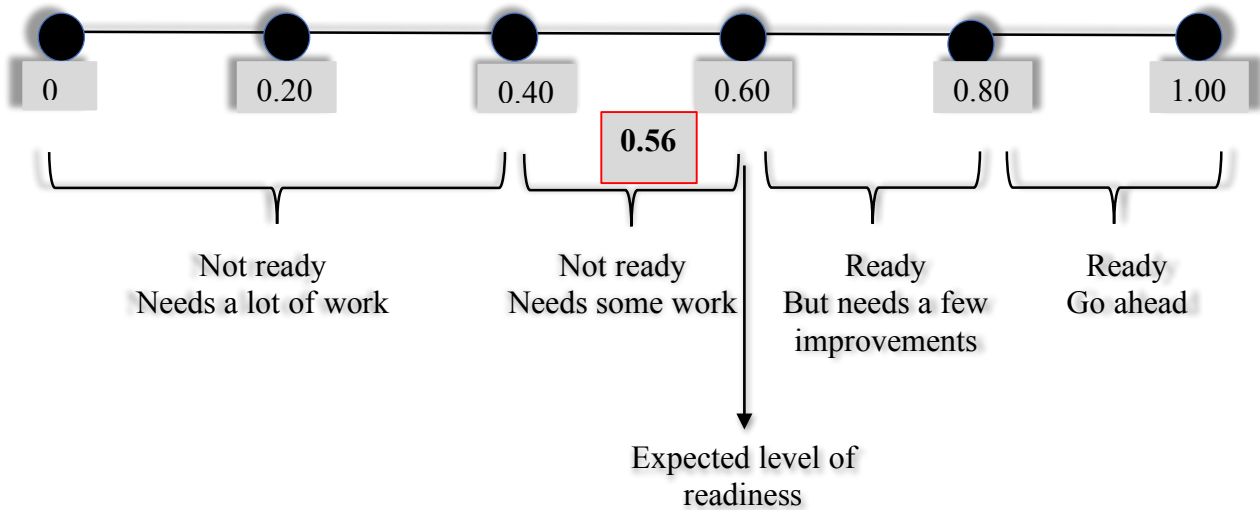

Figure 12: Assessment tool used for e-learning readiness

This low level of readiness is further presented by considering the individual constructs as presented below;

Sociological readiness

According to Chapnick (2000), proper evaluation of e-learning readiness requires that interpersonal aspects of the environment in which the program will be implemented are assessed. This is referred to as sociological readiness. In measuring this construct the researcher considered four statements. These are shown in table 10 below with frequencies of feedback from the respondents.

	Indicator	Yes	No
		n (%)	n (%)
1	I discuss about LMS with my colleagues' time and again	9 (20%)	36 (80%)
2	I get questions about LMS from my students	7 (15.6%)	38 (84.4%)
3	e-Learning is discussed in staff meetings	17 (37.8%)	28 (62.2%)
4	I have discussed about e-Learning with international academicians	27(60%)	18(40%)

Table 10: Sociological readiness of teaching staff.

As the data shows, the teaching staff are more involved in discussing LMS with the outsiders (international academicians) than those from the university which raises the question of 'interpersonal communication environment' as pointed out by Chapnick (2000).The huge disparity in communication involvement points out lack of theoretical and practical understanding of the subject in the university while the same is provided by the academicians who come from foreign universities, who are experienced in using LMS. It is also evident from the data that only a few teaching staffs get questions from the students.

Psychological Readiness

Table 11 below shows respondents agreement to 6 indicators used to measure psychological readiness.

	Indicator	**Yes**	**No**
		n (%)	**n (%)**
1	I have sufficient information about e-learning	25(55.6%)	20(44.4%)
2	I have enough knowledge and competency to prepare e-learning materials	15(33.3%)	30(66.7%)
3	I feel I am ready to integrate e-learning into my teaching	31(68.9%)	15(31.1%)
4	I believe my students will like e-learning	41(91.1%)	4(8.9%)
5	I believe LMS is important to my department	42(93.3%)	3(6.7%)
6	I think LMS can make teaching and learning more creative	45(100%)	0(0%)

Table 11: Psychological readiness of teaching staff.

Four of the indicators received tremendous positive responses from the respondents recording a percentage of agreement from 68.9% (on readiness to integrate e-learning into teaching) to 100% (on LMS can make teaching and learning more creative. The two exceptions were knowledge and competence to prepare e-learning materials (33.3%) and sufficient information about e-learning (55.6%). This pattern in the responses indicate that though the teaching staff are psychologically ready to integrate e-learning in their teaching, they still

need to be equipped with more information and knowledge on how to prepare e-learning materials.

Environmental readiness

To measure environmental readiness, the respondents we asked if they were aware of any university in Uganda using LMS for teaching. 57.8% of the respondents were not aware of any university using LMS. For the 42.2% who were aware about the other universities using LMS, a majority of them only cited Makerere university which contradicts the existing literatures that says a number of institutions in Uganda have already implemented LMS. This is evident that LMS is still considered a new innovation among many teaching staff at Gulu University.

Educational Readiness

Two items were used to measure educational readiness.

	Indicator	Yes	No
		n (%)	n (%)
1	Have you ever undertaken training on the use of an e-learning platform like Moodle?	17(37.8%)	28(62.2%)
2	Are you willing to undertake training on an e-learning platform like moodle	42(93.3%)	3(6.7%)

Table 12: Education readiness of teaching staff.

As shown above, a majority of the respondents have never been trained in using LMS. Only 37.8% had the training. This indicates that a lot has to be done by the institution as far as preparing the teaching staff on the usage of LMS is concerned. However, a majority of the respondents were positive about receiving training on the use of LMS.

Technology Readiness

Technological readiness had a mean score of 0.6086. This score is slightly above the expected level of readiness. This indicates that some slight improvements need to be done as far as the technological aspect is concerned.

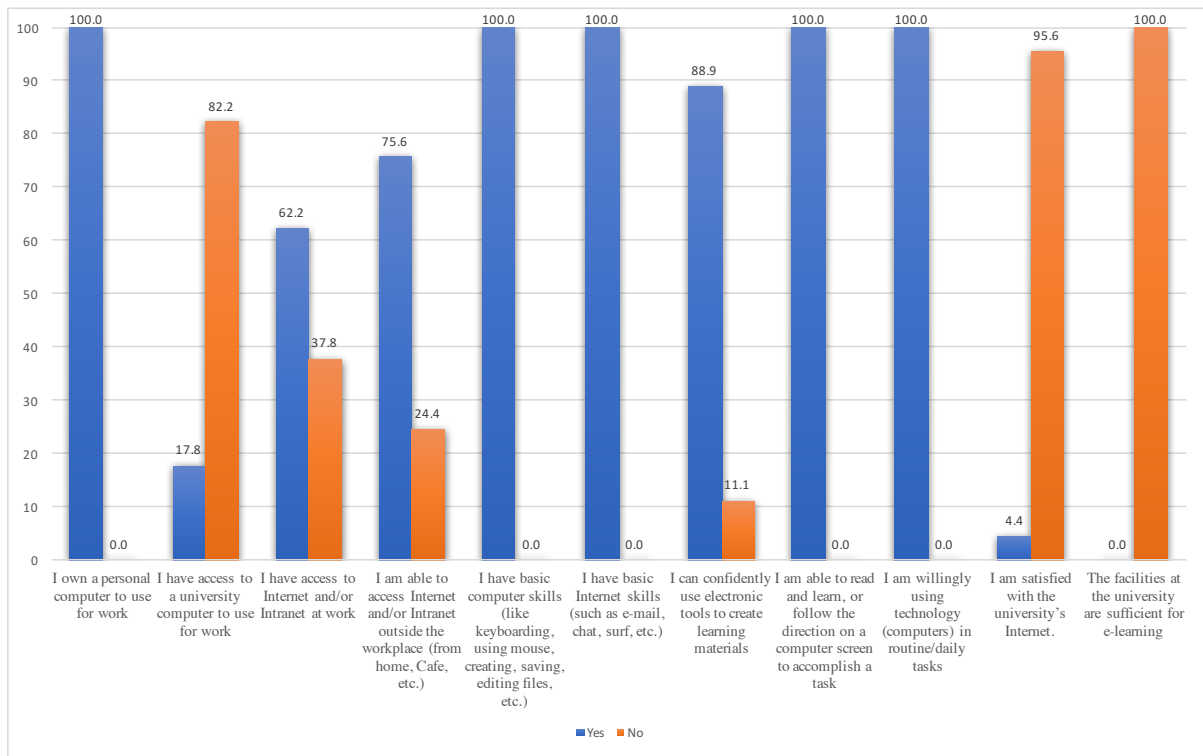A summary of the scores by the various components to measure technological readiness is shown in figure 14.

Figure 13: respondents' agreement to technological readiness (%)

All the respondents indicated they were willingly using technology in routine tasks, able to follow instructions on a computer screen in order to complete a task, have basic internet and computer skills, and own a personal computer. Also, a majority indicated that they had access to internet outside the workplace (75.6%) and can confidently use electronic tools to create learning materials (88.9%)

However, three matters had a majority of respondents disagreeing. These include;

- Access to university computer for to use for work (82.2% disagreed),
- Satisfaction with university's internet (95.4% disagreed),
- Sufficiency of university equipment for e-learning (100% disagreed)

This matches with the responses received during the interviews pertaining LMS use at Gulu university. Below are some of the excerpt from the interviews;

"I find difficulties accessing it at the university because of the slow internet." (Interviewee 1)

"Well, we have been having challenges with the internet. It is not reliable at all. This will definitely affect the e-learning platform." (interviewee 2)

"I think the university will only be ready to use this platform if the internet is improved." (interviewee 4)

The low internet bandwidth was also witnessed by the researcher during the workshop. When participants were told to log into the LMS and upload some materials, none was able to do so due to the poor internet.

The disparity in the results indicate that though most respondents are confident about their own skills and knowledge in using e-learning, the university is not yet in position to support the proper implementation because of unreliable internet access and insufficient equipment.

These findings correspond with prior evidence presented in the literature. Findings by both Unwin et al (2010) and (Black et al., 2007) indicate that technical barriers like low connectivity and unreliable connectivity are the biggest barriers to implementing LMS in developing countries. As such a solution to cub this challenge could play an important role in improving the readiness of the teaching staff.

Perception of teaching staff in using LMS in delivering instructions to students.

According to Rogers (2003), attitudes of individuals towards a given innovation play a vital role in its diffusion. An individual's decision to accept or reject an innovation is influenced by the attributes or characteristics of an innovation (Rogers, 2003).

All the five attributes provided for by Rogers' DOI were identified in the data. An overall positive attitude was identified in relation to relative advantage, compatibility, trialability, observability and complexity with mean scores of 4.04, 4.24, 4.12, 3.81 and 3.82 respectively. The overall mean for all the factors was 4.00.

In analysing how the lecturers perceive the innovation at Gulu University, the questionnaire used statements for all the 5 predictors that influence the decision to adopt an innovation. A Likert scale was used for the responses and these ranged from 1-5 where 1-strongly disagree, 2-disagree, 3-not sure, 4-agree, 5-strongly agree.

The mean and standard deviation of the predictors were calculated and the results are as below.

Descriptive Statistics			
	N	Mean	Std. Deviation
Relative Advantage	21	4.04	0.44
Compatibility	21	4.24	0.32
Trialability	21	4.12	0.44
Observability	21	3.81	0.47
Complexity	21	3.82	0.40
Average Score		4.00	

Table 13: Mean and Standard deviation of the Predictors

This data was from 21 respondents who had used the LMS. The findings are discussed below:

Relative advantage

To determine relative advantage, the researcher used three statements to determine whether or not the LMS is a useful innovation to the teaching staff (Table 14). From the survey data, a majority of the respondents were in agreement with statements that checked on their perception of LMS as far as relative advantage is concerned. Table 14 shows the responses of the teaching staff in both frequency and percentages for the relative advantage dimension.

	Indicator	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		n (%)	n (%)	n (%)	n (%)	n (%)
1	Moodle improves my efficiency when I use them	0 (0%)	1 (5%)	0 (0%)	13 (62%)	7 (33%)
2	There are enough advantages of the LMS (Moodle) for me to consider using them	0 (0%)	0 (0%)	2 (10%)	11 (52%)	8 (38%)
3	Mistakes are more likely to occur with the Moodle (LMS) than with manual operations	1 (5%)	14 (67%)	2 (10%)	4 (19%)	0 (0%)
4	Moodle (LMS) helps me better manage my time	1 (5%)	0 (0%)	1 (5%)	15 (71%)	4 (19%)

Table 14: Relative advantage of LMS

Table 14 indicates that the majority of the respondents were in agreement that LMS is important; 95% (Agree=62%, Strongly Agree=33%) of the respondents agreed that LMS is a useful innovation that improves their efficiency. This is probably because once the respondents never had problems once they were logged into the innovation (LMS). This conforms with some of the statements made by the respondents during the interviews when they were asked about their experience in using the LMS. Some of the responses include:

"I easily accessed the platform during one of the workshops at Churchill Courts last year"

"The platform can be accessed from anywhere"

"The platform also allows me to interact with other lecturers"

Also, a majority of respondents, 90%(Agree=52%, Strongly Agree=38%) believed that there are enough advantages associated with using LMS. On the issue of time management, only 1 respondent disagreed with the statement and 1 was not sure. The rest of the respondents,

90% (Agree=71%, Strongly Agree=19%) agreed that LMS helps them better manage their time.

To avoid biasness in responses, a negatively worded statement towards LMS was also presented in the questionnaire. The statement was meant to check how respondents perceived the innovation in terms of accuracy. A majority of the respondents 72% (Disagree=67%, Strongly Disagree=5%) disagreed with the statement "mistakes are more likely to occur with LMS than the manual mode of operations". This implies that the respondents perceive the LMS as being more accurate compared to the traditional way of handling tasks.

Overall, there was a positive response to all the four statements for relative advantage. Analysis of the data from the questionnaire indicates that the innovation (LMS) is useful with a high perceived relative advantage. Rogers (2003) postulated that the higher the perceived relative advantage, the more likely it is that the innovation will be adopted. With an overall mean score of 4.04 or overall mean percentage of 87% (agree and strongly agree) – after reverse scoring the negatively worded statement, it is evident that innovation is more likely to be adopted by the teaching staff.

Compatibility

Compatibility was defined by Rogers (2003) as the "degree to which an innovation is perceived as consistent with the existing values, past experiences of needs of potential adopters". Additionally, the greater the compatibility, the faster the adoption. A lack of compatibility negatively affects innovation (Rogers, 2003). Table 15 gives a summary of the findings from the study about compatibility of the LMS.

	Indicator	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		n (%)	n (%)	n (%)	n (%)	n (%)
1	I do not need Moodle (LMS) in my work	6 (29%)	14 (67%)	1 (5%)	0 (0%)	0 (0%)
2	Moodle (LMS) makes lecturers redundant	4 (19%)	17 (81%)	0 (0%)	0 (0%)	0 (0%)
3	It bothers me to use Moodle (LMS) when I could do my work manually	6 (29%)	15 (71%)	0 (0%)	0 (0%)	0 (0%)

Table 15: Compatibility of the LMS

Statements used to test compatibility were all negatively worded. Results show that a majority of the respondents disagreed with the statements. A majority of respondents 96% (Disagree=67%, Strongly Disagree=29%) were in disagreement with the statement "*I do not need Moodle (LMS) in my work*". This shows that all the respondents perceive the LMS as being a necessity in their work.

All the respondents disagreed with the statements *"Moodle (LMS) makes lecturers redundant)"* 100% (Disagree=81%, Strongly Disagree=19%) and *"It bothers me to use Moodle (LMS) when I could do my work manually"* 100% (Disagree=71%, Strongly Disagree=29%). The results indicate that the LMS is a compatible innovation which fits in with their day to day activities.

Overall, a majority of the respondents (Mean score 4.24 or overall mean percentage of 98.7%) perceive the LMS as being compatible with the current values and needs of the teaching staff.

Trialability

According to Rogers (2003), trialability is "The degree to which an innovation may be experimented with on a limited basis". The trialability is in terms of experimenting with the innovation or seeing others use the innovation. A summary if findings about trialability of the LMS are given in table 16 below.

	Indicator	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		n (%)	n (%)	n (%)	n (%)	n (%)
1	It was easy to use Moodle (LMS) more frequently after trying it	0 (0%)	1 (5%)	2 (10%)	12 (57%)	6 (29%)
2	A trial convinced me that using Moodle (LMS) was better than using manual systems	0 (0%)	0 (0%)	1 (5%)	15 (71%)	5 (24%)
3	It did not take me much time to try Moodle before I finally accepted its use	0 (0%)	1 (5%)	2 (10%)	16 (76%)	2 (10%)
4	It's better to experiment with ICTs before adopting them	0 (0%)	0 (0%)	0 (0%)	15 (71%)	6 (29%)

Table 16: Trialability of LMS

From the data, it is evident that the majority of the respondents were contented with using the LMS. From the table above, it can be observed that 86% (57% Agree, 29% Strongly Agree) of the respondents agreed that it was easy to use LMS more frequently after trying it. Moreover, a trial convinced a majority of the respondents 96% (71% Agree, 24% Strongly Agree) that using LMS was better than manual systems.

Furthermore, 86% (76% Agree, 10% Strongly Agree) of the respondents agreed with the statement *"It did not take me much time to try Moodle before I finally accepted its use".* This shows that the interface of the LMS is easy to use and the respondents quickly accepted its use. All respondents 100%(71% Agree, 29% Strongly Agree) were in agreement that ICT solutions should be experimented before adopting them. Perhaps this can be attributed to the fact that all the teaching staff had technical skills on how to use various internet services like email and chat as established in the technological readiness of the teaching staff. From

the interviews, none of the respondents mentioned any problem associated with the LMS itself. The only constraint that was mentioned was the slow internet at the University and problems with username and passwords. The experiences captured from the interviews include:

"I didn't find much difficulty with using the platform. One of the challenges that I had was when I lost the password. Retrieving this password required me to first contact the web admin.", "The other challenge is that the platform requires good internet connectivity and yet the internet is not reliable at the University. The internet speed is not good enough."

Overall, a majority of the respondents (mean score of 4.12 or Average percentage of 92%) perceive the innovation as having a higher trialability.

Observability

Observability is defined by Rogers (2003:16) as the "the degree to which the results of an innovation are visible to others". Furthermore, Rogers (2003) ascertains that the easier it is for individuals to see the results of an innovation, they more likely they are to adopt.

The data indicate that most respondents 90% (76% Agree, 14% Strongly Agree) were influenced by what they observed as benefits of using LMS. Most of them 86% (76% Agree, 10% strongly Agree) also agreed that this was after observing others use LMS where they saw the advantages of using it. This is possible because prior to using the LMS, most of the teaching staff were introduced to the system through a practical session from which they probably observed the advantages of using the LMS.

A majority of respondents 86% (76% Disagreed, 10% Strongly Disagreed) disagreed with the negatively worded statement "*Observing e-learning users before using it is unnecessary*". This implies that they believe that it is important to observe e-learning users before using it. Table 17 gives a summary of the statements used to test Observability.

	Indicator	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		n (%)	n (%)	n (%)	n (%)	n (%)
1	I was influenced by what I observed as the benefits of using Moodle (LMS)	0 (0%)	0 (0%)	2 (10%)	16 (76%)	3 (14%)
2	I observed others using eLearning and saw the advantages of doing so	1 (5%)	2 (10%)	0 (0%)	16 (76%)	2 (10%)
3	Observing eLearning users before using it is unnecessary	2 (10%)	16 (76%)	0 (0%)	3 (14%)	0 (0%)
4	I have seen how others use eLearning before using them.	1 (5%)	3 (14%)	0 (0%)	16 (76%)	1 (5%)

Table 17: Observability of LMS

Complexity

Rogers (2003:16) defines complexity as the "degree to which an innovation is perceived as difficult to understand and use". Individuals are less likely to adopt innovations that are perceived as complex. Table 18 below indicates the responses.

In testing complexity, a mixture of both positively and negatively worded statements were used. Statistics show that 91% of the respondents perceived LMS as not complicated to learn, 86% perceived it as not difficult to understand and use, 91% perceived it as convenient to use. LMS was also perceived as being less confusing and easy to use without prior experience. Generally, the respondents perceived the LMS is easy to learn, understand and use.

The perceived ease of use of the LMS is indicative that the teaching staffs at Gulu university are more likely to adopt the innovation (LMS). A summary of the statistics is shown in table 18.

	Indicator	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
		n (%)	n (%)	n (%)	n (%)	n (%)
1	Moodle (LMS) is complicated to learn	1 (5%)	18 (86%)	2 (10%)	0 (0%)	0 (0%)
2	Moodle (LMS) is difficult to understand and use	2 (10%)	16 (76%)	1 (5%)	2 (10%)	0 (0%)
3	Moodle (LMS) is convenient to use	1 (5%)	1 (5%)	0 (0%)	17 (81%)	2 (10%)
4	Moodle (LMS) is confusing	3 (14%)	14 (67%)	1 (5%)	3 (14%)	0 (0%)
5	It is easy to use Moodle (LMS) even if one has not used them before	3 (14%)	0 (0%)	4 (19%)	14 (67%)	0 (0%)

Table 18: Complexity of the LMS

Barriers and solutions towards adoption of LMS

Advantages of using LMS

The respondents were asked to state what they perceive as the advantages of LMS. Some of the responses captured include;

- Increased and easy access to learning resources.
- Increased enrolment of students at the university since learning will no longer depend on the students' presence at the university.
- Promotion of distance learning.
- Makes learning student/learner centred and students will be encouraged to study more on their own.
- Time saving and cost effective. It is cost effective because students can learn online and pay less.

Barriers to the usage of LMS

According to data provided by the respondents, the following are the challenges towards the use of LMS at Gulu University.

- Poor ICT support services
- lack of commitment by staff
- poor internet connectivity
- low sensitisation of staff about Moodle,
- unreliable electricity at the university,
- lack of awareness about the LMS by both the teaching staff and the students.

Enablers towards the use of LMS

In order to improve the adoption and use of LMS at the university, the respondents proposed the following.

- Facilitation of staff in terms of mobile data packages
- Communication improvement and training
- Upgrade of the University internet
- Provision of more e-learning equipments like projectors
- Increase in the support staffs

Discussion

As stated in Chapter I, there are three purposes of this study. First the study seeks to find out the challenges and enablers towards adoption of LMS by teaching staffs in Uganda. Second, to measure the level of readiness of the teaching staffs in adopting LMS. Third, to assess the perception of the teaching staffs towards the use of LMS. Based upon these aims, the findings of the study are discussed as below.

Discussion 1: Challenges and enablers towards adoption of LMS

This study has identified poor internet accessibility and inadequate facilities as the main challenges towards the use of LMS in education institutions which coincides with the findings from Azarias et al. (2010). Similarly, Unwin et al. (2010) states that many developing countries

face a challenge of network access affecting the implementation of technology in education. A study from Bhartu and Whelan (2007) also identified Infrastructure and internet access as the main challenges facing the adoption of LMS. The researcher also identified inadequate awareness among the teaching staffs of Gulu university in regards to the use of LMS. This arises due to the fact that LMS is still a new technology for most universities in developing countries. Other challenges that are identified are unreliable power supply, poor ICT support services and lack of commitment by staff.

As a technological solution to the internet connectivity problem the researcher proposes an architecture based on Castro & Ferreira (2010). The authors used both local and cloud servers (main servers) and deployment of both mirroring and synchronization techniques (ibid.).

Figure 14 shows the current architecture employed by Gulu University. Users access the LMS which resides on a web server. Access to this resource is only possible when the user is connected to the internet. Also, the internet bandwidth ought to be good enough to download the resources from this web service. In case the internet is off or slow, users are deprived of access to the LMS
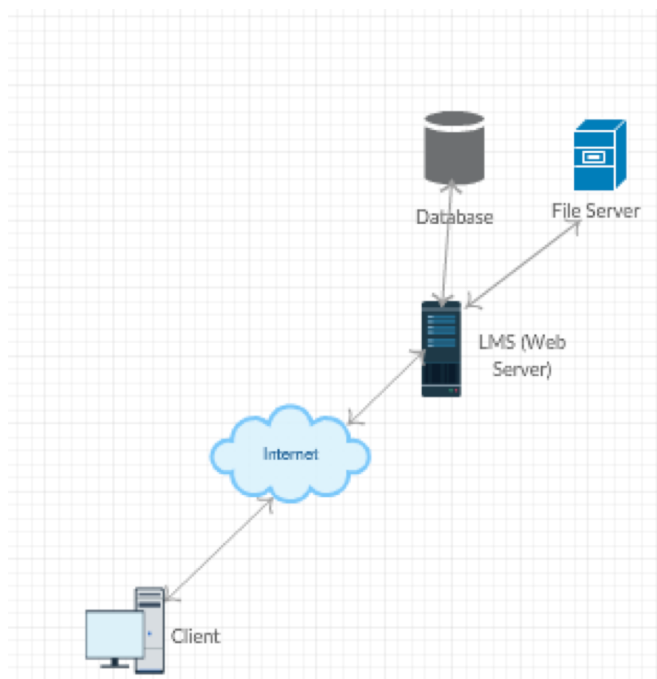
Figure 14: Current architecture being used by Gulu University

The solution to this would be adopting an architecture shown in figure 15 below. This architecture is built on 2 scenarios: 1) no/limited internet access and 2) full internet access.

This architecture also involves employing a local server and a local database which will mirror resources from the web server and primary database.

When internet access is lost/limited, accesses are redirected to the local server. Here, the user will be able to access resources since the last update made to the local server. When connection is restored, the changes made on the local server are sent to the primary server. This process is enabled by synchronization between the local server and primary server (LMS web server). The synchronization will be based on RSYNC algorithm. This algorithm was programmed to add information to data directories anytime.
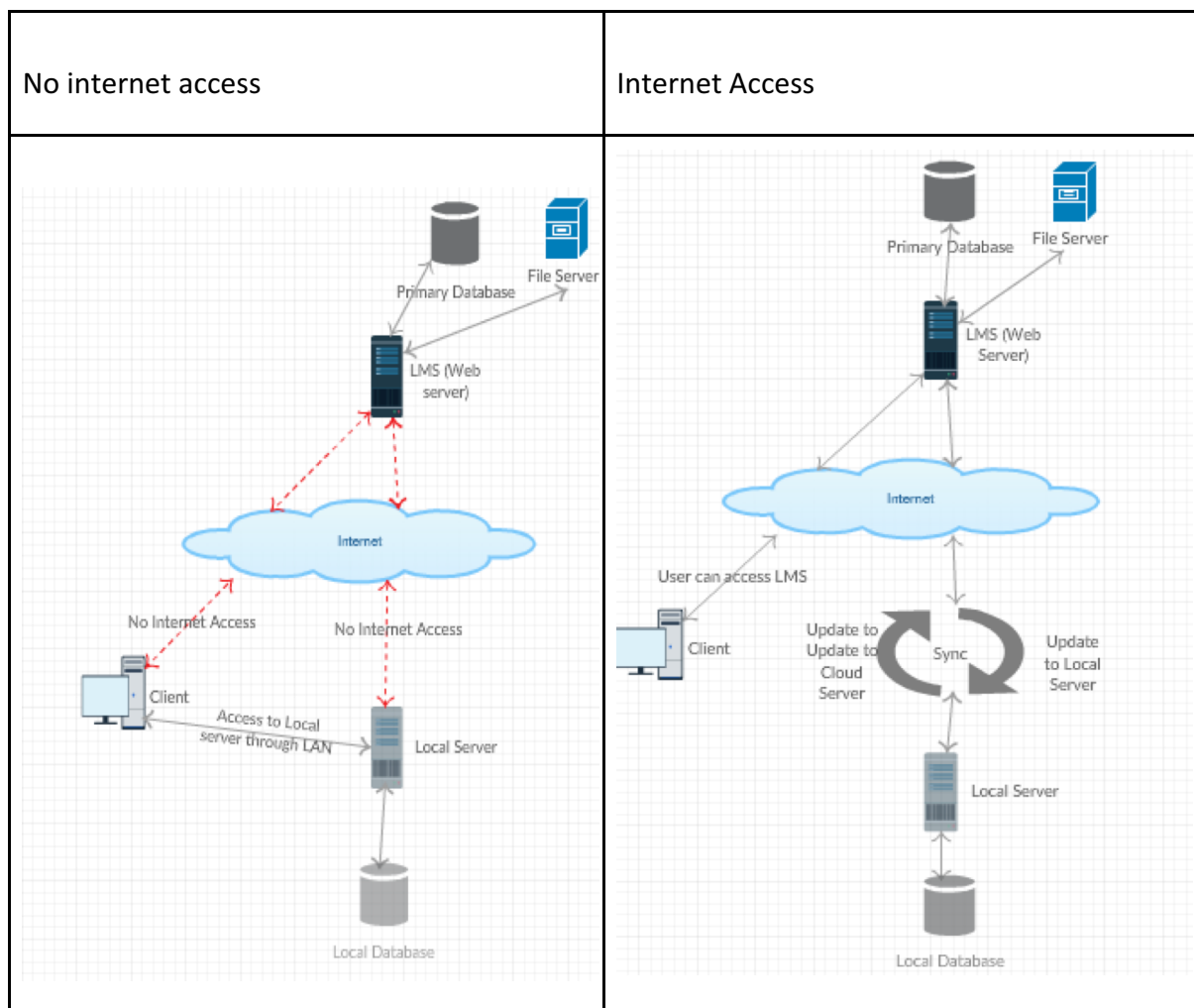
Figure 15: Proposed architecture

To further explain the above solution, the researcher considers a case where a lecturer wants to upload materials to the LMS at a time when the internet is lost/limited. The user will be redirected to access the LAN where he can upload the materials. A timestamp is added to the upload and this is stored on the local servers. When the internet stabilizes, the local server

synchronizes with the LMS web server and an update is made between the two servers able to upload the materials. As such, the lecturer is able to upload the materials irrespective of the status of the internet.

Thus, the users will be in position to access the LMS irrespective of the internet connectivity states. However, it should be noted that technological improvements alone cannot guarantee adoption and use of LMS. Other factors like staff training and ICT support services should as well be addressed.

Discussion 2: Are the teaching staffs ready to adopt LMS?

Findings from the study indicate that generally there is a low level of readiness of the teaching staffs in adopting LMS (see Table 9). The findings indicate that the teaching staffs have basic technological skills as they can use both internet and basic computer applications with ease. With such skills, they are in position to use the LMS. This is one of the reason for the positive perception to use LMS by those who have accessed the e-learning platform, this shall be discussed in the next section. Moreover, they all own personal computers. The fact that each teaching staff owns a computer indicates that they are investing in ICT and willing to use it for their day to day activities. However, there exists some technological factors that hinders the use of LMS. These factors include unreliable internet access and lack of equipment (for example Projectors, Video cameras, and video conferencing facilities) to facilitate LMS. These two technological constraints were also identified by Azarias et al., (2010), Unwin et al., (2010) and, Makokha & Mutisya (2016).

Besides the technological factors, there also exists some social and psychological constraints. This corresponds with findings by (Kafyulilo & Keengwe, 2013). The sociological constraints emerge from the fact that LMS is still a new technology being introduced in the Gulu university and thus the teaching staffs hardly discuss about it amongst themselves. On the other hand, the psychological constraint exists because the teaching staffs have insufficient information about LMS and also inadequate competence and knowledge to prepare e-learning materials.

Another aspect of e-learning readiness that needs strong attention is education of the teaching staffs. Findings indicate that there is lack of awareness and training given to the

teaching staff as far as e-learning is concerned. The university is not investing enough in training the staff. Kamba (2009) also identified lack of investment as a big challenge towards the readiness of universities to implement and use LMS. In the case of this study, the staffs are willing to undertake the training. This provides a good opportunity for the administration to take action if the university is to benefit from the LMS. A study by Muganda (2006) found out that training is one of the key factors that improves the readiness of teaching staffs in adopting e-learning.

Discussion 3: Perception of teaching staffs towards the use of LMS

The study used Five major constructs from Rogers diffusion of innovation theory (relative advantage, compatibility, trialability, observability and complexity to measure the perception of staffs towards the use of LMS. A total of 21 teaching staffs who have used the LMS responded to the survey questionnaire.

Generally, there was a positive perception of the teaching staff towards the use of LMS (see Table 13). Findings from the study showed that the teaching staffs perceived the LMS as having a higher relative advantage to the current system of teaching and learning. As shown in the data presentation and analysis section (Table 14), it was agreed by respondents that LMS is an innovation that has more advantages, saves time and improves the efficiency of the teaching staff. According to Rogers (2003), such innovations with higher relative advantages are most likely to be adopted. Similarly, the LMS was perceived as being compatible to the current mode of teaching. The current mode of teaching involves face-to-face interface with the students. The lecturers believe that LMS will compliment on this mode of learning. Findings also indicated that lecturers were in position to try/experiment with the LMS before consistent use. It was also easy for them to use the LMS. This arises because of the simple design of the LMS and the fact that the teaching staffs have some basic technological skills. They also perceived LMS as being a less complex innovation (Table 18).

In accordance to Rogers (2003), the findings indicate that the innovation (LMS) is most likely to be adopted and used by teaching staffs at Gulu University. All the constructs from Rogers (2003) fared positively with an overall mean of 4.00 on a scale of 5.

Conclusion

This study has identified various key challenges towards adoption of the LMS in a university setting; among which poor internet connectivity and inadequate e-learning resources has emerged as the most challenging factors. On the positive side, the teaching staffs had a positive perception towards the use of LMS and were willing to incorporate LMS in teaching, all of them owned a personal computer and had basic internet and computer skills which are favorable conditions towards the use of LMS in the university. The research was guided by the e-learning readiness models; Chapnick (2000), Psycharis (2005) and (Aydin & Tasci, 2005) and Rogers' Diffusion of innovation theory.

Findings and review of literature shows that technological constraints namely; low internet bandwidth and inadequate e-learning equipments are the biggest challenges as far as implementation of LMS is concerned in developing countries. In order to provide a solution to the technological constraint that emerged, the study proposed an architecture that would use mirroring and synchronization techniques to resolve the low or inconsistent internet connectivity.

The overall findings from the study reveal that the teaching staffs were not ready to adopt LMS and thus there is need for reforms in order to improve on their readiness. However, their perception towards the use of LMS was positive. Moreover, the challenges that the study has identified can highly be related to the situation in most of the developing countries and their educational institutions; poor internet connectivity, insufficient e-learning facilities, inadequate training for the staffs, lack of commitment by both the staffs and administration and poor ICT support services are the overlapping constraints in universities of developing nations.

The study reveals that the positive perception towards the use of LMS was as a result of the perceived advantages, compatibility, trialability, less complexity and visibility of results as far as the use of the LMS was concerned. This show that LMS has a great scope in the developing countries provided that the challenges are taken into considerations and alternatives like the proposed architecture are brought into implementation. LMS can play a vital role in changing the traditional teaching and learning processes in the developing countries and most

importantly to make education more accessible by reducing the time and cost. Hence, on the basis of the study done in Gulu university, following recommendations are provided to universities in developing countries in order to be adaptable to LMS:

1. The universities should upgrade their internet bandwidth to improve on the availability of the LMS. Alternatively, the universities can adopt an infrastructure that deploys both web mirroring and synchronization
2. Universities be equipped with more e-learning tools like projectors, cameras, loud speakers etc.
3. More e-learning workshops should be held to improve on the awareness of teaching staffs in matters pertaining e-learning
4. Staffs should be trained and motivated to use LMS more interactively
5. Universities should deploy more ICT support staffs at departmental levels to help teaching staffs troubleshoot any problems that may arise while using LMS

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Appendix

Appendix 1: Interview Guide

ICT in Education: Adoption of Moodle as a Learning Management System at Gulu University.

Interview guide for teaching staffs.

1. What does e-learning mean to you?
2. Have you ever heard about LMS (Learning Management Systems)?
3. Have you ever attended a training on eLearning?
4. What are the advantages of using e-learning
5. What are some of the problems associated with using e-learning
6. Do you think Gulu University is ready to use LMS/e-learning?
7. What should be done to facilitate the adoption of e-learning at Gulu University?

Appendix 2: Interview responses

Male from Faculty of Science

Interviewer: Have you heard about the term e-learning?

Interviewee: Yes. I have knowledge about e-learning. I use it quite often.

Interviewer: What does e-leaning mean to you?

Interviewee: Basically, I consider e-learning to be the use of technology in education. For example, use of my computer and internet to prepare lecture materials, use of PowerPoint slides, etc.

Interviewer: Have you ever heard about LMS (Learning Management Systems)?

Interviewee: Oh yes, I teach at the department of computer science. In one of the courses I teach, we talked about different management systems of while a learning management system is part. At one point, we had a learning management system at the department level. Unfortunately, most lecturers and students didn't welcome the idea and the project phased out. Of late, we have the Gulu university e-learning platform which I believe is another learning management system.

Interviewer: According to you, what are some of the advantages of using LMS for teaching?

Interviewee: LMS comes with very many advantages. First and foremost, there will be quick access to academic resources by lecturers and students. Secondly, it will allow for collaboration with fellow lecturers. And lastly, it improves on the participation of students in the learning process.

Interviewer: Have you ever used the Gulu university e-learning platform?

Interviewee: Yes, I have used it a few times. The first time I used it was at a workshop organized last year where we had to get reading materials from the platform.

Interviewer: What's is your experience with using the platform?

Interviewee: The platform is a great tool that I believe will improve on learning at this university. It is easy to use. However, I find difficulties accessing it at the university because of the slow internet.

Interviewer: Do you think the university is ready to adopt and use the LMS?

Interviewee: With the slow internet connection, I don't think this system will work as expected. A lot first needs to be done as far as the internet is concerned before this system is brought to proper use. Also, lecturers need to be prepared to use this system. They need orientation on how to use the system.

Interviewer: Are you willing to continue using the LMS at Gulu university?

Interviewee: Of course, I will use the LMS. Let the university improve on the internet and make students and other lecturers aware of the LMS. By the way, it is only of us who have interfaced with this system.

Interviewee 2
Male from Faculty of Business

Interviewer: What does e-learning or electronic learning mean to you?

Interviewee: To me, it to learning through the aid of computers. If I use my computer and a projector to present work to my students instead of using a blackboard, that is electronic learning.

Interviewer: Have you ever heard about LMS (Learning Management Systems) before this interview?

Interviewee: Not really, but I heard about some systems used especially in most secondary schools to manage students results. I think that can be part of the learning management system

Interviewer: Gulu University has an e-learning platform in place. It is called the Gulu University e-learning platform. It operates online. Are you aware of this?

Interviewee: No. I have no idea about its existence. I have never been told that such a system exists. But if it's true that there is a platform in place, then that is good news for us the

teachers. We've been having problems with managing students results. We can probably rely on this to properly manage the results. But, if the platform operates online, then we are bound to have problems.

Interviewer: What kind of problems are you talking about?

Interviewee: Well, we have been having challenges with the internet. It is not reliable at all. This will definitely affect the e-learning platform you talked about.

Interviewer: What should be done in order to make this learning management system a success at Gulu University.

Interviewee: The university should improve on the internet. And like I told you, I wasn't aware of its existence. Therefore, lecturers should always be informed of such developments and included in the design process.

Interviewer: Are you willing to adopt and use the learning management system?

Interviewee: Sure. I am very ready to use the system.

Interviewee 3
Female from Faculty of Business

Interviewer: What does e-learning or electronic learning mean to you?

Interviewee: I think, this means the use of technology to effect education.

Interviewer: Which kind of technology are we talking about here?

Interviewee: Technologies like computers, internet, projectors, video recordings, eBooks and so many others.

Interviewer: Have you ever used or heard about LMS (Learning Management Systems) before this interview?

Interviewee: I have ever heard about it during my study at Makerere university. However, I have never used it.

Interviewer: Gulu University has an e-learning platform in place. It is called the Gulu University e-learning platform. It operates online. Are you aware of this?

Interviewee: Yes. I am aware of this. I came across it while checking on the university website. There I got a link to this platform. Unfortunately, I have never accessed it. I don't have the credentials to use it. I wonder what is taking the university long to announce it to lecturers.

Interviewer: Do you think lecturers are ready to use this system?

Interviewee: from my point of view, not all lecturers are ready and for our students, a lot has to be done before they can use the system. But personally, I have all it takes to use the system. I have good computer skills. I can use the internet with ease and I have a personal modem which I use both at the university and at home.

Interviewer: what makes you think that some lecturers and students are not ready to use this system.

Interviewee: The reason is mainly because of the infrastructure at the university. The internet is unreliable we lack equipments for our students. The computers at the university are not sufficient for the students. Our faculty has no computer lab of its own. We rely on the labs at the faculty of Science for undertaking computer related courses. Besides, some of our students do not own personal computers. This will make the use of the online system a bit hard. Also, some lecturers are not products of this dot com era. We have lecturers who don't use computers for their day to day teaching activities. They still rely and prefer to use the traditional way of teaching. It is hard to change such lecturers.

Interviewer: what should be the way forward to improve on this?

Interviewee: Firstly, the internet should be upgraded. Secondly, more computer laboratories should be set up for each faculty. This will prevent congestion and reliance on the few available laboratories. The university should encourage students to purchase laptops. This can be enforced in a policy for students enrolling at the university. And lastly for the regular trainings to the lecturers about the role of ICT in education should be held. This will help transform the few lecturers who are against use of technology to get on board.

Interviewer: Are you willing to adopt and use the learning management system?

Interviewee: Yes.

Interviewee 4
Male from Faculty of Education

Interviewer: What does e-learning mean to you?

Interviewee: e-learning is the mode of learning which involves delivering of content to students using technology. An example of e-learning using the Gulu University e-learning platform to upload reading materials to students.

Interviewer: Are you familiar with the Gulu university e-learning platform?

Interviewee: I am somehow familiar with the platform. I have navigated through it a couple of times though haven't used it to conduct any course at the university.

Interviewer: What's your experience with using the platform?

Interviewee: I didn't find much difficulty with using the platform. One of the challenges that I had was when I lost the password. Retrieving this password required me to first contact the web admin. There is no straight forward way of retrieving it. The other challenge is that the platform requires good internet connectivity and yet the internet is not reliable at the University. The internet speed is not good enough. I easily accessed the platform during one of the workshops at Churchill Courts last year. This is not the case while at the university. The internet here is very unpredictable. It's on now and after a few minutes it either becomes slow or totally off. The university administration should do something about this internet. There have always been promises of improving the internet.

Interviewer: What are the advantages of using the platform

Interviewee: The platform can be accessed from anywhere. That means that I don't necessarily need to be at school to deliver content to my students. I can also record a video and send to the students. The platform also allows me to interact with other lecturers. With such interactions, we can collaborate on working on academic papers and yield good results.

Interviewer: Do you think Gulu University is ready to use LMS/e-learning?

Interviewee: I think the university will only be ready to use this platform if the internet is improved and both the lecturers and students properly oriented on the use of the platform. It is a gradual process, but with the current development, hopefully, we will be there very soon.

Interviewer: Are you willing to continue using the platform?

Interviewee: Yes.

Interviewee 5
Male from Faculty of Science

Interviewer: Have you ever heard about e-learning?

Interviewee: My answer is yes. I have heard about it. I have also read about it. I clearly know what it entails.

Interviewer: Can you briefly tell me what you know about e-learning?

Interviewee: According to what I have read and heard, it is the use of technology in education. For example, students remotely attending lectures from a distant place through the internet.

Interviewer: Are you willing to use such technology in your teaching?

Interviewee: First of all, I appreciate that it is a good mode of delivering education to distant people. However, I don't think I would entertain it in my teaching. I teach chemistry which is a practical subject. Student should be physically available to undertake the practical. This can not be done online. So, I won't use it in y teaching. But, it would be good for those who teach courses that don't have laboratory related activities.

Interviewer: Have you ever used the Gulu university e-learning platform?

Interviewee: No. I don't even know about its existance.

Interviewer: Do you think the other lecturers will be able to use e-learning for their teaching?

Interviewee: Well, the might be able to use e-learning, but the question is...is the internet sufficient enough? Do they have the knowledge to use the system? And do they have the

76

equipment to use in using the system? By equipment, I mean things like computers and cameras.

Interviewee 6
Male from Faculty of Science

Interviewer: Do you know about e-learning?

Interviewee: Yes. I have some idea about it.

Interviewer: what do you know about e-learning?

Interviewee: e-learning is the use of various tools by both teachers and students in a bit to facilitate learning.

Interviewer: Have you used or ever heard about LMS (Learning Management Systems)?

Interviewee: yeah. I have used MUELE a learning management system used at Makerere. I used it while still a student at the university. I also know about the learning management system at this University

Interviewer: According to you, what are some of the advantages of using LMS for teaching?

Interviewee: The LMS comes with a number of advantages. For example, with the MUELE system, I was able to access materials online, work on coursework and submit online and also interact with fellow students. This is important both in terms of time management and cost reduction.

Interviewer: Have you ever used the Gulu university e-learning platform?

Interviewee: No. I haven't used it yet, but I look forward to using it.

Interviewer: Do you think the university is ready to adopt and use the LMS?

Interviewee: The university is ready. We can use the LMS despite of challenges. Those challenges can be solved as we continue using the system.

Interviewer: what are those challenges?

Interviewee: One of the challenges is the internet at the University. Also, the university lack equipment to make the use of LMS successful. We have very few computer laboratories compared to other universities like Makerere university.

Interviewer: Are you willing to use the LMS at Gulu university?

Interviewee: Yes, I am willing to use it.

Appendix 3: Survey Questionnaire

ICT in Education: Adoption of Moodle as a Learning Management System at Gulu University.

Questionnaire for academic staff
Information:
Whereas most institutions of higher learning across the world have embraced eLearning, some prefer using the traditional (face-to-face) mode of learning. This has been as a result of a number of reasons for and against the use of technology in learning.

Gulu University with funds from DANIDA under the BSU (Building Stronger Universities) initiative is moving towards the implementation of a **Learning Management System (LMS)** called **MOODLE** also known as the **Gulu University eLearning platform.** Currently, a number of lecturers have been enrolled in the use of this platform through a number of workshops.

This study aims at ascertaining the position of lecturers at Gulu University on the use of eLearning and as such present recommendations for the implementation of eLearning at the University.

This study is being conducted purely for the academic purpose precisely the fulfilment of the thesis requirement for the Master's degree (MSc Engineering – Innovative Communication Technologies & Entrepreneurship) at Aalborg University, Denmark. The title of the project is **ICT in Education: Adoption of Moodle as a Learning Management System (LMS) at Public Universities in Uganda – A Case of Gulu University.''**. I assure you that the information you have given will be treated with confidentiality.

Section 1: Demographic Questions

1. Gender *   2. Age *

☐	☐
Male	*Female*

☐	☐	☐	☐	☐	☐	☐
<25	*26-30*	*31-35*	*36-40*	*41-45*	*46-50*	*Above 50*

3. Faculty/Institute (**Please Tick only one**) *

☐	☐	☐	☐	☐	☐	☐	☐
Science	*Medicine*	*Business & Development Studies*	*Education & Humanities*	*Law*	*Agriculture & Environment*	*Peace & Strategic Studies*	*Research & Graduate Studies*

4. Academic rank *

☐	☐	☐	☐	☐
Graduate trainee	*Lecturer*	*Senior lecturer*	*Associate professor*	*Professor*

Section 2: e-learning Readiness Questions

5. Below are a number of statements regarding technology. Please read each one and indicate whether you agree or disagree with the statement

Indicators	Yes	No
I own a personal computer to use for work	☐	☐
I have access to a university computer to use for work	☐	☐
I have access to Internet and/or Intranet at work	☐	☐
I am able to access Internet and/or Intranet outside the workplace (from home, Cafe, etc.)	☐	☐
I have basic computer skills (like keyboarding, using mouse, creating, saving, editing files, etc.)	☐	☐
I have basic Internet skills (such as e-mail, chat, surf, etc.)	☐	☐
I use electronic file management systems confidently	☐	☐
I can confidently use electronic tools to create learning materials	☐	☐
I am able to read and learn, or follow the direction on a computer screen to accomplish a task	☐	☐
I am willingly using technology (computers) in routine/daily tasks	☐	☐
I am satisfied with the university's Internet.	☐	☐
The facilities at the university are sufficient for e-learning	☐	☐

6. Below are a number of statements regarding psychological readiness. Please read each one and indicate whether you agree or disagree with the statement

Indicators	Yes	No
I have sufficient information about e-learning	☐	☐
I have enough knowledge and competency to prepare e-learning materials	☐	☐
I feel I am ready to integrate e-learning in my teaching	☐	☐
I believe my students will like e-learning	☐	☐
I believe LMS is important to my department	☐	☐
I think LMS can make teaching and learning more creative	☐	☐

7. Below are a number of statements regarding sociological readiness. Please read each one and indicate whether you agree or disagree with the statement

Indicators	Yes	No
I discuss about LMS with my colleagues time and again	☐	☐
I get questions about LMS from my students	☐	☐
eLearning is discussed in staff meetings	☐	☐
I have discussed about LMS and eLearning with international academicians	☐	☐

8. Below are questions regarding environmental readiness.

Do you know of any public university in Uganda using an eLearning platform like Moodle?

☐	☐
Yes	*No*

If yes, mention the institution (s):

_____

_

Do you think eLearning can bring any transformation in academia in Uganda?

☐	☐
Yes	*No*

Why do you think so?

_____

_____

9. Below are a number of questions regarding educational readiness.

Have you ever undertaken training on the use of an e-learning platform like Moodle?

☐	☐
Yes	*No*

Are you willing to undertake training on the use of an e-learning platform like Moodle?

☐	☐
Yes	*No*

10. Have you ever used Gulu University's e-learning platform (Moodle) during any of the trainings/workshops?

☐	☐
Yes	*No*

If yes to 10, please answer the questions in section 3 else go to section 4.

Section 3: Diffusion of innovation (ONLY TO BE ANSWERED BY THOSE WHO HAVE USED GULU UNIVERSITY'S E-LEARNING PLATFORM/MOODLE)

This section aims at finding out your opinions about the statements listed below.

Please read the following statements and tick what best describes your use of the Gulu University's e-learning platform (Moodle)

11. Relative advantage of eLearning

Indicators	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Moodle improves my efficiency when I use them.	☐	☐	☐	☐	☐
There are enough advantages of Moodle (LMS) for me to consider using them.	☐	☐	☐	☐	☐
Mistakes are more likely to occur with Moodle (LMS) usage than with manual operations.	☐	☐	☐	☐	☐
Moodle (LMS) help me to better manage my time.	☐	☐	☐	☐	☐

12. Compatibility of eLearning

Indicators	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I do not need Moodle (LMS) in my work	☐	☐	☐	☐	☐
Moodle (LMS) makes lecturers redundant.	☐	☐	☐	☐	☐
It bothers me to use Moodle (LMS) when I could do my work manually.	☐	☐	☐	☐	☐
I worry about the privacy of my information when using Moodle(LMS)	☐	☐	☐	☐	☐
I worry that Moodle(LMS) is not secure enough to protect my personal information.	☐	☐	☐	☐	☐

13. Trialability of eLearning

Indicators	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
It was easy to use Moodle (LMS) more frequently after trying them out.	☐	☐	☐	☐	☐
A trial convinced me that using Moodle (LMS) was better than using manual systems.	☐	☐	☐	☐	☐
It did not take me much time to try Moodle before I finally accepted its use.	☐	☐	☐	☐	☐
It is better to experiment with ICTs before adopting them.	☐	☐	☐	☐	☐

14. Observability of eLearning

Indicators	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
I was influenced by what I observed as the benefits of using Moodle (LMS)	☐	☐	☐	☐	☐
I observed others using eLearning and saw the advantages of doing so	☐	☐	☐	☐	☐
Observing eLearning users before using eLearning is unnecessary.	☐	☐	☐	☐	☐
I have seen how others use eLearning before using them.	☐	☐	☐	☐	☐

15. Complexity and e-learning

Indicators	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Moodle (LMS) is complicated to learn.	☐	☐	☐	☐	☐
Moodle (LMS) is difficult to understand and use.	☐	☐	☐	☐	☐
Moodle (LMS) is convenient to use.	☐	☐	☐	☐	☐
Moodle (LMS) is confusing.	☐	☐	☐	☐	☐

Indicators					
It is easy to use Moodle (LMS) even if one has not used them before.	☐	☐	☐	☐	☐

16. Kindly indicate how your experiences/attitude with the use of Moodle (LMS) have affected your intention to continue to use the technology

Indicators	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
The benefits of Moodle (LMS) will make me continue to use them in the future.	☐	☐	☐	☐	☐
I intend to continue to use Moodle (LMS) because they help manage my time better.	☐	☐	☐	☐	☐
Because Moodle (LMS) are appropriate to my profession I will use them in future	☐	☐	☐	☐	☐
Moodle (LMS) usage is appropriate for my working style and I will continue using it	☐	☐	☐	☐	☐
The ease of use of Moodle (LMS) will make me continue to use them	☐	☐	☐	☐	☐
The difficulty in learning to use Moodle (LMS) will make me not use them in future	☐	☐	☐	☐	☐
Seeing my colleagues use Moodle (LMS) will make me continue to use it	☐	☐	☐	☐	☐
Trying out the opportunities of using Moodle (LMS) in my profession will make me continue using them in future.	☐	☐	☐	☐	☐

Section 4: Summing up

17. Overall, are you willing to adopt eLearning as a mode of instructional delivery at Gulu University?

☐	☐
Yes	No

18. If yes to 17, give your personal reasons in support of eLearning.

19. If no to 17, give reasons against using eLearning.

20. What are some barriers associated with the adoption of eLearning at your University?

21. What can be done to efficiently adopt eLearning at your University?

Thanks