

Design and Development of a Web Based E-learning System for Sinda Day Secondary School

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Abstract— *E-learning has become an integral component of education nowadays. There are several e-learning systems widely available to educational institutions worldwide. In Zambia, however, only a selected number of Higher Learning Institutions provide fully fledged e-learning services to their students. These include Information and Communications University (ICU), University of Lusaka (Unilus), University of Africa (UoA) and The University of Zambia (UNZA) among others. Currently, there are no secondary schools in rural Zambia that offer e-learning services to its learners. E-learning services depend heavily on a software system that allows access to all the materials for the educational process and makes such materials electronically available to all learners on the internet whenever they need and wherever they may be. The design and implementation of a well functioning e-learning system is a pivotal part of the educational process as it mirrors on the usage*

of the system as well as the values of the implementing institution.

In this project, the design and implementation of e-learning system is well described where various techniques are explored and compared. This e-learning system for Sinda Day Secondary School is designed using off-the-shelf and open-source software engineering model and programming tools and database models. This system was developed using HMTL, CSS Hyper Pre-processor (PHP) and MySQL. The system is tested to prove design concepts and features. The procedures used in the back-end and front-end design and implementation allows for easy usage and integration of the e-learning system by the targeted secondary school.

Keywords—; *E-learning; Design; Learners; System*

I. INTRODUCTION

At the turn of the century, advances in computers and related technology such as internet, the growth of e-learning has been fostered. E-learning is basically the network-enabled system to convey skills and knowledge. This has provided opportunities and freedom to determine when, what and how to learn. Learning is the key to achieving our full potential. Our survival in the 21st century as individuals, organizations and nations will depend on our capacity to learn and the application of what we learn in our daily lives (Kulesi, 2014). E-learning has the ability to transform how and when we learn.

A growing number of higher learning institutions such as colleges and universities world over have fully embraced e-learning because of various factors. With its low-cost delivery, interactive capabilities, and 24/7 accessibility, e-learning can provide convenient, affordable opportunities for skills and career development (Allen, 2006). E-learning has made it possible for education services to be offered to learners who do not have to be at a specific learning institution physically. The traditional provision of education services comes with a huge cost of putting up infrastructure. This is increasingly becoming difficult for countries such as Zambia that have to cope with an increasing population against limited classroom accommodation in schools and higher learning institutions. E-learning comes in really handy in this case! Learners can access learning materials at anytime and from anywhere. The new generation of e-learning should be able to provide richer learning environment that allows interactive knowledge construction. As a result, the cost of providing education becomes significantly low. This scenario supports the government of the Republic of Zambia's aim, through the Ministry of General Education (MOGE), that seeks to provide universal access to education to all its citizens.

However, e-learning systems are not readily available in secondary schools.

E-learning represents an innovative shift in the field of learning, providing rapid access to specific knowledge and information. E-learning offers instruction that can be delivered anytime and anywhere through a wide range of electronic learning solutions that are web-supported. Because e-learning transcend distances and learning institutional gaps, it provides a cohesive virtual learning environment that can truly make a difference in the delivery of quality education.

With all its abilities, e-learning must, therefore, be embraced in secondary schools especially in rural Zambia to ensure that pupils benefit fully. The main aim of this study is to come up with the best possible ways of designing and developing a web-based e-learning system for Sinda Day Secondary School that would meet the needs of all its stakeholders.

The e-learning system that would be developed after the study would have to achieve the following:

- a. Enable teachers to upload timely tutorials, assignments and other resources for their learners
- b. Enable learners to down the resources and upload assignment for marking
- c. Provide an easy-to-use way of managing course contents that would include timetable information, announcements as well as specific subject or course discussions.

With the above specifications met, the study would help to improve learner performance and mitigate the impact of shortage of teaching staff and classroom at Sinda Day Secondary School.

II. Use Of Ict In Education

The use of ICT in education involves supporting teaching and learning, and providing a range of activities in the learning environment. Such ICT-related activities include, for example, the use of micro-computers with appropriate keyboards, and devices to facilitate communication for pupils with special needs, etc (Kozma et al., 1999). To see how ICT can be used for education, the key question to ask is what parts of the teaching and learning process can be helped through ICT, which enables information, knowledge and experience to be presented in new ways, so that new learning outcomes can be achieved. ICT has a very broad and persistent impact on the entire education process (OECD, 2001).

- **On the learning environment:** ICT enables learning to take place in different places, both physically and virtually. Learners can choose where they want to study and what they want to learn.
- **On the content of learning:** With the implementation of ICT, learners, increasingly, have easy and independent access to a vast amount of information of potential relevance, e.g. via the Internet.
- **On the empowerment of the learner:** ICT can empower the learner by offering choice and potentially a more engaging and effective way of learning.
- **On the forms of communication used:** ICT enables communication to happen one to-one, one-to-many, many-to-many and many-to-one.

E-learning is mostly associated with activities involving computers simultaneously with interactive networks

E-Learning

a. History

In many contemporary sectors, E-learning is often regarded as a 'new' form of learning that uses the affordances of the Internet to deliver customized, often interactive, learning materials and programs to diverse local and distant communities of practice. This view, however, is historically disconnected from its antecedent instantiations, failing to recognize the extensive links between developing educational theories and practices that had shaped the use of E-learning over the past 40 years.

Long before the internet was launched, distance courses were being offered to provide students with education on particular subjects or skills. In the 1840's Isaac Pitman taught his pupils shorthand via correspondence. This form of symbolic writing was designed to improve writing speed and was popular amongst secretaries, journalists, and other individuals who did a great deal of note taking or writing. Pitman, who was a qualified teacher, was sent completed assignments by mail and he would then send his students more work to be finished using the same system.

In 1924, the first testing machine was invented. This device allowed students to test themselves. Then, in 1954, BF Skinner, a Harvard Professor, invented the "teaching machine", which enabled schools to administer programmed instruction to their students. It wasn't until 1960 however that the first computer-based training program was introduced to the world. This computer-based training program (or CBT program) was known as PLATO-Programmed Logic for Automated Teaching Operations. It was originally designed for students attending the University of Illinois, but ended up being used in schools throughout the area.

With the introduction of the computer and internet in the late 20th century, e-learning tools and delivery methods expanded. The first MAC in the 1980's enabled individuals to have computers in their homes, making it easier for them to learn about particular subjects and develop certain skill sets. Then, in the following decade, virtual learning environments began to truly thrive, with people gaining access to a wealth of online information and e-learning opportunities.

By the early 90s, several schools had been set up that delivered courses online only, making the most of the internet and bringing education to people who wouldn't previously have been able to attend a college due to geographical or time constraints. Technological advancements also helped educational establishments reduce the costs of distance learning, a saving that would also be passed on to the students – helping bring education to a wider audience.

In the 2000's, businesses began using e-learning to train their employees. New and experienced workers alike now had the opportunity to improve upon their industry knowledge base and expand their skill sets. At home, individuals were granted access to programs that offered them the ability to earn online degrees and enrich their lives through expanded knowledge.

The first online learning systems were really only set up to deliver information to students but as we entered the 70s online learning started to become more interactive. In Britain, the Open University was keen to take advantage of e-learning. Their system of education has always been primarily focused on learning at a distance. In the past, course materials were delivered by post and correspondence with tutors was via mail. With the internet, the Open University began to offer a wider range of interactive educational experiences

as well as faster correspondence with students via email etc.

The term “e-learning” has only been in existence since 1999 when the word was first utilized at a CBT systems seminar. Other words also began to spring up in search of an accurate description such as “online learning” and “virtual learning”. However, the principles behind e-learning have been well documented throughout history, and there is even evidence which suggests that early forms of e-learning existed as far back as the 19th century.

In addition, the historic divide between Education and Training has led to both the concurrent development of different notions, foci, and labels for technology-enhanced learning in different contexts and situations, and different conceptual origins arising in acquisitive and participatory learning metaphors (Nicholson, 2007). With the historian it is an article of faith that knowledge of the past is a key to understanding the present (Stamp & Szasz, 2006). In the history of E-learning, it is important to note that there is no single evolutionary tree and no single agreed definition of E-Learning: since the 1960s, E-learning has evolved in different ways in Business, Education, the Training sector, and the Military (Fletcher & Rockway, 1986), and currently means quite different things in different sectors. In the school sector, ‘E-Learning’ refers to the use of both software-based and online learning, whereas in Business, Higher-Education, the Military and Training sectors, it refers solely to a range of on-line practices. (Campbell, 2004)

The history of E-learning across all sectors is best summed up as: ‘Opportunities multiply as they are seized (Sun Tzu, 410bc). As for the past 40 years, educators and trainers at all levels of Education, Business, Training and the Military made use of computers in different ways to support and enhance teaching and learning. Consequently, the

contemporary use of the term 'E-learning' has different meanings in different contexts (Campbell, 2004).

In the Higher Education, Business, and Training sectors it relates particularly to Internet-based flexible delivery of content and programs that focus on sustaining particular communities of practice. E-learning in business and training can be characterized as being driven by notions of improved productivity and cost reduction, especially in an increasingly globalised business environment, with a focus on content delivery and online course management. These sectors initially employed the limited learning models extant at the time, but have since moved to incorporate a diverse range of learning models and foci. Nicholson, (2004) argues that in a broader sense, in industry settings, E-learning reflects an emphasis on informal and non-formal, just-in-time learning where the emphasis is on collaborative productivity whilst, in higher education settings, best-practice online learning emphasizes the development of meta-cognitive skills, where the emphasis is on reflective and collaborative learning.'

In the context of the wider education community, the use of the term E-learning has historically had wider connotations that embrace a diverse range of practices, technologies, and theoretical positions. It is not only focused on online contexts, and includes the full range of computer-based learning platforms and delivery methods, genres, formats and media such as multimedia, educational programming, simulations, games and the use of new media on fixed and mobile platforms across all discipline areas. It is often characterized by active learner-centered pedagogies (King, 2002).

The growth of E-learning in Business and Higher Education has led to concerns about the influence of quality assurance driven models on the structure and quality of these programs (Friedman, 1999).

Related concerns about its ability to deliver meaningful pedagogically structured learning experiences or to have a clearly identifiable learning paradigm have also been raised (Gillham, 2002; Sick et al., 2001; Suthers, Hundhausen et al., 2003). Recently, driven by such concerns, its focus has expanded to accommodate the incorporation of learner engagement and social-learning models (Mortera-Gutiérrez, 2006; Schroeder & Spannagel, 2006).

b. Definition

Open Learning in the educational context may be perceived as a philosophy of learning that is based on the principle of flexibility, aimed at increasing access to and equity in education. Institutions that practice open learning philosophy offer a variety of ways to open access to credible learning opportunities for a diverse range of learners.

In this context, learners are allowed to determine what, how, when and where they want to learn. The South African government defines open learning as follows: Open learning is an approach which combines the principles of learner-centeredness, lifelong learning, flexibility of learning provision, the removal of barriers to access learning, the recognition of prior learning, the provision of learner support, the construction of learning programmes in the expectation that learners can succeed, and the maintenance of rigorous

quality assurance over the design of learning materials and support systems. South Africa is able to gain from world-wide experience over several decades in the development of innovative methods of education, including the use of guided self-study, and the appropriate use of a variety of media, which give practical expression to open learning principles. (South Africa, National Department of Education, 1995, p. 9)

Distance learning may be broadly defined as a flexible form of education characterized by the:

- a. **Separation of the teacher from the learner** in time or space, or in both;
- b. **Use of a variety of media** to bridge that separation, including print, radio and television broadcasts, video- and audiocassettes, computer-based learning and telecommunications
- c. **Provision of two-way communication**, which allows for tutor-learner and/or another learner interaction;
- d. **Possibility of face-to-face meetings** for tutorials, learner-learner interaction and laboratory or practice sessions; and
- e. **Use of industrialised processes** where there is a division of labour that contributes to reduced unit costs through economies of scale (COL, 2000, p. 2).

Among the more commonly used terms related to ODL are the following: correspondence education, home study, independent study, external studies, continuing education, distance teaching, adult education, technology-based or mediated education, learner-centered education, open learning, open access, flexible learning, and distributed learning. A learning institution may be constituted as an entirely distance learning institution (single mode) or as part of an existing conventional university education (dual mode).

ODL has the potential to assist Zambia in the following ways.

- a. **Expanding access to higher education**, by enabling those who cannot be accommodated in conventional secondary schools to continue their studies;
- b. **Ensuring equity for marginalised groups**, by reaching out to people living in remote areas, those working in the home and other hard-to-reach groups

- c. **Preparing youth and adults for sustainable livelihoods**, by providing training in vocational skills, entrepreneurship and other competencies to those outside the formal education system;
- d. **Reducing the costs of education**, by strictly managing costs and realising the economies of scale that characterise ODL (open universities can reduce government expenditure per student and make further study more affordable); and **ensuring quality in education**, with proper attention to quality assurance processes (open universities can offer a good education and sometimes a better education than that available through the conventional system because of a rigorous quality assurance mechanism) (COL, 2008: 4).

E-learning is a learning system based on formalized teaching but with the help of electronics resources. Computers and internet form the major component of E-learning. A learning system based on formalized teaching but with the help of electronic resources is known as E-learning. While teaching can be based in or out of the classrooms, the use of computers and the Internet forms the major component of E-learning. E-learning can also be termed as a network enabled transfer of skills and knowledge, and the delivery of education is made to a large number of recipients at the same or different times. Earlier, it was not accepted wholeheartedly as it was assumed that this system lacked the human element required in learning.

However, with the rapid progress in technology and the advancement in learning systems, it is now embraced by the masses. The introduction of computers was the basis of this revolution and with the passage of time, as we get hooked to smartphones, tablets, etc; these devices now have an importance place in the classrooms for learning. Books are gradually getting replaced by electronic

educational materials like optical discs or pen drives. Knowledge can also be shared via the Internet, which is accessible 24/7, anywhere, anytime.

E-learning has proved to be the best means in the corporate sector, especially when training programs are conducted by Multinational Corporations for professionals across the globe and employees are able to acquire important skills while sitting in a board room, or by having seminars, which are conducted for employees of the same or the different organizations under one roof. The schools which use E-learning technologies are a step ahead of those which still have the traditional approach towards learning.

No doubt, it is equally important to take forward the concept of non-electronic teaching with the help of books and lectures, but the importance and effectiveness of technology-based learning cannot be taken lightly or ignored completely. It is believed that the human brain can easily remember and relate to what is seen and heard via moving pictures or videos. It has also been found that visuals, apart from holding the attention of the student, are also retained by the brain for longer periods. Various sectors, including agriculture, medicine, education, services, business, and government setups are adapting to the concept of E-learning which helps in the progress of a nation (Berners-Lee, 2001).

In a fast-paced world, the essence of e-learning is to take advantage of the available technologies to make learning exciting. It always seeks to ensure that changing course contents can and should be updated quickly to give students the very latest information. This is especially important if the e-learning facility is being offered to science or business students (Aggarwal, 2011).

It's true that as individuals we don't all respond to one teaching method in the same way – some learn visually, and others learn with repetition or writing. E-learning responds to those different needs with the use of different types of material, whether that is audiovisual content or interactive testing on the go, there is a plethora of options to cater to the needs of each and every learner and in the end, help them learn online in a much more efficient way (Nicholson, 2004).

E-Learning, in comparison with traditional learning, allows for easier access to online resources, databases, periodicals, journals and other material you wouldn't normally have easy access to from a library. If a student has trouble understanding part of the coursework, finding tips on the matter couldn't be easier than having immediate access to supplementary, unlimited and free material online!

Moreover, e-learning is designed to cater to the needs of different types of learners, who wouldn't normally do as well in a traditional learning environment, as well as complement the traditional learning environment with more features to make it an even more appealing option for the sceptics. Teachers and e-learning establishments should encourage a strong sense of community amongst their online students. This will enable students to interact with one another and the instructors, as well as with the resources provided, making for an enhanced educational experience.

Along with location restrictions, time is one of the issues that learners and teachers both have to face in learning. In the case of face-to-face learning, the location limits attendance to a group of learners who have the ability to participate in the area, and in the case of time, it limits the crowd to those who can attend at a specific time. E-learning, on the other hand, facilitates learning without having to

organize when and where everyone who is interested in a course can be present (Campbell, 2002).

Previous research on e-learning elucidates the notion of presence and learning. Scholars have conceptualized different concepts and theories based on the idea of distance education and learning. However, the experience of learning has been overshadowed with emphasizes on pedagogical models for social presence, theories on how to improve learning collaboration between students and teachers, and how the presence of individuals in digital environments plays a crucial role for establishing genuine learning.

E-learning is a breath of fresh air as n traditional classrooms courses like math and physics can be quite difficult to digest. So contrary to it through online channel, fun learning ways can be used to gain students attention. Also, online education is not book focused, so it allows the students to explore different options and think out of the box.

Overall, traditional learning is expensive, takes a long time and the results can vary quite significantly. In the case of face-to-face learning, the location limits attendance to a group of learners who have the ability to participate in the area, and in the case of time, it limits the crowd to those who can attend at a specific time. E-learning, on the other hand, facilitates learning without having to organize when and where everyone who is interested in a course can be present.

Unlike textbooks used in traditional learning that can become obsolete after a certain period of time, the need to constantly acquire new editions is not present in e-learning. E-learning offers an alternative that is faster, cheaper and potentially better (Chan & Robbins, 2006). For teachers and instructors, e-learning is no longer an add-on feature in teaching but a necessity. Thus, teachers

should consider this trend in education and get prepared technically and pedagogically to take e-learning into consideration. Students, on the other hand, need to get enough skills that would help them effectively benefit from the advantages e-learning is providing.

The early form of e-learning was referred to as Computer based training program (CBT). It was originally designed for students attending the University of Illinois in 1960, but ended up being used in schools throughout the area. With the introduction of the computer and internet in the 20th century, e-learning tools and delivery methods expanded. By 1980's, it became easier for individuals to own computers and learn a host of skill sets in various areas. Today, e-learning is more popular than ever, with countless individuals realizing the benefits that online learning can offer (Gogos, 2013).

When it comes to online learning in education, the model has been pretty straightforward – up until the early 2000s education was in a classroom of students with a teacher who led the process. Physical presence was a no-brainer, and any other type of learning was questionable at best. Then the internet happened, and the rest is history. Some of the most important developments in education have happened since the launch of the internet. These days, learners are well versed in the use of smartphones, text messaging and using the internet so participating in and running an online course has become a simple affair. Message boards, social media and various other means of online communication allow learners to keep in touch and discuss course-related matters, whilst providing for a sense of community. E-learning is being implemented in many countries all over the world. A study by Sloan Consortium shed light on the fact that a whopping 6 million students in the United States of America were studying through some online course or another. The number of

people taking these courses is so significant that it has caused several prestigious institutions such as Stanford, Berkeley and Princeton have made a place for e-learning classes. Other countries that have fully harnessed e-learning include India, South Korea and China (Hallberg, 2017).

In the USA, an increasing number of secondary (high) schools have taken on e-learning as an important component of service delivery to students. For instant, Huntley High School began offering blended e-learning programs in 2011 and has a total enrolment of 2,863 (Lindenmuth, 2015).

In Sub-Saharan Africa, by 2018 there was no secondary school in the country side had fully adopted e-learning as a way of reaching out to students who would not be physically in the campus. E-learning has mainly been taken on by higher learning institutions such as Makerere University of Uganda, University of Dar-e-salaam of Tanzania among others. In Zambia, while a considerable number of secondary schools have well functioning computer labs, e-learning services have not yet been considered (Techtrends, 2018). Despite the enormous growth of e-learning and its perceived benefits, the efficiency of such tools has not been fully embraced in the developing world (Kattoua, 2016). Recent studies have shown that e-learning implementation is not simply a technological solution, but a process of different factors such as social, individual and organizational factors play an important role in how e-learning is absorbed and used (Kim and Moore, 2005). Hence Zambia through the Ministry of General Education came up with a number of interventions to promote the use of ICTs in schools.

Many educators saw that ICT had potential of raising the quality of teaching and learning. Some of the most prominent features of ICT with regards to education include the following.

- a. Universal access to high quality education
- b. Teachers' professional development
- c. Efficient education management in terms of governance and administration
- d. Promotion of equity in education

For teachers, ICT offers a rich mine of content, material and ideas through;

- a. Sharing
- b. Socialising
- c. Collaboration
- d. Creating
- e. Authenticity

Recent research worldwide has shown that ICT can lead an improved student learning and better teaching methods. A report by the National Institute of Multimedia Education in Japan proved that an increase in the use of ICT in education with integrating technology to the curriculum has a significant and positive impact on students' achievements. Today, the emergence of such modern education technologies has altered how learners approach learning and education. The failing conventional methods prompted the birth of new-age education models that provide and support innovative pedagogy. Information and Communications Technology (ICT) in education has been linked with the upward shift in the quality of people's lives by improving teaching and learning. In fact, students who are continuously exposed to ICTs though education have better knowledge, presentation skills, innovative capabilities and are ready to take more efforts into learning as compared to their counterparts.

The use of ICTs in teaching has a very positive influence on a learner's learning capabilities as well. It is established that learners reflect in a very positive manner towards work and education when computers are used to

complete tasks given to them. Hence teachers should be in the forefront in using ICTs as the MOGE has embraced the use of ICTS in accordance with the ICT policy. This can be seen in a number educational programmes being implemented through the use of ICTs such as Examination candidate online registration, e-pay slips, checking of results via SMS on mobile phones and soon learners will be accessing their results through emails as well so as to enable them to print out their statement of results (MOCT 2006).

E-learning has evolved from the 20th Century and continues to become an integral part of our lives. Technological advancements in Information Technology have made it even easier for institutions, whether commercial or otherwise, to embrace the new mode of learning. As can be seen from the reviewed literature, E-learning has huge benefits all round and can only become better if well harnessed in the traditional learning setup. Keys factors in implementation, however, should be taken into serious consideration and ensure that social, economical or cultural circumstances of the people involved (learners and teachers) do not impede the overall e-learning process.

A ground for vibrant e-learning systems has already been set as can be seen from the number of similar systems that are in use today. The E-pay slip arrangement by the Government of the Republic of Zambia and the overall Payroll System is such an interactive system that helps End-users (Human Resource Management Officers) to learn a lot of things on their respect establishments. The e-eNAPSA is another such fine example when it comes to employees' social contributions and management.

The University of Zambia E-Campus has helped a lot of Zambians and other nationals to acquire Post Graduate qualifications through an effective online

learning program. The success of such programs clearly shows that E-learning has huge potential.

The essence of an effective e-learning system is to bridge the gap. For e-learning, distance no longer becomes a hindrance neither are low staffing levels or inadequate classrooms. The cost of acquiring quality education becomes significantly reduced. There is no need for stocking libraries with revised editions of books because all the latest information is always available online for both teachers and learners to explore.

III. RELATED WORKS

• On-line Examinations System

This system is a manual application used to conduct online examination in which users store the information like Student Details, Instructor Details, Schedule Details and feedbacks about learners who attempted exam as per schedule and also the details of learners who attempted Online Examination are maintained at administrator. Learners can sit at individual terminals and login to write the exam in the given duration. This application performs correction, display the result immediately and also store it in database. This application provides the administrator with a facility to add new exams and also enables the Instructor add questions to the exam, modify questions in a particular exam. The application takes care of authentication of the administrator, Instructor as well as the student. The online Examination tool's system specifications are:

Hardware Requirements: - Pentium-IV(Processor), 256 MB Ram, 512 KB Cache Memory, Hard disk 10 GB and Microsoft Compatible 101 or more Key Board.

Software Requirements: - Operating System: Windows, Web-Technology: PHP, Front-End: HTML, CSS, JAVASCRIPT, and Back-End: MySQL and Web Server: Apache SERVER (Kanjee, 2005).

- **Learning Management System**

A learning management system (LMS) is a software application for the administration, documentation, tracking, reporting, and delivery of educational courses, training programs, or learning and development programs. The learning management system concept emerged directly from e-Learning. Although the first LMS appeared in the higher education sector, the majority of the LMSs today focus on the corporate market. Learning Management Systems make up the largest segment of the learning system market. The first introduction of the LMS was in the late 1990s. Learning management systems were designed to identify training and learning gaps, utilizing analytical data and reporting. LMSs are focused on online learning delivery but support a range of uses, acting as a platform for online content, including courses, both asynchronous based and synchronous based. An LMS may offer classroom management for instructor-led training or a flipped classroom, used in higher education. An LMS delivers and manages all types of content, including video, courses, and documents. In the education and higher education markets, an LMS will include a variety of functionality that is similar to corporate but will have features such as rubrics, teacher and instructor facilitated learning, a discussion board, and often the use of a syllabus. A syllabus is rarely a feature in the corporate LMS, although courses may start with heading-level index to give learners an overview of topics covered (Ryann, 2009).

- **UBI Campus**

UbiCampus is an advanced web-based campus management solution. It can manage entire educational administrative tasks with greater flexibility. This system is able to track attendance for students, web portals development, learning

management solutions, online journal publishing, aptitude test and online test maker for schools.

- **Smart Zambia Institute – e-Government Directorate**

The Directorate is responsible for designing, implementing and managing e-Government programs to enhance access and effective delivery of government services to citizens, business enterprise and government entities.

The specific functions of the e-Government Directorate are to:

- a. Develop and manage the implementation of national e-government policies and programs.
- b. Undertake research on ICTs to enhance e-governance and other e-services
- c. Provide assistance with automation of processes in the public sector and make them deliverable through electronic channels
- d. Develop modalities for providing e-services using different channels to make services readily available as close to the citizenry as possible
- e. Encourage and coordinate interventions to make public information and services more accessible for citizens and public agencies
- f. Sensitize citizens on the availability of e-services
- g. Collaborate with stakeholders on the provision of e-services
- h. Oversee the development and implementation of Government-wide capacity building initiatives on ICTs
- i. Monitor and Evaluate implementation of ICT Research and Training Programs
- j. Mobilize resources for research and capacity building interventions

- k. Develop appropriate strategies to enhance uptake and application of ICT innovations in the Public Sector
- l. Develop and implement change management strategies
- m. Re-engineer and computerize business processes

IV. METHODOLOGY

The methodology that is used in this study is Incremental Model a process of software development where requirements are divided into multiple standalone modules of the software development cycle. In this model, each module goes through the requirements, design, implementation and testing phases. Every subsequent release of the module adds function to the previous release. The process continues until the complete system achieved (Pressman, 2001).

The reason for selecting this method is because it generates working software quickly and early during the software life cycle. Incremental model is more flexible and less costly to change scope and requirements. It is also easier to test and debug during a smaller iteration and easier to manage risk because risky pieces are identified and handled. Incremental method is useful where requirements are clear and can be implemented in phases (Somerville, 2011).

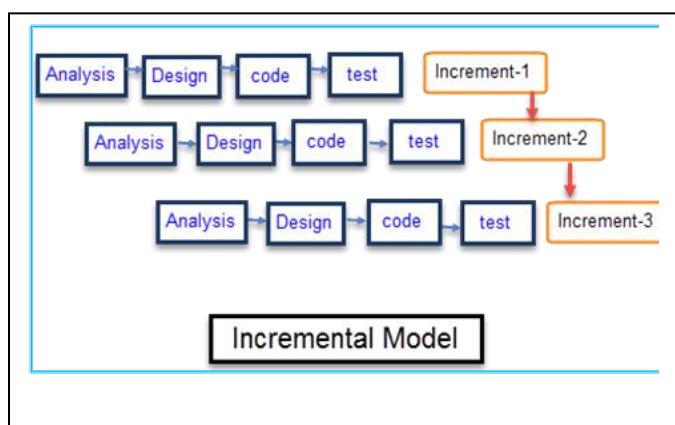


Figure 1: Incremental Model

Baseline Study

Due to numerous socio-economic challenges facing the world, many people are unable to attend on-campus regular courses, and so are deprived from access to education. The fourth Sustainable Development Goal recommends that policy-makers ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Inclusive and equitable quality education can be achieved, if adequate measures are in place, to widen access to learning. Developing Open and Distance Learning facilities can be one strategy of achieving this goal. Besides, ODL is becoming an accepted and indispensable part of mainstream education prompted by: the need to make learning more accessible to a wider population; the growing need for continual skills, upgrading and re-skilling; and advances in technology that have made it possible for teaching to be conducted at a distance.

Most governments are cognizant of the potential of ODL for fulfilling the fundamental rights of all people to education and meeting the need to incorporate it within the framework of human capital development. It will be practically impossible for the Government of Zambia to guarantee a seat for all students that are seeking high school education in on-campus or conventional universities given the global economic environment and the financial constraints facing the country.

• Data Collection

A questionnaire was developed for the baseline study, focusing on the objectives of the study and the terms of reference. The questionnaire was developed based on emerging themes from the literature review. After several reviews, it was adopted for use to collect data from secondary

schools in Sinda District in relation to the possible establishment of an e-learning system.

• Research Approach

The approach in this research is based on the use of data collected in order to prove the need for an e-learning system as a solution to the challenges facing high school learners in Sinda district.

• Development of the Application

There are different strategies for the creation of system for e-Learning. The system is a web-based E-learning System (eLS) for Sinda Day Secondary School with the following modules:

- a. User Dashboard
- b. Attend Lessons
- c. Download Notes
- d. Assessments
- e. Alternative

The system has a user-friendly front-end interface for the user to interact with the system which enables teachers enter learners' details, store assessment questions, administer assessment and generate learner's results, and reports which can be printed so as to enable quick feedback to all parties concerned. The Admin has the right to create and delete the questions, add or delete user accounts, and view assessments and rankings given to learners, as well as user feedback of the system.

V. SYSTEM DESIGN

• Context Diagram

An E-learning System Data Flow Diagram (DFDO) is often used as a preliminary step to create an overflow of the system without going into great detail, which can later be elaborated. It normally consists of overall application dataflow and processes of the E-learning process. It contains all of the use-flow and their entities such as all the flow of:

- Student
- Activity Log,
- Assignments
- Files
- Teacher
- Subject.

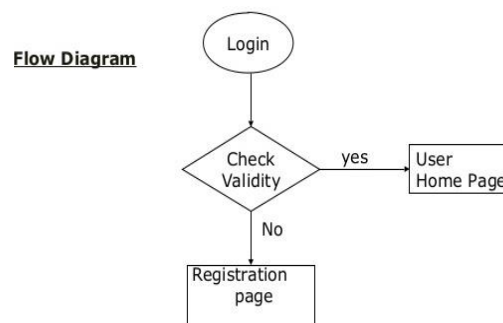


Figure 2: E-learning System Data Flow Diagram

VI. SYSTEM SOFTWARE LEVEL ARCHITECTURAL DESIGN

In software development, a successful information system is subject to frequent evaluation and revision within the SDLC. Davis et al. (1988) argue that SDLC is the basis for most software development methodologies. Pressman (1997) adds to this by pointing out that a system's life cycle consists of four principal phases:

- *Requirements Phase* is the process whereby the users' needs in a software project are identified, modeled and validated. This phase is regarded as one of the most important aspects of building an information system because it is during this process that what is to be built is decided on. It is an iterative process by which the needs and requirements of individuals and groups significant to the development are researched and identified. Requirements phase

defies the customer, user and market requirements, design requirements and technical requirements (Arayici et al. 2005).

- *Analysis Phase* is when the main information for designing the new system is obtained. It specifies the system objectives and describes the work and its constraints with which designers have to comply.

- *Design Phase* is when the architecture is established. This phase starts with the documentation delivered by the requirement and analysis phases and incorporates the requirements into the architecture.

- *Testing/Implementation Phase* is when the system is built. The implementation phase deals with issues of quality, performance, baselines, libraries, and debugging. The end deliverable is the product itself. These phases address what is to be built, how it will be built, building it and ensuring the quality to highest possible standard.

E-learning applications combine content with learning technology systems to support the creation of content and its delivery to the learner. In the future, we can expect the distinction between learning content and its supporting infrastructure to become blurred. Content objects will interact with infrastructure services as independent objects. Our solution to the development of e-learning applications –content-driven design and architecture – is based on content-centric ontological modeling and development of architectures. Knowledge and modeling will play an important role in the development of content and architectures. Our approach integrates content with interaction (in technical and educational terms) and services (the principle organization for system architecture), based on techniques from different fields, including software engineering, learning design and knowledge engineering (Pahl, 2008).

VII. SOFTWARE REQUIREMENTS

The proposed e-learning system requirements statements define the capabilities and performances that the system will provide. The requirements are used to guide the design of specific system deliverables, and to assess whether those deliverables are satisfactory for the intended purpose. The system requirements describe what is needed; the deliverables are how that is accomplished; and the outcomes describe why the system is worthwhile. These requirements are:

- a. The admin will be able to manage courses, levels, users, department or unit, students, lecturers, and contents.
- b. The teacher will be able to manage classes for his/her classes, send and receives messages to and from his/her students and other teachers. Send the link to the intended class via notification, and manage downloads, announcements, assignments and quiz.
- c. The student will be able to view his/her class, view notifications, send and receive messages to and from his/her teachers and other students, view and download learning materials including audios
- d. Students can take quiz questions anytime they are ready.

i. Functional Requirements

Functional requirements describe what the system should do such as things that can be captured in use cases and things that can be analyzed by drawing sequence diagrams and state charts. Functional requirements will probably trace to individual chunks of system.

Functional requirements are the properties or function of the System. E-learning System (eLS) supports two users, namely;

Administrator and User. User has limited administrative tasks. The following are the functional requirements of E-learning System.

- **Administrator**

- Add user:** Administrator will be able to create user accounts and add users to the system.
- View assessment:** Administrator will be able to view all the assessments in the system.
- Edit:** Enables Administrator to create and delete the user accounts, and edit or add on assessment questions.
- View Results:** Administrator will be able to view learners' results
- Rankings:** Administrator will be able to view learners' performance and how they are rated.
- Search:** Administrator will be able to search for learners, assessments, results for a particular class and user information.
- Feedback of the system:** Administrator will be able to view feedback on learners' performance, interventions and recommendations.

- **User**

- Login:** Users should be able to login using a username and a password **Registration:** Users should register learners in their class by entering all their details e.g. Serial number, name, sex, age, date of birth and address
- Upload notes:** Users should be able to upload notes and tutorials for learners
- Upload/download assessment:** Users should enter the type of the assessment to be administered
- Administer assessment:** Enables users to administer the assessment and the results will automatically be generated.
- View Results:** Users will be able to view learners' results.
- Search:** Enable a user to search either for assessment or a learner in his/her class.

- Sign-out:** Enable a user to sign out of the system.

- Non-Functional Requirements**

Non-Functional requirements can be defined as global constraints on the software system and they include development costs, operational costs, performance, reliability, maintainability, portability, robustness etc. Hence usually cannot be implemented in a single module of a program.

This E-learning System has the following non-functional requirements.

- The System must be user friendly. Users must be able to interact with the system's interfaces and applications.
- The system must be fast. eLS must take as less time as possible to respond to a query/command from a user.
- The System must be accurate. The System must handle all assessment tasks, records and results accurately and if an error occurs, the system must revert back to the previous state.
- The System must allow more than one user to use it at the same time.
- The system must comply with the laws of Zambia concerning the ICT policy.

- **Logical Design**

The logical design provides the flow of logic in the system. It describes the design of an application giving the modules to be added and showing how the modules interact to accomplish the systems objective.

- **Application Design**

The application menu gives the overview of the e-Learning System (eLS).

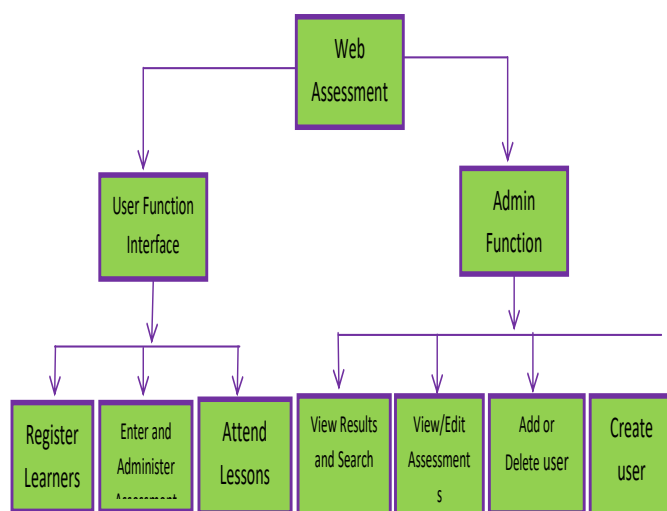


Figure 3: Application Design

VIII. MODULAR DESIGN OF THE SYSTEM FUNCTION

Generally, it is not easy for an instructor to prepare and deliver electronic courses via e-learning. Therefore, it is necessary to work and develop an easy system. In this context module technology is used to provide modularity in conducting educational development of e-learning course.

Designing course for e-learning requires consideration of curricular obligations, available development tools and materials, but it also requires careful analysis of teaching and learning techniques. A modular design of e-learning course can facilitate teaching, course design, delivery, and well growth of students. Lecture modules provide tutorials, scripts, interfaces, flexibility and richness for classes. The course modules also should offer the instructor the ability to enhance, interrupt, change order of materials to be covered, or deliver chronological and sequential of instruction. Modular course architecture consists of a core framework combined with the required modules to build a custom-tailored course (Jeny et al, 2006). Modern information technologies (IT) are

becoming an integral part of an educational process. Education institutions need to gain more with low costs from their IT investments (Kurilovas and Dagiene, 2009).

Modular course design enables flexibility in providing inter-changeability, transferability and portability of digital learning objects as well modules and course materials (Hai-Jew, 2009). The modules can be optimized independently of other modules; failure of one module does not cause other modules to fail. In modular design, one can replace or add any module without affecting the rest of the system without technical help (Bliss, 2008). In modular design, one module can be re-used in other systems. Thus, modules can be reviewed, edited, and implemented by different people (Berners-Lee, 2008). Kelly (2009) summarizes advantages of modular design as follows:

- Expedited course creation
- Simplified course updates
- Consistency for users.

In module design related contents are clustered into a module. Subject-based modules may be formed around a type or class of an object. Also, a module may be organized around a particular activity or problem-based learning task (Hai-Jew, 2009).

The basic structure of a module has learning objectives and learning outcomes. All the contents and resources within the module should support the objectives and outcomes (Hai-Jew, 2009). Learning objectives are specific statements, actions, performance criteria, and conditions of what students will be able to do upon completing the module. A module should contain granular digital learning objects, multimedia contents, activities, assignments, discussions, practices, virtual experiences and simulations, and assessments (Boise State University, 2013).

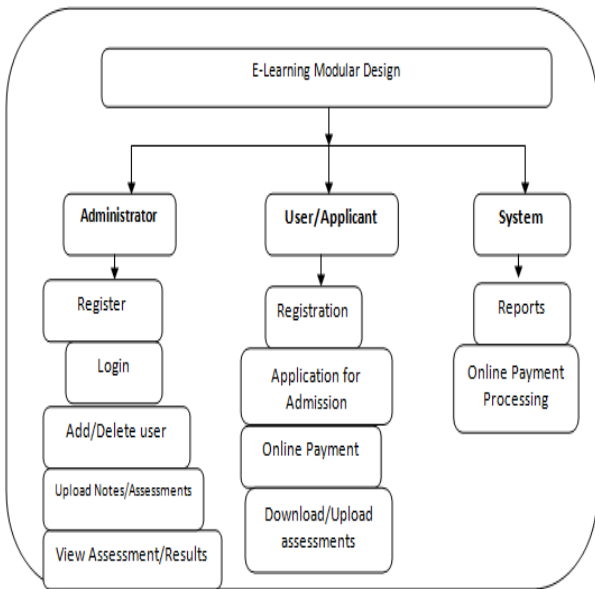


Figure 4: Modular Design

IX. SYSTEM USER INTERFACE

The system has a user-friendly interface to enable both teachers and learners navigate through the modules easily. This is cardinal in ensuring that the main objective of the study, which is to improve learner performance through e-learning, is achieved.



Figure 5: User Interface Design

- **Activity diagram for a user function**

The figure shows the activity diagram for a user function. When the user provides the username and password the user details are checked and if he is successful the user is able to access different functions offered by the system. The user can register learners, Enter or Administer Assessment, View Results, Rankings and perform a Search. The user can then logout the close his account once he has finished the carrying out the task at hand.

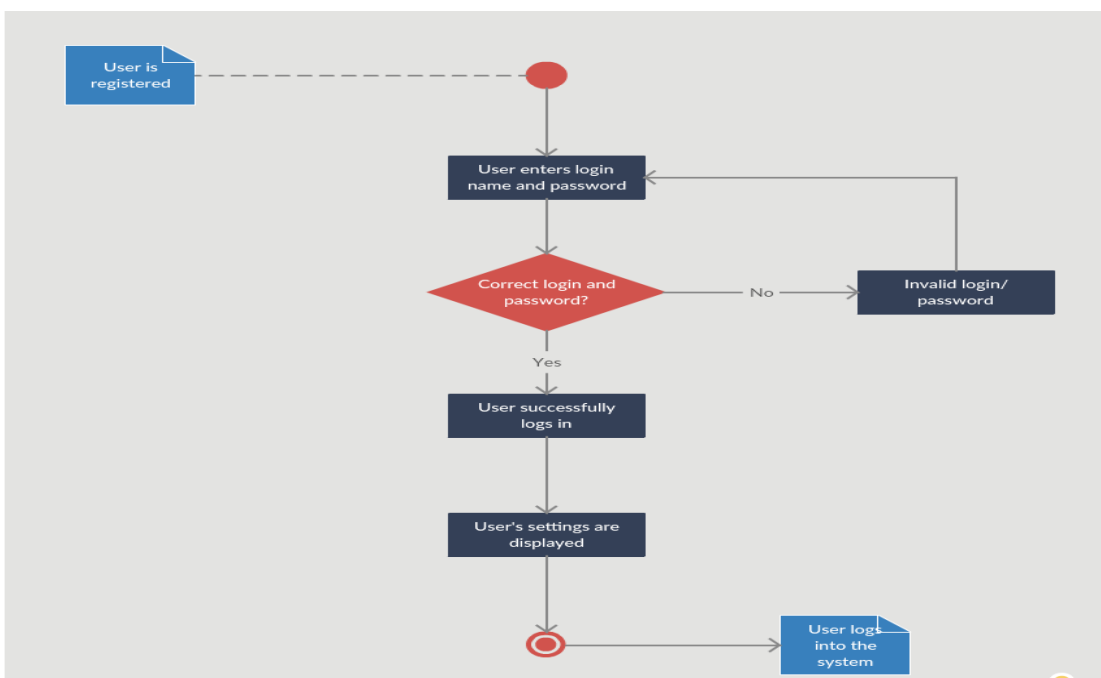


Figure 5: Activity Log Diagram for User Functions

Figure 6: Activity Diagram

- **Activity diagram for administrator functions**

The figure shows the activity diagram for administrator functions. During authentication the user is checked whether he is an administrator or just a common user. When the user provides the username and password, the user details are checked and if he is successful the user is able to access different functions offered by the system. The user can make view request, view solutions and add solutions.

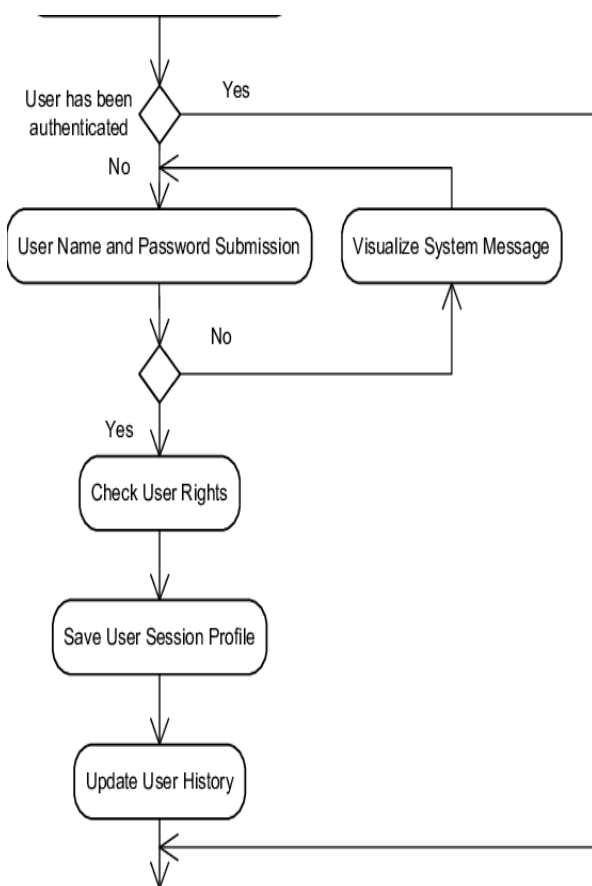


Figure 7: Admin Activity Log Diagram

- **Access Control Design**

Access control design generally addresses the question of how the system will avoid unauthorized access to the system and modification of data in the system database. Access control in the E-learning System will be

implemented by the use of password and the username. Users will be required to log into the system using their username and password. Modification of data in the database will be according to the privileges accorded to the user. That is, there will be two kinds of users of the system, basic users and system administrator. Basic users will only be allowed to be using a restricted number of functions of the system in accordance to the user interface. They will not be allowed to temper with other user accounts in the database. The system administrator will be allowed to access and use all.

This e-learning system is designed to be very interactive and help achieve the ultimate aim of the project. Nowadays the progress in information technologies filed is opening great new possibilities for people in all areas of living. As education is fundamental step in every person's life, we have to increase its' popularity, availability and convenience for everybody. Information technologies present a lot of new tools and approaches which expand the infrastructure of the educational process. This idea integrates the simplicity and reliability of web-based architecture and usability of appealing forms of user interfaces. The design describes an e-learning system, which has an interface, and several new modules which increase the efficiency of the studies. The variety of interfaces is supported by web-based application.

X. SYSTEM IMPLEMENTATION RESULTS

The results of this research are geared towards the development of an e-learning system that would help Sinda Day Secondary school to establish a well functioning e-learning system that seeks to improve learner performance inspite of various challenges such as low stuffing and lack of classroom accommodation for learners.

- **Testing Procedure**

The testing procedures was done in two stages

- a. Module testing
- b. System testing

- **Testing Activities**

The testing activities that were carried out are as follows:

- a. Security testing
- b. Testing for valid and invalid data
- c. Windows Operating System Files access tests.
- d. Integration testing

- **Security testing for web system**

To gain access to the system the, a user is always asked to enter a correct user name and a correct password. Entering a wrong combination of user name and password displays an error message: Enter Correct User name and password.

Test	Expected Results	Actual Results
Correct User name and Correct Password	Login dialog box disappears and user has access granted	Access to system granted
Wrong User name or Wrong Password	Error message: Wrong User name and Password	Access to system denied
Correct User name, Wrong Password	Error message: Invalid Password	Access to system denied
Wrong Username, Correct Password	Error message: Invalid User name	Access to system denied

Table 1: Security testing

- **Data Entry**

The following was observed during data entry.

- a. Entering alphabetical characters where numerical characters are supposed to be entered to avoid an error message being given.
- b. When one or more necessary fields were left blank an error message would be given.
- c. However, when a user successfully logs-in, the user interface opens and is ready to start implementing the task at hand as shown below.

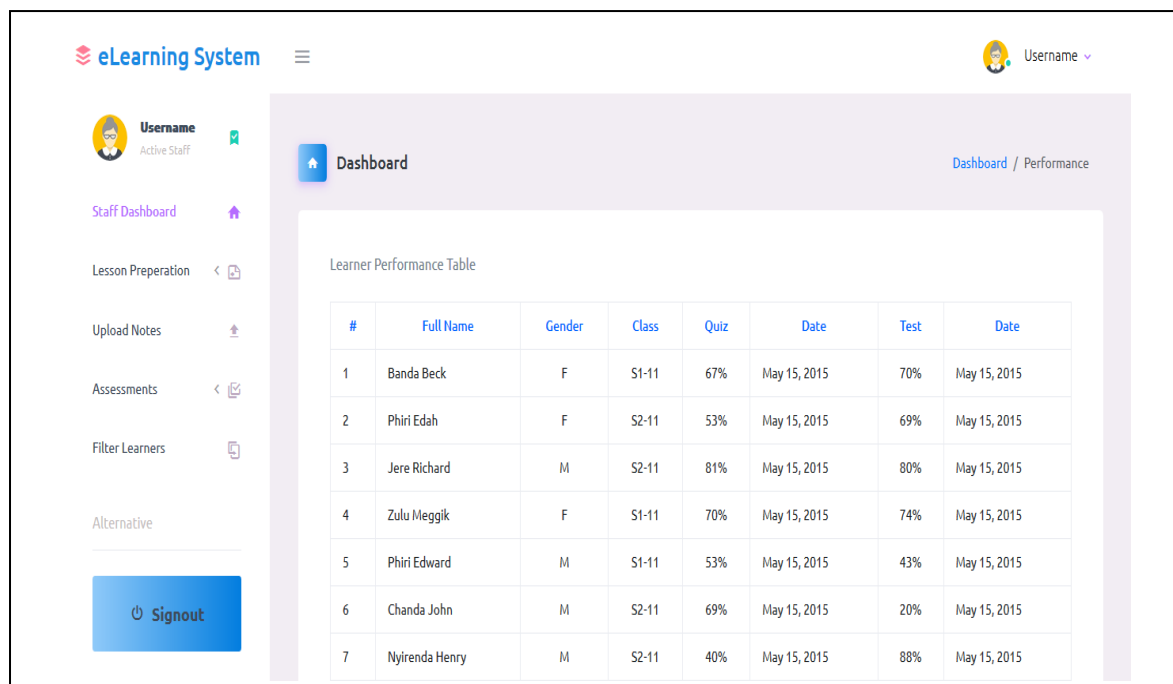


Figure 8: Successful login opens this interface

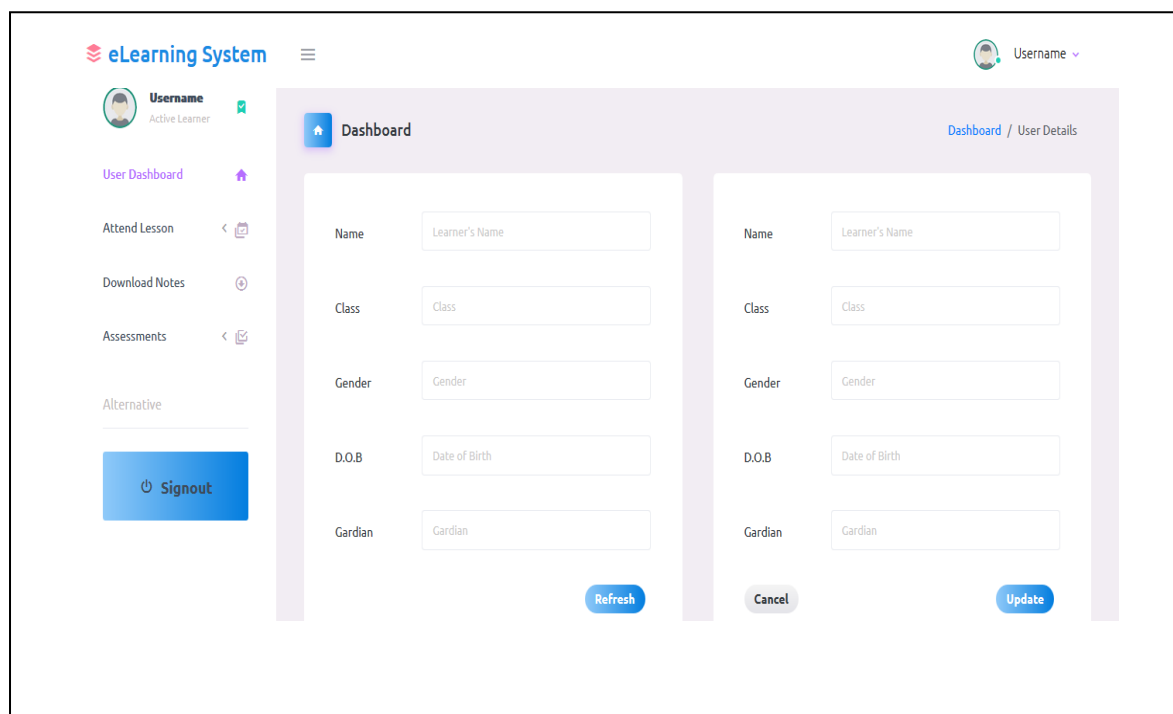


Figure 9: Shows a learner data collection form (interface)

The screenshot shows the 'eLearning System' dashboard. On the left is a sidebar with a user profile (Username, Active Learner), navigation links (User Dashboard, Attend Lesson, Download Notes, Assessments), and a 'Signout' button. The main content area is titled 'Dashboard' and contains two data entry forms. The first form is for 'Wezi Nyirenda', with fields for Name, Class (51-10), Gender (F), D.O.B (25/10/2004), and Gardian (Patrick Nyirenda). The second form is for 'Chimwemwe Banda', with fields for Name, Class (53-8), Gender (M), D.O.B (21/10/2006), and Gardian (Ireen Banda). Both forms have 'Refresh' and 'Update' buttons at the bottom.

Figure 10: Shows a filled-in learner data collection form (interface)

The screenshot shows the 'eLearning System' dashboard with the 'Downloads' section active. The sidebar is similar to Figure 10, but the 'Download Notes' link is highlighted. The main content area is titled 'Downloads' and shows four grade-level sections: 'Grade Eight (8)', 'Grade Nine (9)', 'Grade Ten (10)', and 'Grade Eleven (11)'. Each section contains a horizontal list of tabs labeled 'Tab 1' through 'Tab 4'. A context menu is open over the 'Tab 4' of the 'Grade Ten (10)' section, listing 'History', 'Geography', and 'Civic Education'.

Figure 11: Shows a successful login accessing subject notes

- **Testing**

System Testing is an important phase. Testing represents an interesting anomaly for the software. Thus, a series of testing are performed for the proposed system before the system is ready for user acceptance testing. Hence a good test case is one that has a high probability of finding an as undiscovered error. A successful test is one that uncovers an as undiscovered error.

- a. Integration Testing**

The purpose of integrating testing is to test how various modules are working together in the system. It also involved tests to find discrepancies between the system and its original objective and current specification. When the system was run using correct and incorrect data, the system collaborated well with other modules and it displayed the appropriate error messages when an error occurred. For valid transactions the system did not display any error message but simply execute the transaction. Network connectivity tests were carried out. The web system was hosted the computers running the server and it was accessible on the internet using the browser.

The tests produced required results in areas tested, modifications were made where necessary. All the tests that were conducted revealed errors. The testing was successful as many errors were found and corrected.

- b. Acceptance Testing**

This testing is done to verify the readiness of the system for the implementation. Acceptance testing begins when the system is complete. Its purpose is to provide the end user with the confidence that the system is ready for use. It involves planning and execution of functional tests, performance tests and stress tests in order to demonstrate that the implemented system satisfies its requirements.

Test coverage Analyzer tested the records which the control paths followed for each test case.

Timing Analyzer also called a profiler, reports the time spent in various regions of the code are areas to concentrate on to improve system performance. Coding standards static analyzers and standard checkers are used to inspect code for deviations from standards and guidelines.

- c. Test Cases**

Test cases are derived to ensure that all statements in the program have been executed at least once during testing and that all logical conditions have been executed. Using White-Box testing methods, the test cases are derived guarantee that logical decisions on their true and false sides.

Exercise all logical decisions on their true and false sides. Execute all loops at their boundaries and within their operational bounds. Exercise internal data structure to assure their validity. The test case specification for system testing has to be submitted for review before system testing commences.

- d. Coding of the system**

The system was implemented using PHP, HTML, CSS and JavaScript for the graphical interface design and the process logic coding. MySQL was used for designing the database. PHP, HTML, CSS and JavaScript were chosen for implementation because of the power they offer in building highly interactive and user-friendly application packages and for defining the appearance and layout of text and other material.

Visual Basic was chosen as an implementation tool for the E-learning System because of the power it offers in building highly interactive and user-friendly application packages.

- **Web-Based E-learning System for Sinda Day Secondary School Header**



Figure 12: System Header

- **Staff Dash Board**

#	Full Name	Gender	Class	Quiz	Date	Test	Date
1	Banda Beck	F	S1-11	67%	May 15, 2015	70%	May 15, 2015
2	Phiri Edah	F	S2-11	53%	May 15, 2015	69%	May 15, 2015
3	Jere Richard	M	S2-11	81%	May 15, 2015	80%	May 15, 2015
4	Zulu Meggik	F	S1-11	70%	May 15, 2015	74%	May 15, 2015
5	Phiri Edward	M	S1-11	53%	May 15, 2015	43%	May 15, 2015
6	Chanda John	M	S2-11	69%	May 15, 2015	20%	May 15, 2015
7	Nyirenda Henry	M	S2-11	40%	May 15, 2015	88%	May 15, 2015

Figure 13: Staff Header

Below is the HTML code for the system header.

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="UTF-8">
  <meta name="viewport"
content="width=device-width, initial-scale=1">
  <title>Home</title>

<!------->
  <link
href="https://fonts.googleapis.com/css?family=Cr
oissant+One" rel="stylesheet">
  <link
href="https://fonts.googleapis.com/css?family=Ral
eway:400,500,600,700,800,900" rel="stylesheet">
  <link
href="https://fonts.googleapis.com/icon?family=M
aterial+Icons" rel="stylesheet">
<!------->
  <link rel="stylesheet"
href="assets/css/bootstrap.css">
  <link rel="stylesheet" href="assets/css/font-
awesome.min.css">
  <link rel="stylesheet"
href="assets/css/owl.carousel.min.css">
  <link rel="stylesheet"
href="assets/css/owl.theme.default.min.css">
  <link rel="stylesheet"
href="assets/css/styles.css">
  <link rel="stylesheet"
href="assets/css/responsive.css">
<!------->

  <style>
    body { font-family: Arial, Helvetica,
sans-serif; }
```

```
* { box-sizing: border-box; }

/* Button used to open the
contact form - fixed at the top of the page */
.open-button {
  top: 23px;
  right: 28px;
  colour: white;
  cursor: pointer;
  position: fixed;
  font-size: 16px;
  padding: 6px 30px;
  border-radius: 30px;
  text-decoration: none;
  display: inline-block;
  border: 2px solid white;
  background: transparent;
}

.open-button: hover {
  colour: #1686d9;
  background-colour: white;
  border: 2px solid #fff;
}

/* The popup form - hidden by
default */
.form-popup {
  bottom: 0;
  right: 0;
  z-index: 9;
  display: none;
  position: fixed;
  border-radius: 20px;
  border: 2px solid #F1F1F1;
  background-colour: #FFFFFF;
}

/* Add styles to the form
container */
.form-container {
  padding: 10px; }
```



```
max-width: 280px;
border-radius: 20px;
background-colour: #FFFFFF;
}

/* Full-width input fields */
.form-container input [type=text], form-
container input[type=password] {
width: 100%;
border: none;
padding: 8px 0;
background: #FFF;
margin: 5px 0 22px 0;
border-bottom: 1px solid
#4CAF50;
}

/* When the inputs get focus,
do something */
.form-container input[type=text]: focus,
form-container input[type=password]: focus {
outline: none;
background-colour: #FFFFFF;
border-bottom: 1px solid red;
}

/* Set a style for the login
button */
.form-container .btn {
width: 35%;
opacity: 0.8;
colour: #4CAF50;
cursor: pointer;
font-size: 14px;
padding: 6px 20px;
border-radius: 30px;
margin-bottom: 10px;
background-colour: #FFFFFF;
border: 2px solid #4CAF50;
}

/* Add some hover effects to
login button */
.form-container .btn:hover{
background-colour: #4CAF50;
colour: #FFFFFF;
}

/* Add a red background colour
to the cancel button */
.form-container .cancel {
float: right;
color: #FF0000;
background-colour: #FFF;
border: 2px solid #FF0000;
}

/* Add some hover effects to
cancel button */
.form-container .cancel:hover{
colour: #FFFFFF;
background-colour: #FF0000;
}

/*-----[ Alert
validate ]-----*/
</style>
</head>
<body>

<div class="wrapper">
<header class="header">
<div class="blue">

</div>
<div class="white">

</div>
<div class="container">
<div class="row">
```


The following is the HTML code for the staff dashboard.

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <!-- Required meta tags -->
    <meta charset="utf-8">
    <meta name="viewport"
content="width=device-width, initial-scale=1,
shrink-to-fit=no">
    <title>Staff Dashboard</title>
    <!-- plugins:css -->
    <link rel="stylesheet"
href="assets/vendors/mdi/css/materialdesignicons.
min.css">
    <link rel="stylesheet"
href="assets/vendors/css/vendor.bundle.base.css">
    <!-- endinject -->
    <!-- Plugin css for this page -->
    <!-- End plugin css for this page -->
    <!-- inject:css -->
    <!-- endinject -->
    <!-- Layout styles -->
    <link rel="stylesheet"
href="assets/css/style.css">
    <!-- End layout styles -->
    <link rel="shortcut icon"
href="assets/images/favicon.png" />
  </head>
  <body>
    <div class="container-scroller">
      <!-- partial:partials/_navbar.html -->
      <nav class="navbar default-layout-navbar col-
lg-12 col-12 p-0 fixed-top d-flex flex-row">
        <div class="text-center navbar-brand-wrapper
d-flex align-items-center justify-content-center">
          <div class="nav-profile-text">
            <h3 class="mb-1 text-info" ><i
class="mdi mdi-buffer text-danger"></i>
eLearning System </h3>
          </div>
```

```
<a class="navbar-brand brand-logo-mini"
href="index.html"></a>
        </div>
        <div class="navbar-menu-wrapper d-flex
align-items-stretch">
          <button class="navbar-toggler navbar-
toggler align-self-center" type="button" data-
toggle="minimize">
            <span class="mdi mdi-menu"></span>
          </button>
          <ul class="navbar-nav navbar-nav-right">
            <li class="nav-item nav-profile
dropdown">
              <a class="nav-link dropdown-toggle"
id="profileDropdown" href="#" data-
toggle="dropdown" aria-expanded="false">
                <div class="nav-profile-img">
                  
                  <span class="availability-status
online"></span>
                </div>
                <div class="nav-profile-text">
                  <p class="mb-1 text-black"> Username
                </p>
              </div>
            </a>
            <div class="dropdown-menu navbar-
dropdown" aria-labelledby="profileDropdown">
              <a class="dropdown-item" href="#">
                <i class="mdi mdi-cached mr-2 text-
success"></i> Reset Password </a>
              <div class="dropdown-divider"></div>
              <a class="dropdown-item"
href="index.html">
                <i class="mdi mdi-logout mr-2 text-
primary"></i> Signout </a>
            </div>
          </li>
        </ul>
```

```
<button class="navbar-toggler navbar-
toggler-right d-lg-none align-self-center"
type="button" data-toggle="offcanvas">
  <span class="mdi mdi-menu"></span>
</button>
</div>
</nav>
<!-- partial -->
<div class="container-fluid page-body-
wrapper">
  <!-- partial:../../partials/_sidebar.html -->
  <nav class="sidebar sidebar-offcanvas"
id="sidebar">
    <ul class="nav">
      <li class="nav-item nav-profile">
        <a href="#" class="nav-link">
          <div class="nav-profile-image">
            
            <span class="login-status
online"></span>
            <!--change to offline or busy as
needed-->
          </div>
          <div class="nav-profile-text d-flex flex-
column">
            <span class="font-weight-bold mb-2">
Username </span>
            <span class="text-secondary text-
small"> Active Staff</span>
          </div>
          <i class="mdi mdi-bookmark-check text-
success nav-profile-badge"></i>
          <a>
          </li>
        <li class="nav-item">
          <a class="nav-link"
href="dashboard.html">
            <span class="menu-title"> Staff
Dashboard</span>
            <i class="mdi mdi-home menu-
icon"></i>
```

```
<li class="nav-item"> <a class="nav-link" href="#"> Quiz </a></li>
<li class="nav-item"> <a class="nav-link" href="#"> Test </a></li>
</ul>
</div>
</li>
<li class="nav-item">
<a class="nav-link" href="#">
<span class="menu-title">Filter
Learners</span>
<i class="mdi mdi-content-duplicate
menu-icon"></i>
</a>
</li>
<li class="nav-item sidebar-actions">
<span class="nav-link">
<div class="border-bottom">
<h6 class="font-weight-normal mb-3
text-secondary">Alternative</h6>
</div>
<button class="btn btn-block btn-sm
btn-gradient-info mt-4" style="font-size:18px;"><a class="nav-link"
href="..index.html"><i class="mdi mdi-power
text-dark" style="font-size:20px;"></i>&nbsp;Signout </a></button>
</span>
</li>
</ul>
</nav>
<!-- partial -->
<div class="main-panel">
<div class="content-wrapper">
<div class="page-header">
<h3 class="page-title">
<span class="page-title-icon bg-gradient-info text-white mr-2">
<i class="mdi mdi-home"></i>
</span> Dashboard </h3>
<nav aria-label="breadcrumb">
<ol class="breadcrumb">
```

```
<li class="breadcrumb-item"><a href="#">Dashboard</a></li>
<li class="breadcrumb-item active"
aria-current="page">Performance</li>
</ol>
</nav>
</div>
<div class="row">
<div class="col-lg-12 grid-margin stretch-card">
<div class="card">
<div class="card-body">
<p class="card-description"> Learner
Performance Table
</p>
<table class="table table-bordered">
<thead>
<tr align="center"
style="colour:#0066FF;">
<th> # </th>
<th> Full Name </th>
<th> Gender </th>
<th> Class </th>
<th> Quiz </th>
<th> Date </th>
<th> Test </th>
<th> Date </th>
</tr>
</thead>
<tbody>
<tr>
<td> 1 </td>
<td> Banda Beck </td>
<td align="center"> F </td>
<td align="center"> S1-11 </td>
<td align="center"> 67% </td>
<td> May 15, 2015 </td>
<td align="center"> 70% </td>
<td> May 15, 2015 </td>
</tr>
<tr>
<td> 2 </td>
```

Phiri Edah	S2-11
F	69%
S2-11	20%
53%	20%
May 15, 2015	May 15, 2015
69%	
May 15, 2015	
	7
	Nyirenda Henry
3	M
Jere Richard	S2-11
M	40%
S2-11	88%
81%	May 15, 2015
May 15, 2015	May 15, 2015
80%	
May 15, 2015	
4	
Zulu Meggik	
F	
S1-11	
70%	
May 15, 2015	
74%	
May 15, 2015	
5	
Phiri Edward	
M	
S1-11	
53%	
May 15, 2015	
43%	
May 15, 2015	
6	
Chanda John	
M	

```
<!-- plugins:js -->
<script
src="assets/vendors/js/vendor.bundle.base.js"></sc
ript>
<!-- endinject -->
<!-- Plugin js for this page -->
<!-- End plugin js for this page -->
<!-- inject:js -->
<script src="assets/js/off-canvas.js"></script>
<script src="assets/js/hoverable-
collapse.js"></script>
<script src="assets/js/misc.js"></script>
<!-- endinject -->
<!-- Custom js for this page -->
<!-- End custom js for this page -->
</body>
</html>
```

The system was successfully tested for all “test factors” and include, among others, Correctness, File integrity, Access control, Compliance, Reliability, Ease of use, Maintainability, Portability and Performance. The teachers and learners tried the system using smart phones and laptops. The system proved interactive and easy to use as individuals who did not need to have exceptional computer skills to access it.

XI. CONCLUSION

Problems facing mainly developing countries need to be addressed by making use of applied research, which is designed to solve specific practical problems and meet a specific need within the community. The world should now call for implementing more applied research in addition to basic or traditional research that is mode 1 as referred to by Gibbons et al. (1994). Taking advantage of software tools can help to develop customized E-learning Systems that are optimally suited to the specific context.

Research studies in the field of e-learning may not explore every axis, nor each particular link in the structure, but by referring to a larger picture of reciprocal co-evolution between ICT and learning, may be able to position themselves more clearly and accurately in a complex and intra-related field of enquiry. E-learning is both cause and result of significant changes in the definition of education concept, as well as changes in the understanding of how it should be organized and managed (Peters, 2003). With the e-learning advance, educational institutions managers started to deal with different activities, requiring the development of new procedures and finding alternatives to address emerging challenges that go beyond educational issues. An e-learning system consists of all components and processes that operate when distance learning and teaching occurs (Rosenberg, 2001). It includes learning, teaching, communication, creation and management (Belloni, 2001). According to Moore and Kearsley (2007), e-learning is a planned learning process that occurs in general, in a different place other than a regular school, and as a result, it requires special techniques of course design, special forms of instruction, special methods of communication through electronic and other technologies, as well as essential organizational and administrative arrangements.

Bof (2009), states that e-learning is complex and requires efficient management so that educational outcomes can be achieved. It is crucial to establish strategies and mechanisms by which one can ensure that this system will effectively work as intended, once the following components are defined: educational goals, instructional design, steps and activities, mechanisms to support the learning system, technologies to be used, evaluation system, formal academic procedures and functioning of the system as a whole, E-learning is made up of a number of components

that must operate in an integrated manner. It is about the formalization of an operational structure since that involves the development of the course design, the production of didactic materials or information sources and the definition of an evaluation system, including the establishment of operational mechanisms for the distribution of subjects, the availability of learning support services and the establishment of academic procedures.

For being an institution of peculiar nature, the ways to plan, organize, manage and control a school like Sinda Day Secondary must be different from the traditional ways business managers make decisions. By the type of institution, the management of higher education differs from the management of basic education. Likewise, the management of e-learning must be treated distinctly. As well as in regular education, managers of e-learning should not disregard the pedagogical nature of their decisions which are turned into actions, but it should be clear that teaching and learning are distinct processes. The educational management of e-learning also provides planning decisions, organization, direction and control, similar to those of regular education in higher education and also concerned with facilities, space, time, money, information and people (Mill & Brito, 2009).

The development of this e-learning system for Sinda Day Secondary School has enhanced the opportunities for most rural children who find it extremely hard to pay for school fees and procure other school necessities. In the case of Sinda Day Secondary School, most of the learners have to walk long distances because the school does not have boarding facilities. Other pupils opt to be renting small houses in the vicinity of the school. This scenario makes the learners, especially girls, to be a subject of sexual abuse by uncaring people. This only compounds the situation of poor

performance by pupils especially during national exams at grades 9 and 12. This system has come in very handy for such vulnerable children who are going to pay considerably less compared to the traditional arrangement.

The increase of e-learning systems is likely to be considerable based on economic factors, but it is made to grow exponentially by learner's demands for flexibility and more learner-centered learning. E-learning is seen to provide a flexible and innovative ways of supporting and enabling quality learning and teaching. E-learning is defined as the systemic use of networked, multimedia computer technologies to improve learning; empower learners; connect learners to people and resources supportive of their needs; integrate learning with performance and link individuals with organizational goals .

Distance education is in fact an opportunity for those who have no time to continue their education in normal mode, attending classes regularly, due to some reasons. Some of the disadvantages of distance education which does not include direct provision of regular interaction between a student and a teacher, no question of revision, and so on can be solved by employing e-learning. E-learning has completely changed the view of both academic education and corporate training. E-learning has the ability to change the way we study, and to bring high quality, easy to get learning to everyone – so that every learner can achieve his or her full potential.

There are several problems with the current way of training and learning in secondary school institutions and other cooperate training. These include: lack of adequate training and required commitment by the lecturers, unreliable technology that hinder lecturers' ability to monitor student's activities, students technical limitations were not put into consideration, students may find that lecturers are not sufficiently responsive

because of the lecturers' workload or unfamiliarity with new technology and the requirements of reading, following instructions, reducing distractions, and exercising self-discipline have been found difficult to communicate to the students that need to understand the perils of enrolling in online courses if they are not equipped to handle the different learning environments.

As a result of these problems, this research was undertaken to deliver an e-learning system for schools and other learning institutions and organizations. It allows upload of learning materials online and give room for one-on-one interaction with the lecturer by creating an avenue for the students to ask questions and get their answers online.

The system is aimed at being user-friendly, reliable and improved with better specifications. The e-learning system is designed as such using HTML, CSS, PHP, Ajax and MySQL.

There are many challenges to be faced in implementing e-learning from the perspectives of both students and teachers in Zambia and more generally in developing countries. In the present study, 80% of students and 74% of teachers were concerned that they would have technical problems in using online courses. Several students and teachers commented on the physical infrastructure requirements: "easy access to computers, accessible, reliable and affordable bandwidth and a robust network are all important requirements for the successful implementation of e-learning." Lack of experience of using online learning technologies is also an obstacle to effective participation in e-learning, the ultimate success of which will depend on both students and teachers becoming confident and capable (Hadad, 2007). Around three-quarters of students and teachers (75% and 72%, respectively,) indicated that they needed appropriate training in using ICT-based learning components such as multimedia,

chat-room, wikis and blogs, since their Internet and computer skills or experience were insufficient to use e-learning elements effectively. Some teachers also commented on their need for training in instructional design in order to create effective and interactive contents.

Even more importantly, 76% of teachers referred specifically to the time needed to prepare instructional materials and to manage the learning process in digital formats. Several teachers commented on the workload issue; for example, "I should regularly check the online communication tools for new postings, replying to students' questions and encouraging them to participate actively".

While many students may have access to e-learning facilities, they tend to use them for entertainment rather than for learning (Appana, 2008). A total of 78% of teachers expressed concerns that students would be distracted from concentrating on online courses. Time management skills are extremely important and a challenge in this endeavor is how to enhance learners' motivation for self-study.

Development of a System as a Solution

Recesso (2001) pointed out that each problem in an education system has a direct impact on student learning, but it provides a broader lens for considering the potential use of ICT in education. The use of ICT in e-learning and related services has gained commercial significance. Behling et al (1996) conclude that, generally, the benefits that can be derived from effective utilization of ICT include cost reduction, performance improvement, quality enhancement and the creation of new products and services. Some rural secondary schools have acquired computers but they are not being used for teaching normal subjects. This E-learning System for Sinda Day Secondary School intends to

make use of the few available ICT resources to improve teaching and learning functions.

Apart from the many problems facing Sinda Day Secondary School, the administration is struggling hard to make sure that students are performing well. Strategies taken by administrators to ensure that schools perform well include, close supervision to ensure that teachers fully cover the curriculum, if possible well in advance, so that students can have more time for revision before examinations; making sure that all periods are taught and involving teachers in serious and efficient teaching, that is motivating teachers to efficiently fulfill their responsibilities; closely following up on the attendance of teachers and students in class and motivating students in self-learning after classes; rewarding students who perform well and giving incentives to teachers who are doing well; staff meetings to discuss the problems of students and how to handle them; and emphasizing that teachers must provide more and frequent exercises.

Teachers, on the other hand, play an important role in ensuring good performance through: giving students enough exercises, more tests and correcting the work done to clarify areas that students got wrong; preparing lessons in order to teach and teach well; adhering to school rules and regulations, while maintaining class discipline; and working hard and using student-centered teaching techniques. Some teachers assign tasks using participatory methods, creating subject clubs and teaching in a participatory manner. Sometimes they get students to orally present what they have learned and understood, they keep students busy in finding materials by themselves under their guidance, and involve parents in school activities.

Sinda Day Secondary School has double teaching sessions due to many students. In this case there is

no time for extra classes on weekdays. The development of this e-learning system for school indeed addresses all such challenges as students can now learn in the comfort of their homes at a minimal cost. Teachers and students can interact for almost 24hrs everyday without concerns of classrooms being overcrowded and the teacher tiring out because of talking for extended hours. Individualized sessions for students who miss out on certain class work can easily catch up with the rest through the online provision. This E-learning system has addressed the identified problem and proved to be a viable solution.

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