Design and Development of An Online Library Management System for Luangwa Secondary School
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ABSTRACT

This project sought to design and develop an Online Library Management System (OLMS) at Luangwa Secondary School in Luangwa District. the project specific objectives included to design a database to store library information and a user friendly front-end for the user to interact with the system; to determine the suitability and usability of the system, the researcher also sought to establish the use of ICTs in library management and academic studies and, determine the basic technological literacy levels among library users.

A quantitative baseline study was conducted in order to understand the viability of OLMS with data collected data primarily through interviewer administered questionnaire from a sample size of 76 participants representing 10% of the study population. The collected data was analysed using SPSS version 20.0 Ethical considerations were followed throughout the research process. The Software Development Life Cycle (SDLC) used was incremental model. PHP scripting language, HTML5, CSS, MySQL version 5.3 Database running on (XAMPP) Server and Bootstrap were among the tools and programs were used to develop the system.

OLMS is an application developed and designed with the sole objective of automating library services. The system was intended to address the tedious work of the librarian at Luangwa Secondary School whose library relied on manual book transactions. The system automated the processes of cataloguing, book reservation, book transactions (borrow and return), card processing, member details maintenance, and online study. A fully automated online library management system was developed. The performance of the designed system meets user's requirements, thus providing the main benefits of having all the library services and functions within the power of a mouse click and feeding of data into the system. Other benefits include accessibility of lesson notes and books online.

Keywords: *Transaction; Database; Online System; Automation; Book Transaction; Online Library*

I. INTRODUCTION

A. Background

A library is a room, building or an institution where a collection of books and other written genre of information are kept. A library contains well researched information for the consumption of its clientele. However, establishing a library through construction and stocking it with adequate books and other materials is always an expensive venture. Thus, schools have ended up having libraries with out-dated books stocked in dilapidated and abandoned rooms.

Above all, the modern advancement in information and communications technology is already endangering the existence of libraries [1]. The web is becoming a universal source of information giving an illusion of depth and comprehensiveness that leads to a questioning of the value of libraries and their collections.

Luangwa Secondary School had maintained a good reading atmosphere. Most students are eager to learn by reading different genre of books and other reading materials. However, the manual transaction method used in the school library system is insufficient to meet the great demand for borrowing and returning books and access to information among the learners. This may eventually affect the good reading culture negatively due to the complicated book transactions.

Due to the lack of a paperless library management system, several problems had arisen such as inconvenient to access information of library materials during holidays, inconsistence of data, lack of opinion exchange platform, hand written transaction and long waiting time by students, thus imposing heavy workload for librarians.

This project aimed at designing and developing an Online Library Management System (OLMS) for Secondary School Education. The system is designed in two-folds; library management to manage the available hardcopy books in the library and online study that manages the database of lesson notes and eBooks relevant to the current revised Ministry of General Education (MoGE) curriculum. The target site for the project is Luangwa Secondary School in Luangwa District of Lusaka Province, Zambia.

The proposed system employed PHP and HTML for programming and MYSQL for Database. It has been designed as an interactive and content management system. The content management system deals with data entry, validation and updating while the interactive system is concerned with system interaction with the users. The designed system comprises of a few salient modules behind it such as user registration, login, and forgot password and admin modules.

B. Problem Statement

For so long, educational literature has been largely disseminated through libraries. The state of libraries in most learning institutions is poor and contain out dated reading materials stocked in dilapidated and almost abandoned rooms [2]. Worse still, the management of the few surviving libraries is paper based making book transaction a huge task for librarians. Despite the school maintaining a good reading culture, the library management system used at Luangwa Secondary School is insufficient to meet the great demand for book transaction and access to information among the learners. With the advancements in information and communications technologies, the existence of the school library is already endangered, as the internet is becoming the sole and readily available source of information with

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diffuse genre [1]. Thus, there is need to develop a modern library that meets the demands of the ever-changing digital world. Indeed, a digital library that can provide information to the students anywhere, at any time with an interactive and content management system. It is with this background that the researcher desired to design and develop an Online Library Management System for Secondary School Education at Luangwa Secondary School.

C. Project Objectives

The main objective of this project was to design and develop an Online Library Management System for Secondary School Education at Luangwa Secondary School in Luangwa District.

D. Specific Project Objectives

i) To design and develop a user-friendly GUI for a library management system that can help secondary school students to easily access library services and study materials online.

ii) To design and develop a secure and portable database that stores library information and students' study materials.

iii) To determine basic technological literacy skills among secondary school students necessary for online library management system

E. Research Questions

i) Is it possible to design and develop a user-friendly GUI for a library management system that can help students to easily access library services and study materials online?

ii) Can a secure and portable database that stores library information and students' study materials be designed and developed?

iii) What are some of the basic technological literacy skills necessary for online library management system?

II. REVIEW OF LITERATURE

A library is a room, building or an institution where a collection of books and other research materials are kept. It is a collection of sources, resources, and services, and the structure in which it is housed. The modern advancement in ICTs is already endangering the existence of libraries [1]. The web is becoming a ubiquitous source of information giving an illusion of depth and comprehensiveness that leads to a questioning of the value of libraries and their collections. This review will not speculate on these future roles, but will focus instead on the certainty of changing technology, increasingly digital information resources and societal shifts that have changed user expectations of library services [3].

In recent years, research concerning digital libraries has focused on questions of website design, information provision and information retrieval. Digital library research draws mainly from computer science, information science, library and information studies. An Online Library shall be a collection of educational documents such as magazine articles, book, papers, teachers' lesson notes, images, sound files and videos organized in an electronic form and made available on the Internet.

Digital libraries have existed for more than a decade now, yet for many library users, they remain somewhat in the shadows, especially in comparison to physical library spaces. However as more and more information moves into a digital-only space, digital libraries continue to boom and skills in managing digital information are in high demand in public and private institutions around the world. As Interlibnet [4] observed that digital libraries can vary immensely in size and scope, and can be maintained by individuals, organizations, or affiliated with

established physical library buildings or institutions, or with academic institutions.

The digital library Federation developed a plan that identifies appropriate time frames, strategizes and attendant costs for migrating to predominantly digital library [2]. The strategic planning cycle of the Digital Library Federation (DLF) comprised about 25 libraries in the United States. These libraries stated that the "future of libraries is digital [5]. The University administration in United State endorsed this concept and provided additional funding for the purchase of digital resources while they also recognized the correct deficiencies in existing print collection following a developmental plan to achieve a digital future, even though Digital Library Federation's assertion that libraries should predominantly be digital.

Furthermore, the university libraries made the commercial vendors to implement national standards that effectively assessed the use and impact of digital libraries on education and use of the web as an academic resource [2]. Thus, goal of academic libraries generally is to meet the teaching, learning, research and other information needs. It was in order to meet this standard and goal that the Digital Library Federation provided the above benchmark/standards as guide for all libraries and especially for the academic libraries and other institutions.

Similarly, Anaraki and Heidari [6] stated that Poland, established consortia of regional libraries for the purpose of networking the traditional libraries into digital libraries and that the university libraries are to ensure network access to digitalized resources. The academic libraries of Poland have an initiative that developed network of regional digital libraries, as they reported. Developed countries have responded to major changes brought about by the

ICT age in the library world. The libraries abroad can be said to have moved into reliance on digital technology systems. From this literature, it can be said also that digital database and vendor connections directly impact the academic libraries collections decisions especially.

Digital libraries are much more than easy access to literature and information, they are dwellings that expand clientele's possibility to store books and read them at the comfort of their electronic gadgets. And although the book as an object remains unbeatable, when reading on a screen, a phone or a tablet we are simply repeating one of the most beautiful human activities: illuminating our brains with the glow of our gaze [7].

The literature reviewed show that a number of approaches have been used to assess usability of digital libraries. In addition to the technical aspects of digital library design such as architecture, interfaces and search tools, there are a number of usability issues such as globalisation, localisation, language, culture issues, content and human information behaviour [8]. Digital libraries should, however, be evaluated primarily with respect to their target users, applications and contexts.

Unfortunately, digital libraries, or at least their digital collections, also have brought their own problems and challenges. These challenges and problems include user authentication for access to collections, copyright, digital preservation, equity of access and interface design. Other comprise interoperability between systems and software, information organisation, inefficient or non-existent taxonomy practices, quality of metadata and exorbitant cost of building and maintaining the terabytes of storage, servers, and redundancies necessary for a functional digital collection.

Adversely, there are many large-scale digitization projects that perpetuate these problems globally [4].

There is an incredible variety of digital libraries around the globe. Just like regular libraries, there are roles for effective management of the libraries. Digital libraries are increasingly offered by corporative, government or non-government organisations. The majority of the digital libraries are invaluable sources of reference that contain books, maps, films and audio-books that would be difficult to find in physical form.

Some digital libraries serve a specific community such as the International Children's Digital Library (ICDL) whose goal is to build a collection of books on historical and contemporary books throughout the world. Ultimately, the Foundation aspires to have every culture and language represented so that every child can know and appreciate the riches of children's literature from the world community. This digital library also offers some interesting alternatives to traditional discovery interfaces, including the option to search by the colour of the cover.

Additionally, some digital libraries are stocks of things and people. One such example is the Europeana which explores millions of items from a range of Europe's leading galleries, libraries, archives and museums. Books and manuscripts, photos and paintings, television and film, sculpture and crafts, diaries and maps, sheet music and recordings, they're all here. No need to travel the continent, either physically or virtually.

The Trove digital library helps you find and use resources relating to Australia. It's more than a search engine. Trove brings together content from libraries, museums, archives and other research organisations and gives you tools to explore and build. Trove is a community, a set of services, an aggregation of metadata, and a growing repository of full text digital resources.

The Internet Archive founded in 1996 and in late 1999, the organization started to grow to include more well-rounded collections. Now the Internet Archive includes: texts, audio, moving images, and software as well as archived web pages in our collections, and provides specialized services for adaptive reading and information access for the blind and other persons with disabilities [4].

The World Digital Library (WDL) is a project of the U.S. Library of Congress, carried out with the support of the United Nations Educational, Cultural and Scientific Organization (UNESCO), and in cooperation with libraries, archives, museums, educational institutions, and international organizations from around the world. The WDL makes available on the Internet, free of charge and in multilingual format, significant primary materials from all countries and cultures.

Of more than 2 000 open access repositories worldwide, fewer than 3% are in Africa [5]. Even though the availability of open access material is low, it is important to recognize the progress that has been made over the past decade: several institutions across the region have adopted and are implementing open access policies. However, in spite of these strides, only about 16% of African scholars claim to have a high awareness of e-resources. Thus, African librarians need data skills to make the transition to open access.

By the year 1999, the use of e-books had begun to gain acceptance across the majority of countries in Africa. Some earlier studies indicate that the African Digital Library (ADL) represents a collection of books which is available across the entire African continent of 54 countries and serves as a back-up to

all physical libraries and it was created in the spirit of the African Renaissance.

Additionally, anyone who lives in Africa and has access to the Internet can use ADL which was jointly created by the Association of African Universities, Technikon SA and NetLibrary [9]. Net Library is an American company specialized in setting up digital libraries for universities and companies.

In 2004, the International Network for the Availability of Scientific Publications (INASP) commissioned a survey to find out the current state of digitization in university libraries in Sub-Saharan Anglophone Africa. The study finds that university libraries in Africa have progressed towards establishing digital library services at very different speeds and levels. Libraries therefore have very different needs and ambitions.

Further, for the majority of libraries e-resources are available but facilities for access are poor. The acquisition and implementation of a library management system would appear to be an essential building block in the construction of a digital library [10]. All e-developments have depended heavily on external funding and will continue to do so. Lack of funding and lack of or retention of trained staff is the key challenge for the future.

A study conducted by Kavulya [11] focussed on the role of libraries and information in social development, sectorial information needs and the issues involved in the establishment of digital libraries. The findings of the study indicate that lack of social development in Africa is exacerbated by lack of adequate information. The paper concludes that, through better information gathering, processing and especially by taking advantage of today's digital transfer of knowledge, countries in the Sub-Saharan region can experience rapid economic, social and political development to benefit the local dwellers.

The study concludes that digital libraries in the Sub-Saharan region can be strategic gateways to the global information and a boost to development in the region. The goal of establishing digital libraries in the region can be achieved through measures such as adoption of modern information communication technologies, amassing relevant digital content, investing in digital skills for library staff and users, strategic partnerships between local institutions, and funding agencies and above all government-backed strategy on digital libraries.

The development of digital libraries is in resonance with the Zambia 2030 vision. The government visualizes a Zambia transformed into information and knowledge-based society and economy, supported by consistent development and universal access to ICT's by all citizens by the year 2030 [12]. This is evidence that the Zambian government desires to identify drivers of change in order to entrench use of information and communications technology (ICT) among citizens in different sectors such as health, education and community development. It is for this reason that the current educational system can no longer ignore the importance of technological literacy, a phenomenon that should become an integral portion of a new core curriculum [13].

However, the development of digital libraries in Zambia is hampered by the challenges of internet accessibility due to poor network and under-developed telecommunication infrastructure [12], in addition to the Zambia's small telecommunications infrastructure and low information and communications technology (ICT) literacy and skills levels especially in the rural areas [14].

A study conducted by Zulu [15] revealed that there had been some development in the implementation of digital libraries in Zambia. By 2012 the University of Zambia being the oldest learning institution in Zambia started the digitalization of scholarly works at the special collections of the University of Zambia Library; this is in addition to the repository of eBooks and e-journals stocked by the University for the benefit of the students.

Another digital library that is fast development is the JSTOR a digital library run by the Zambia Open University. JSTOR is a growing digital library of academic journals, books, and primary source objects. JSTOR helps students, scholars, and other individuals discover, use, and build upon a wide range of content through a powerful research and teaching platform [16].

Relevant literature on digital and/or online library management systems was adequately revealed. The literature revealed that digitalisation of reading materials has been growing steadily with the advancement of internet and other information and communication technologies. Most of the libraries in the world's learning institutions are going digital in terms of book transactions and a few are also providing soft copies of reading materials to the clients. The literature has also confirmed that there are specific libraries for specific audiences. However, the objective of this project design has not been adequately answered. Literature on the design and development of an Online Library Management System for Secondary School Education with specific digital materials for online study was not found. This justified the need to proceeding with the project design and development at Luangwa Secondary School.

III. METHODOLOGY

A. Baseline Study

The project site for the design and development of an Online Library Management System was Luangwa District; a peripheral town of Lusaka Province. The district is roughly 350 Km away from Lusaka and had a total population of 25, 294 with 6.3 persons per Km^2 [17]. The baseline study was a quantitative in nature and took the descriptive tradition in order to describe the state of affairs with regard the school library [18]. The researcher collected data primarily through interviewer administered questionnaire. With permission from the school questionnaires were distributed to the selected student and teachers.

The study population comprised 768 library users deemed as students and teachers. At the time of study, Luangwa Secondary School had two (2) streams in the junior section (Grade 8-9) and 4 streams in the senior section (Grade 10-12) giving a total of 16 groups (classes) where the 768 population were distributed. Using random and purposeful sampling techniques a sample size of 76 (10%) was selected who included students, teachers, and administrators. The data collected was analysed with the aid of the Statistical Package for Social Sciences (SPSS) version 20.0

B. Development of the Online Library Management System

Incremental method was used to design and develop an Online Library Management System. Incremental Model is 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

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the previous release. The process continues until the complete system achieved.

A system analysis was done in order to determine the requirements of the system. The online library management system requirements document was generated. Functional and non-functional requirements were developed. In order to develop the requirements, the use case diagram and entity relationship diagram, sequence diagram, activity diagrams, system data model design were also developed.

B) (i). Technologies used

Front end-is a term used to characterize program interfaces and services relative to the initial use of these interface and services. In designing and development of an Online Library Management System, Cascading Style Sheets (CSS) and Hypertext Markup Language (HTML) for front-end technologies, while My Structured Query Language (MySQL) and Hypertext Pre-processor (PHP) for back-end technologies.

B) (ii). Functional Requirements

Functional requirements describe what the system should do, the things that can be captured in use cases and can be analysed by drawing sequence diagrams and state charts. Online Library Management System supports two users, namely; Administrator and Student. The student has limited administrative tasks. The following are the functional requirements of Online Library Management System;

User (student/teacher)

a) **View book transactions:** the student must be able to view book transactions

b) **Borrow a book:** the student must be able to borrow a book on request from the librarian

c) **Return a book:** the student must be able to return a book on request from the librarian

d) **Check book availability:** the student must be able to check whether the desired book is available in the library via internet

e) **Check e-study availability:** the student must be able to check availability of e-study materials using online library management system.

f) **Book Search:** the student must be able to search the desired book from the Online Library Management System

g) **Search subjects:** the student must be able to search subjects offered by Online Library Management System and transact.

h) **File upload**: the student must be able to upload a file using the Online Library Management System subject for approval by the librarian.

i) **Online Study**: the student must be able to study online using the OLMS

Administrator (Librarian)

a) **Add Student:** The administrator must be able to add other Students

b) **Edit Administrator and Student:** The administrator must be able to edit administrator and Students' information

c) **View Student:** The administrator must be able to view administrators and Students

d) **Delete Student:** The administrator must be able to delete administrators and Students

e) **Search Student:** The administrator must be able to search for Students

f) **Add Subject:** The administrator must be able to add subjects to Online Library Management **Delete Subjects:** The administrator must be able to delete Subjects

g) **Search Subjects:** The administrator must be able to search for Subjects

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h) **Add Book:** The administrator must be able to add subjects to Online Library Management

i) **Delete Book:** The administrator must be able to delete books

j) **Search Book:** The administrator must be able to search for books

k) **Add Course:** The administrator must be able to add subjects to Online Library Management

l) **Delete Course:** The administrator must be able to delete courses

m) **Search Course:** The administrator must be able to search for courses

n) **File upload**: the administrator must be able to upload a file using the Online Library Management System.

o) **Borrow Book:** the administrator must be able to process book borrowing using the OLMS

p) **Return a book:** the administrator must be able to process book returning using the Online Library Management System

q) **Online Study**: the administrator must be able to study online using the Online Library Management System

r) **Manage Course**: the administrator must be able to manage added courses using the Online Library Management System

s) **View report**: the administrator must be able to view monthly statistical report using the Online Library Management System

B) (iii).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 and more. They usually cannot be implemented in a single module of a program. Online Library Management System has the following non-functional requirements.

a) The System must be user friendly. The Librarian must be able to carry out book transactions with much easy. The students must able to study online without visiting the library.

b) The system must be fast. Online Library Management System must take less than 10 seconds to open and provide accessibility to study materials.

c) The System must be accurate. The System must handle all book transactions accurately and if an error occurs, the system must revert back to the previous state

d) The System must allow more than one student to study at the same time

e) The system must conform to the standard library management system

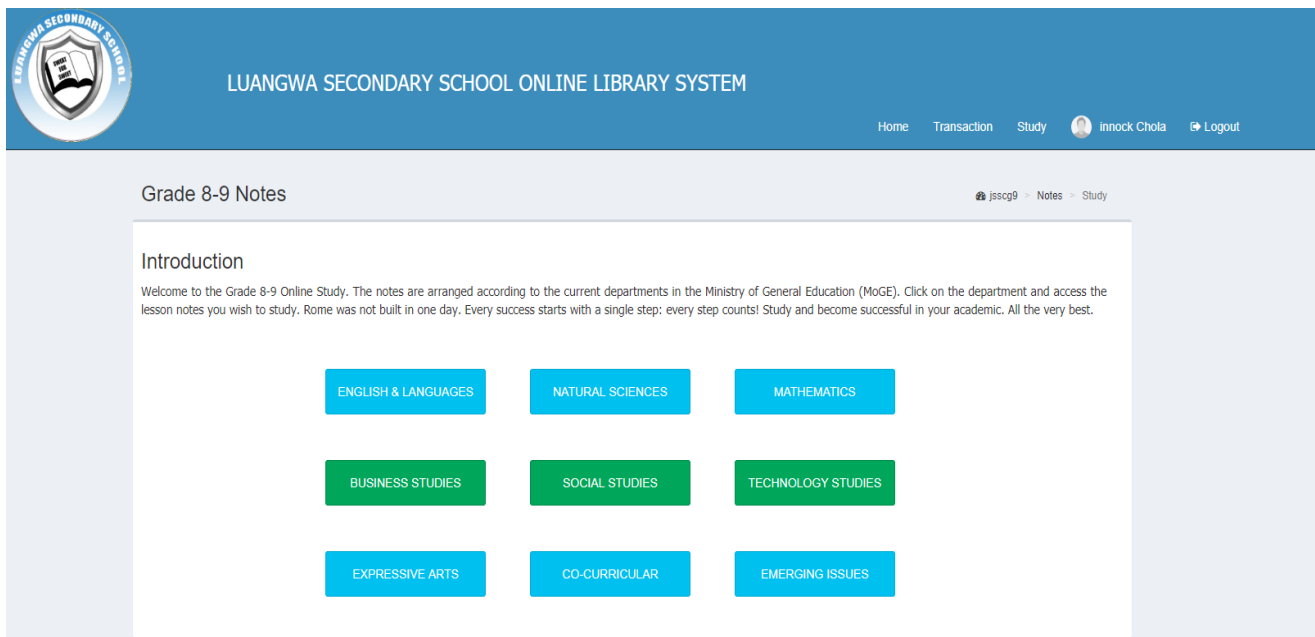## IV. SYSTEM ARCHITECTURE

Figure 1: Student's start page
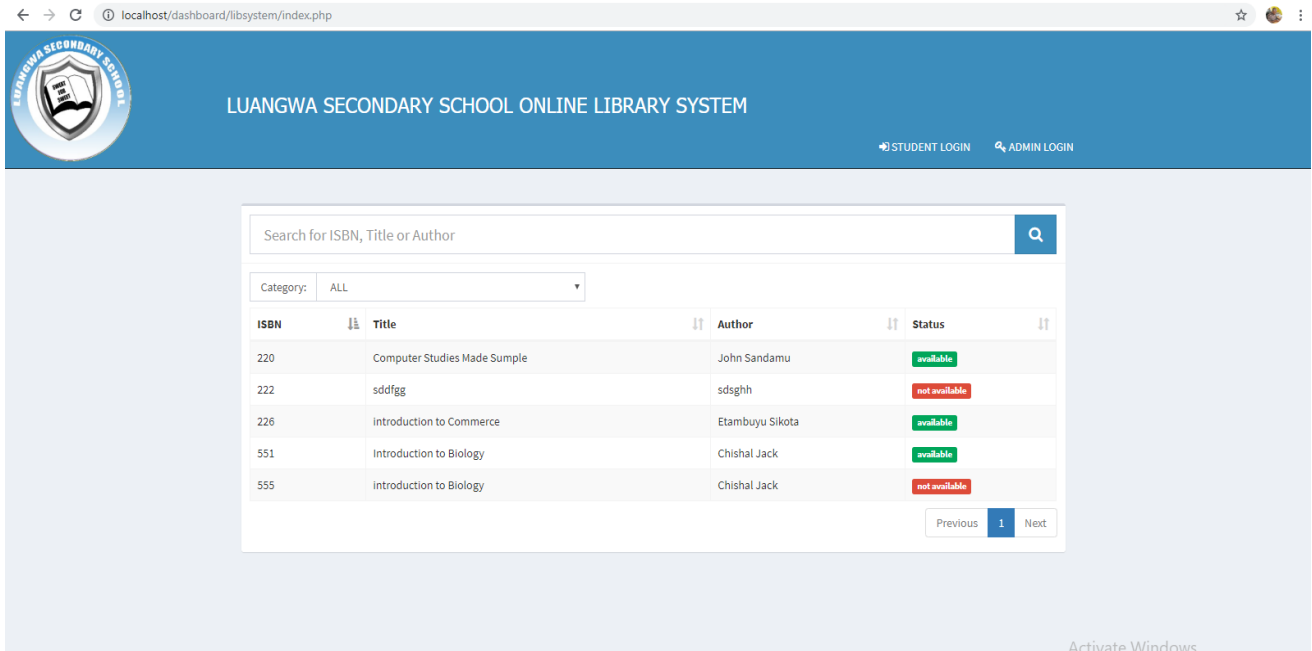
Source: screenshot from the designed system
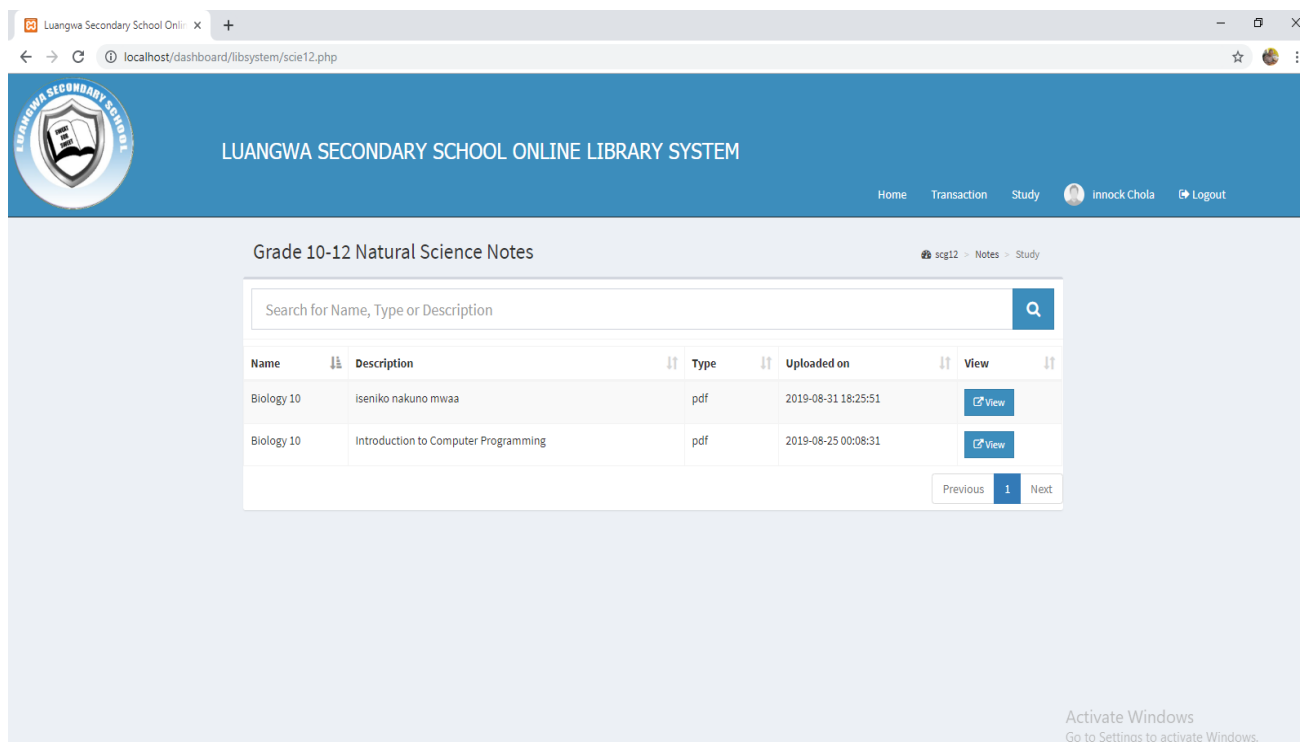
Figure 2: Student login page
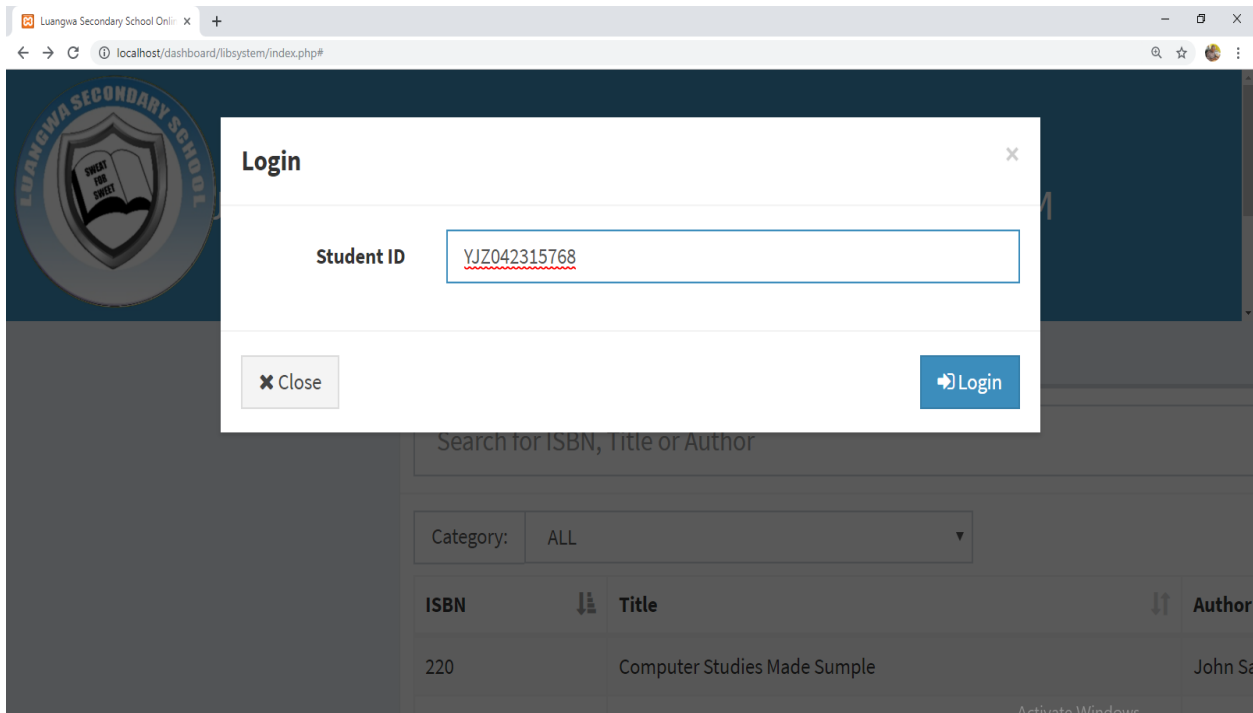
Source: screenshot from the designed system

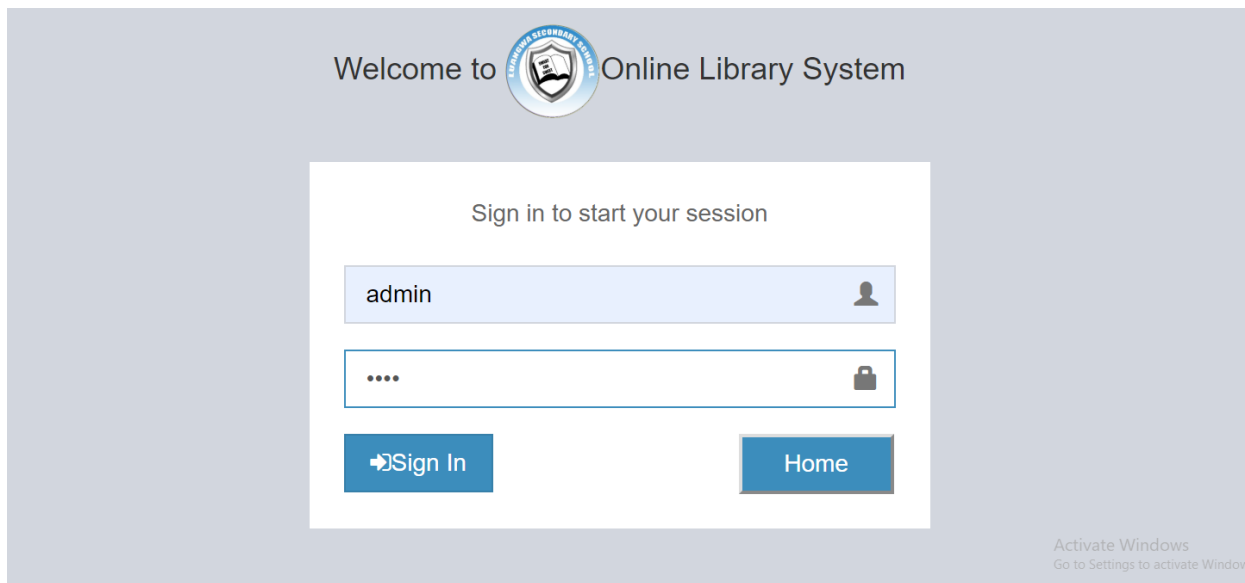**Figure 3: Grade 8-9 Student's Subject Module**

Source: screenshot from the designed system

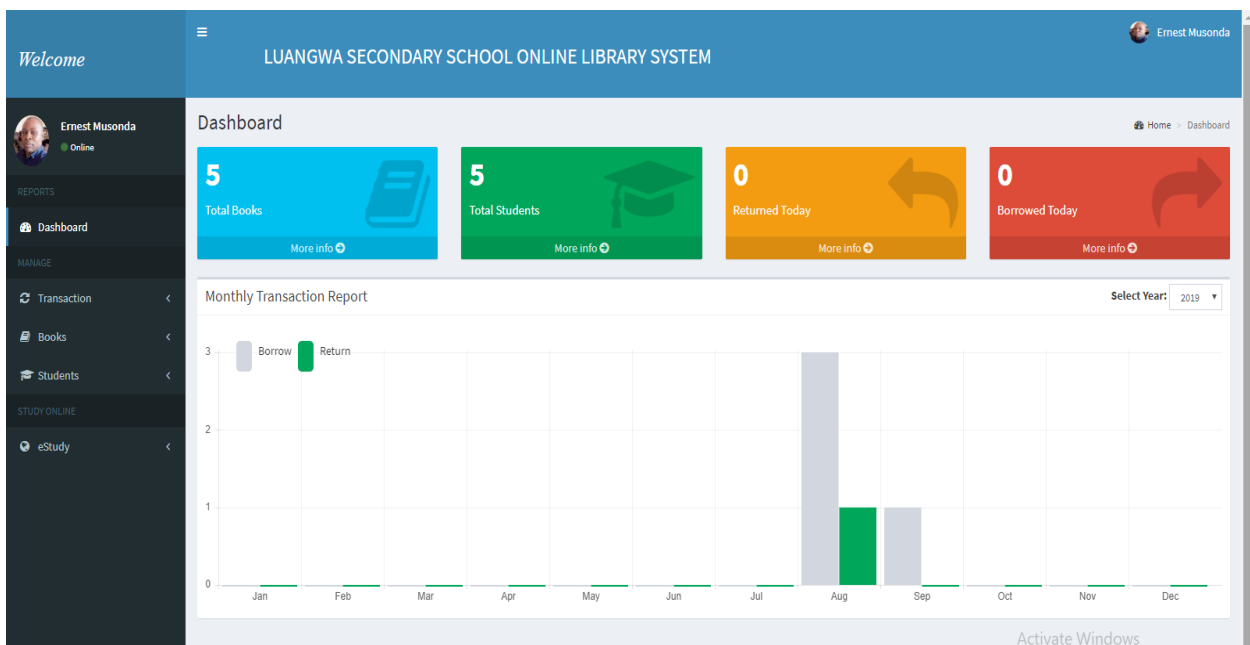**Figure 4: Grade 10-12 Student's Natural Science Notes page**

Source: screenshot from the designed system
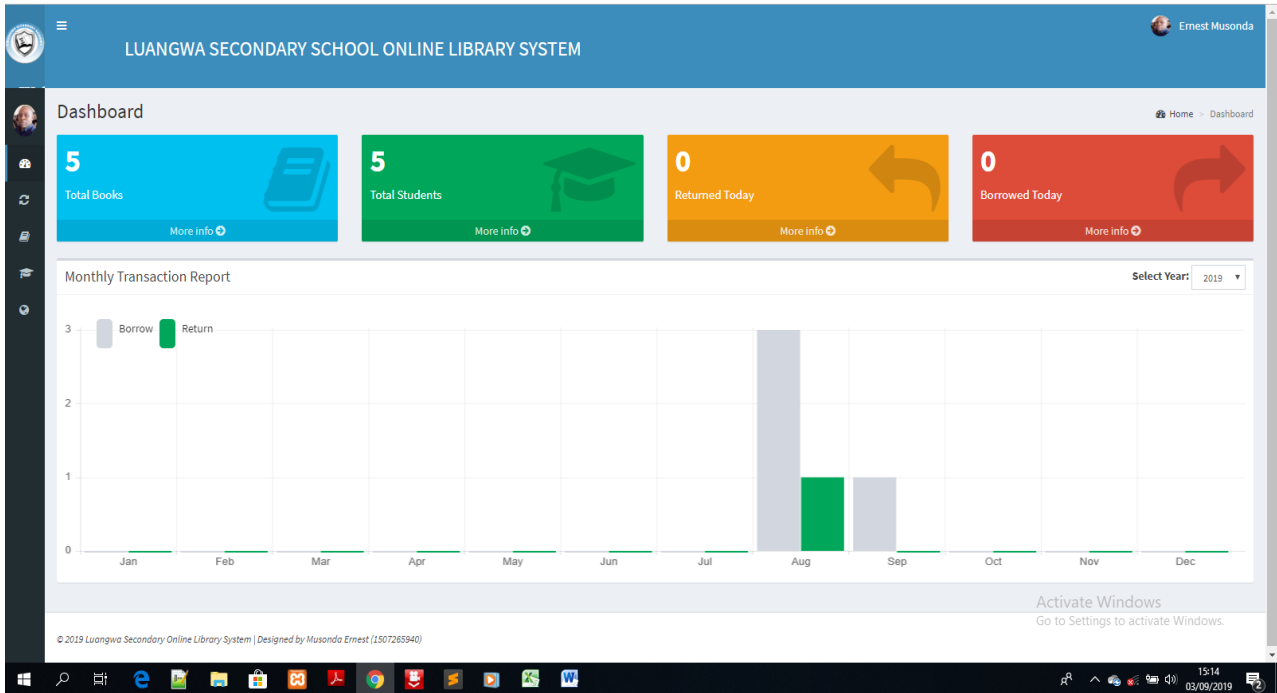
Figure 5: Administrator's logging page

Source: screenshot from the designed system

Figure 6: Dashboard Admin Module: Normal view

Source: screenshot from the designed system

Figure 7: Dashboard Admin Module: Spanned view

Source: screenshot from the designed system

Figure 8: Admin borrow books processing
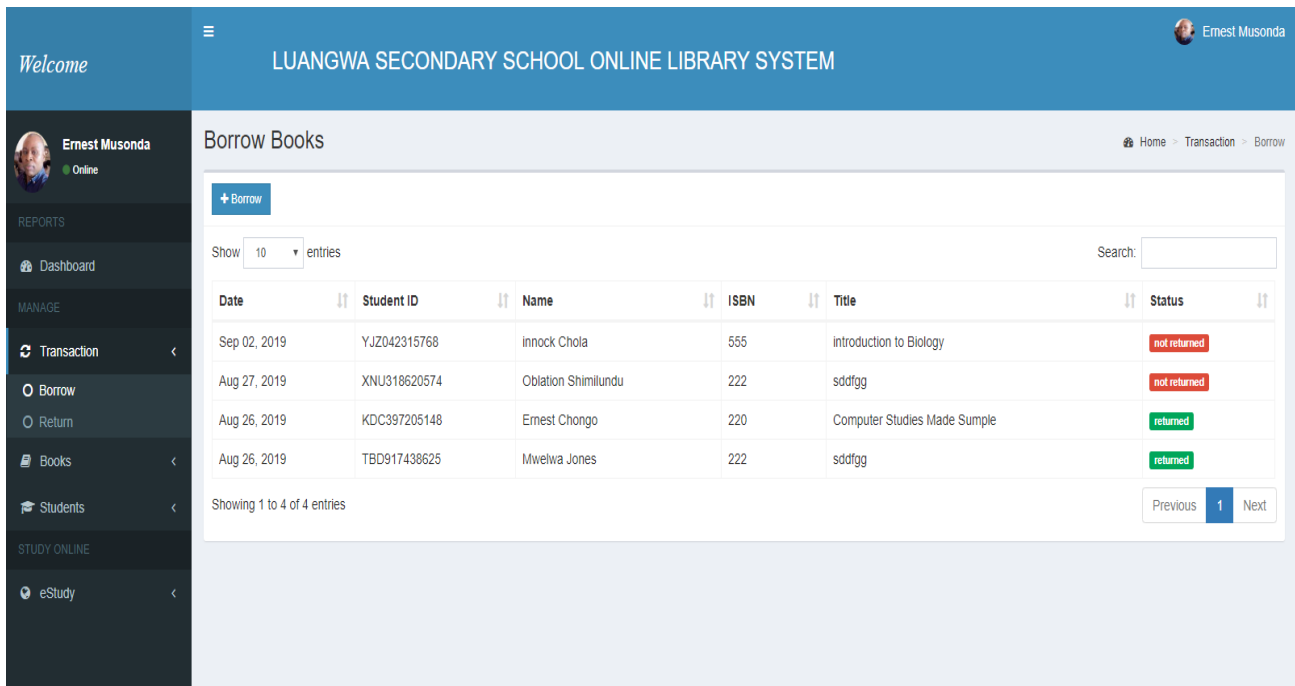
Source: screenshot from the designed system

Figure 9: Admin return books processing
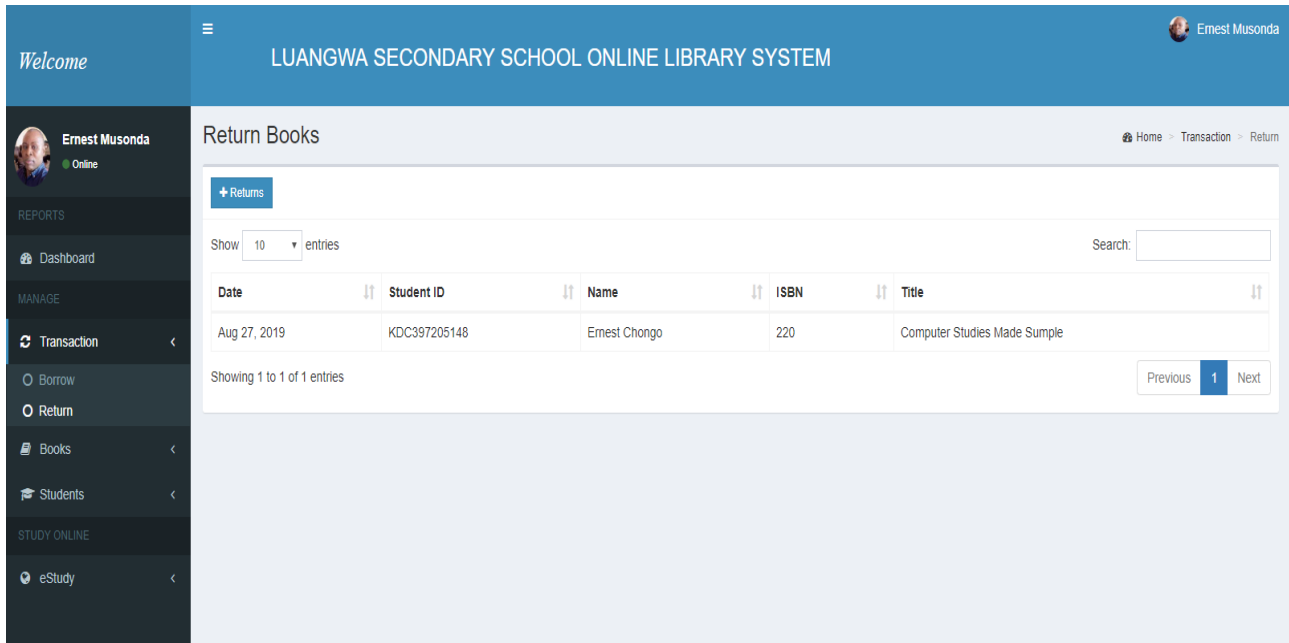
Source: screenshot from the designed system

Figure 10: Admin book list module
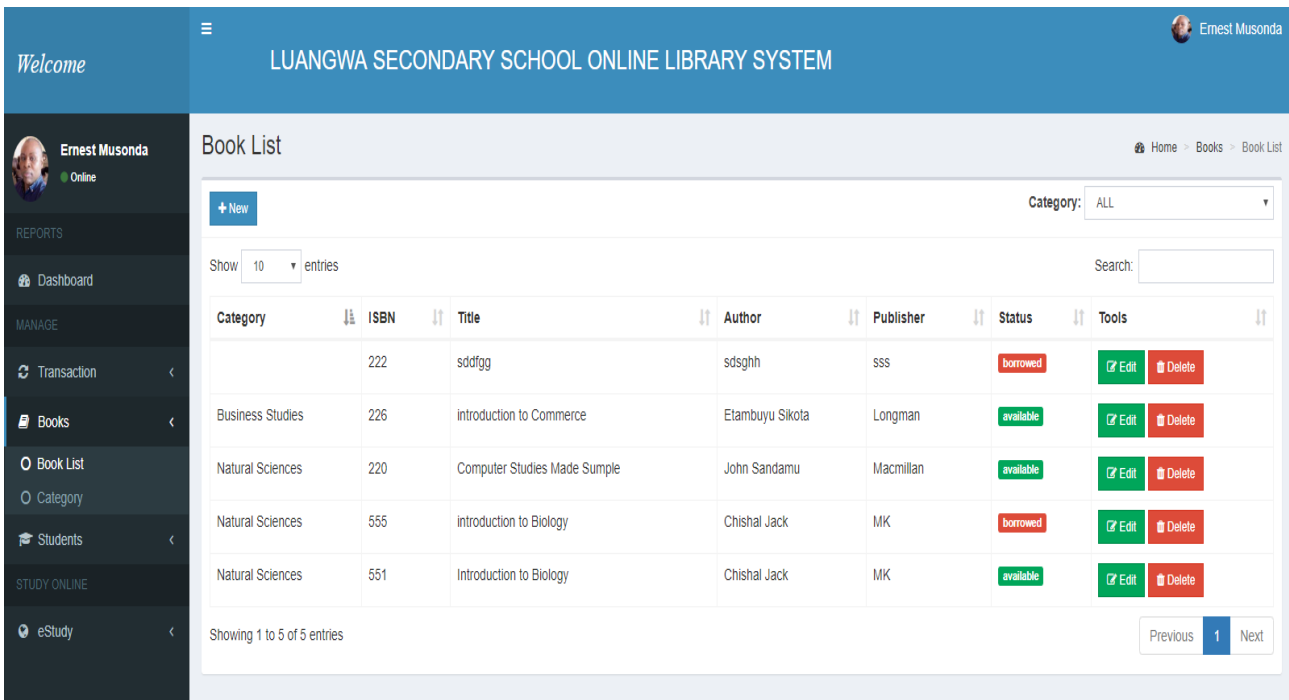
Source: screenshot from the designed system

Figure 11: Admin Student List Module

Source: screenshot from the designed system

Figure 12: Admin subject module

Source: screenshot from the designed system

Figure 13: Administrator's list of senior section secondary school syllabuses

Source: screenshot from the designed system

V. DISCUSSION AND CONCLUSION

The study aimed at designing and development of an online library management system for Luangwa Secondary School so as to reduce the school librarian's heavy workload due to the manual book transactions. Ultimately, the outcome of the project was to nurture and enhance the reading culture of the student population at School.

A. The Baseline Study

The baseline study showed that library users (teachers and students) were skilled in typing, and internet browsing and/or internet surfing through the use of technological gadgets such as computers, smartphones and modem. This was a good indicator that when the designed system is fully operational, the clients (library users) would not face challenges to accessing online library services at the study site.

The study also revealed that the school had a computer laboratory with 40 desktop computers

running on Windows 7, 8 and 10 operating systems. There was also availability of internet services through the use of Wireless Fidelity (Wi-Fi), 32-user HUAWEI branded – B315-49A4 run on MTN internet with an internet protocol (IP) address of 192.168.8.1. MTN is one of the competitive commercial company and an Internet Service Provider (ISP) in Zambia.

The study showed that an online library management system can be established as the school had adequate computers as well as skilled teacher and students in ICT. The current library service can be computerised to shorten the time taken for book transaction and also provide the students with online study materials. This can improve the reading culture among students and also help improve both student and school performance.

B. Use of Technology

The second objective of the study sought to determine the use of ICTs in library management

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and services. This objective was based on assessing the usage and appreciation of technology as a way of mitigation challenges associated with the manual library management system. The study showed that the use of ICT in library services promoted easy and effective library management, thereby drastically reducing the librarian's heavy work load. The use of technology ensures a paperless library environment and also promote consistence in data record keeping. The provision of study materials online motivates students to research anywhere and at any time.

C. Development of the online library management system as a solution

The third objective was to design and develop a school online library management system that would help reduce the librarians' workload, improve on data record keeping, reduce time taken to transact a single borrow for both borrowing and returning and provide study materials (books and lesson notes) online so students can study anywhere, anytime and at own pace.

The study revealed that designing and developing a school online library management with a user-friendly GUI that suit library users and enable a secure and portable database management system (DBMS) that eliminates duplication of data, would help improve the provision of school library services to the student, teachers and community members. This could contribute to good performance of individual learners, teachers and the school.

The online system was build using the incremental software development method, using XAMPP (PHP and MySQL) as explained in Chapter 3. This is in the limelight to implement e-governance in Zambia in the education sector.

The Prototype was developed, implemented and tested at Luangwa Secondary School. The Prototype testing was done among 10 participants from the school; they included students, teachers, and teacher librarian and middle management personnel. The system was installed on a library computer using the XAMPP with 10 participants accessing the system as students and one teacher role playing as system administrator (the Librarian).

D. Results from System Testing and Evaluation

The designed and developed system was tested and evaluated with ten (10) research units using the available computers in the school computer laboratory. XAMPP was used to provide the server side of the system. A one (1) day hands-on training was conducted for the ten (10) participants in readiness for testing the designed and developed system. The researcher explained all about the system to the students using each graphical interface of the system.

The following are some of the summarized criticisms of the online library management system.

i)   The participants observed that the system was unable display information on the number of individual physical copies of book time. This made the librarian still getting back to paperwork. The participants seemed to suggested that the system should count individuals copies of the library books differentiated by the international standard book number

ii) It was also observed that the system had inadequate statistical information about book transaction. If not improved, librarian's workload would still be high as good as the manual library management system. The participants feel the system must include a page summarizing book transactions and lesson notes using statistical information.

iii) During testing and evaluation, the participants observed that the system had unordered database. So, they suggested ensuring the

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system has a specific ordering systemic that must be ordering entries (books, book transactions, student enrolled on the system) either in ascending or descending. This would help in searching recent or old data records.

iv) The participants envisioned an online library management system that includes instant messaging to effectively help users in large numbers.

v) Participants also seem to propose for an online library management system with more a variety of student-teacher interaction. The research units were most likely envisaging for a library management system that should provide online tuitions chatting or instant messaging via live online.

E. Comparison with other similar works

This study acknowledges similar works done by University of Zambia in digitizing most of the study materials and research papers in its main library, and also for investing in cloud computing, dspace online storage of research papers, modules and tutorials. Other learning institutions were also following suit in digitalizing student modules, notes, research papers and publishing such basic educational documents on their websites.

Other acknowledged works includes all the mushrooming websites by various higher learning institutions. An example is the JSTOR, an online library system run by the Zambia Open University; a growing digital library of academic journals, books, and primary source objects that is helping students, scholars, and other individuals discover, use, and build upon a wide range of content through a powerful research and teaching platform.

The Luangwa Secondary School Online Library Management System has been designed and developed using two (2) major modules: the student and administrator's modules. The modules have similar functionalities but with different privileges. The administrator has absolute privileges while the student's roles are limited. The system has designed with user-friendly modules such as student and administrator for book transactions, search/view of courses and subjects, and an e-study for accessing lesson notes and/or eBooks online.

F. Possible application

This study was an attempt to reduce the challenges of manual library management system that are characterized by heavy workload for teacher librarians, inconsistence manual data records and long periods of time taken in searching, viewing, borrowing and returning library books. This system aimed at reducing such challenges using modern computer technology.

The designed OLMS may help government, specifically the Ministry of General Education, Ministry of Community Development, Mother and Child to provide quality education to the Zambian masses through quality online library service provision.

The system can be used by any learning institution to disseminate, entertain and education its clientele through online sharing of lesson notes, books, leaflets, booklets and many other interactive educational materials to student. The system can also be used to manage library resources and data records in library service provision in a paper less work environment with effective service delivery.

G. Conclusion

The advancements in information and communications technology (ICTs) can be used to mitigate the challenges of library service provision and library management in Zambia's secondary school education. An Online Library Management System can help in running school libraries effectively and efficiently. Application of ICTs in library management can easily improve the reading culture among students and shape the teaching and learning process according to the government

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standards. Government policies and desires to effectively implement the e-governance crusade can become more enforceable and promote mass education among the Zambian citizen. Community members and parents can be well vested with the changes in curriculum and help their children at home thereby enhancing the implementation of homework policy. The Online Library Management System was designed and implemented to work as an internet-based (web-based) system. The internet is one of the most used platforms among library users in school. The Online Library Management System prototype was implemented and demonstrated at Luangwa Secondary School.

H. Future works

Through the use ICTs, this study has applied a number of functionalities through the Online Library Management System but the following was not covered:

a) Comprehensive integration for online requests of book transactions and delivery of study materials (hardcopies) in school.

b) Comprehensive integration for backend staff portal and student portal so as to encourage student consulting individual subject teacher through instant messaging online.

c) An android version of the Online Library Management System can be designed and developed for use on mobile computing devices.

d) The following modules need to be included in future development of this study. In future developments the system must;

   i) Count individual copies of the library books despite having different international standard book numbers

   ii) Include a page summarizing book transaction using statistical information to

benefit the librarian to give quick feedback on the availability of copies.

   iii) A database that is able to arrange books, book transactions, student enrolled in order, either in ascending or descending

   iv) Include instant messaging to help users in large numbers

   v) Provide online tuitions via chatting (instant messaging)

These functionalities were not covered due to limited financial resources and time allocated to this study. Future researchers can delve into design and development of the online library management system with an addition of these functionalities and modules.

VI. ACKNOWLEDGEMENT

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VIII. APPENDICES

A. Appendix 1: Sample code

This sample code shows the code structure of the software prototype on the administrator's home page.

```php
<?php
    session_start();
    if(isset($_SESSION['admin'])){
    header('location:home.php');
    }
?>
<?php include 'includes/header.php'; ?>
<body class="hold-transition login-page">
<div class="login-box">
    <div class="login-logo">
    <h4>Welcome to <img
src="../images/p1.png" height="55" width="55"
alt="image">Online Library System</h4>
    </div>
    <div class="login-box-body">
    <p class="login-box-msg">Sign in to start
your session</p>
    <form action="login.php"
method="POST">
        <div class="form-group has-
feedback">
        <input type="text" class="form-
control" name="username" placeholder="input
Username" required autofocus>
        <span class="glyphicon glyphicon-
user form-control-feedback"></span>
        </div>
    <div class="form-group has-feedback">
    <input type="password" class="form-
control" name="password" placeholder="input
Password" required>
    <span class="glyphicon glyphicon-lock
form-control-feedback"></span>
    </div>
        <div class="row">
            <div class="col-xs-4">
```

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```
                    <button type="submit"
class="btn btn-primary btn-block btn-flat"
name="login"><i class="fa fa-sign-in"></i>Sign
In</button>
              </div>
         <div style="float: right; padding-right:
16px; color: white;">
            <button style="background-color:
#3c8dbc; height: 35px; width: 90px; "
onclick="goBack()">Home</button>
        <script>
           function goBack() {
             window.history.back();
            }
         </script>
       </div>
       </div>
       </form>
       </div>
       <?php
              if(isset($_SESSION['error'])){
                      echo "
                           <div class='callout
callout-danger text-center mt20'>

        <p>".$_SESSION['error']."</p>
                              </div>
                      ";
                      unset($_SESSION['error']);
              }
       ?>
</div>
</body>
</html>
```

B. Appendix 2: Database Access Code sample

```
SET SQL_MODE =
"NO_AUTO_VALUE_ON_ZERO";
SET time_zone = "+00:00";
```

```
/*!40101 SET
@OLD_CHARACTER_SET_CLIENT=@@CH
ARACTER_SET_CLIENT */;
/*!40101 SET
@OLD_CHARACTER_SET_RESULTS=@@C
HARACTER_SET_RESULTS */;
/*!40101 SET
@OLD_COLLATION_CONNECTION=@@CO
LLATION_CONNECTION */;
/*!40101 SET NAMES utf8 */;

--
-- Database: `libsystem`
--
-- --------------------------------------------------------
--
-- Table structure for table `admin`
--
CREATE TABLE IF NOT EXISTS `admin` (
  `id` int(11) NOT NULL,
  `username` varchar(30) NOT NULL,
  `password` varchar(60) NOT NULL,
  `firstname` varchar(30) NOT NULL,
  `lastname` varchar(30) NOT NULL,
  `photo` varchar(200) NOT NULL,
  `created_on` date NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=2
DEFAULT CHARSET=latin1;
--
-- Dumping data for table `admin`
--
INSERT INTO `admin` (`id`, `username`,
`password`, `firstname`, `lastname`, `photo`,
`created_on`) VALUES
(1, 'admin',
'$2y$10$A7f/KqG5LploFZFm1Hj20OZg/OdZUs
bQ1UizMt/z.ottVdMGEBlYy', 'Ernest',
'Musonda', 'p11.png', '2019-05-03');
-- --------------------------------------------------------
--
-- Table structure for table `books`
--
```

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```
CREATE TABLE IF NOT EXISTS `books` (
`id` int(11) NOT NULL,
  `isbn` varchar(20) NOT NULL,
  `category_id` int(11) NOT NULL,
  `title` text NOT NULL,
  `author` varchar(150) NOT NULL,
  `publisher` varchar(150) NOT NULL,
  `publish_date` date NOT NULL,
  `status` int(1) NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=10
DEFAULT CHARSET=latin1;
--
-- Dumping data for table `books`
--
INSERT INTO `books` (`id`, `isbn`,
`category_id`, `title`, `author`, `publisher`,
`publish_date`, `status`) VALUES
-- --------------------------------------------------------
--
-- Table structure for table `borrow`
--
CREATE TABLE IF NOT EXISTS `borrow` (
`id` int(11) NOT NULL,
  `student_id` int(11) NOT NULL,
  `book_id` int(11) NOT NULL,
  `date_borrow` date NOT NULL,
  `status` int(1) NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=25
DEFAULT CHARSET=latin1;
--
-- Dumping data for table `borrow`
--
INSERT INTO `borrow` (`id`, `student_id`,
`book_id`, `date_borrow`, `status`) VALUES
(17, 3, 1, '2019-05-04', 0),
(18, 3, 2, '2019-05-04', 1),
(19, 5, 3, '2019-06-26', 0),
(23, 6, 7, '2019-06-26', 0),
(24, 6, 4, '2019-06-26', 0);
-- --------------------------------------------------------
--
-- Table structure for table `category`
```

```
--
CREATE TABLE IF NOT EXISTS `category` (
`id` int(11) NOT NULL,
  `name` varchar(100) NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=6
DEFAULT CHARSET=latin1;
--
-- Dumping data for table `category`
--
INSERT INTO `category` (`id`, `name`)
VALUES
(1, 'Engineering'),
(2, 'Mathematics'),
(3, 'Science and Technology'),
(4, 'History'),
(5, 'IT Programming');
-- --------------------------------------------------------
--
-- Table structure for table `course`
--
CREATE TABLE IF NOT EXISTS `course` (
`id` int(11) NOT NULL,
  `title` text NOT NULL,
  `code` varchar(15) NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=4
DEFAULT CHARSET=latin1;
--
-- Dumping data for table `course`
--
INSERT INTO `course` (`id`, `title`, `code`)
VALUES
(1, 'Bachelor of Science in Information Systems',
'BSIS'),
(2, 'Bachelor of Science in Computer Science',
'BSCS'),
(3, 'Bachelors of Information Technology', 'BIT');
-- --------------------------------------------------------
--
-- Table structure for table `returns`
--
CREATE TABLE IF NOT EXISTS `returns` (
`id` int(11) NOT NULL,
```

```
  `student_id` int(11) NOT NULL,
  `book_id` int(11) NOT NULL,
  `date_return` date NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=6
DEFAULT CHARSET=latin1;
--
-- Dumping data for table `returns`
--
INSERT INTO `returns` (`id`, `student_id`,
`book_id`, `date_return`) VALUES
(3, 3, 2, '2019-05-04'),
(4, 3, 2, '2019-05-04'),
(5, 6, 4, '2019-06-26');
-- --------------------------------------------------------
--
-- Table structure for table `students`
--
CREATE TABLE IF NOT EXISTS `students` (
`id` int(11) NOT NULL,
  `student_id` varchar(15) NOT NULL,
  `firstname` varchar(50) NOT NULL,
  `lastname` varchar(50) NOT NULL,
  `photo` varchar(200) NOT NULL,
  `course_id` int(11) NOT NULL,
  `created_on` date NOT NULL
) ENGINE=InnoDB AUTO_INCREMENT=7
DEFAULT CHARSET=latin1;
--
-- Dumping data for table `students`
--
INSERT INTO `students` (`id`, `student_id`,
`firstname`, `lastname`, `photo`, `course_id`,
`created_on`) VALUES
(3, 'IMU702639514', 'Neovic', 'Devierte',
'facebook-profile-image.jpeg', 1, '2019-05-04'),
(4, 'TBD917438625', 'Gemalyn', 'Cepe', '', 2,
'2019-05-04'),
(5, 'GSU960812475', 'Christine', 'Gray', '', 1,
'2019-03-26'),
(6, 'NOY017542369', 'Tonny', 'Jr', '', 1, '2019-03-
26');
--
```

```
-- Indexes for dumped tables
--
--
-- Indexes for table `admin`
--
ALTER TABLE `admin`
 ADD PRIMARY KEY (`id`);
--
-- Indexes for table `books`
--
ALTER TABLE `books`
 ADD PRIMARY KEY (`id`);
--
-- Indexes for table `borrow`
--
ALTER TABLE `borrow`
 ADD PRIMARY KEY (`id`);
--
-- Indexes for table `category`
--
ALTER TABLE `category`
 ADD PRIMARY KEY (`id`);
--
-- Indexes for table `course`
--
ALTER TABLE `course`
 ADD PRIMARY KEY (`id`);
--
-- Indexes for table `returns`
--
ALTER TABLE `returns`
 ADD PRIMARY KEY (`id`);
--
-- Indexes for table `students`
--
ALTER TABLE `students`
 ADD PRIMARY KEY (`id`);
--
-- AUTO_INCREMENT for dumped tables
--
--
-- AUTO_INCREMENT for table `admin`
```

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```
--
ALTER TABLE `admin`
MODIFY `id` int(11) NOT NULL
AUTO_INCREMENT,AUTO_INCREMENT=2;
--
-- AUTO_INCREMENT for table `books`
--
ALTER TABLE `books`
MODIFY `id` int(11) NOT NULL
AUTO_INCREMENT,AUTO_INCREMENT=10;
--
-- AUTO_INCREMENT for table `borrow`
--
ALTER TABLE `borrow`
MODIFY `id` int(11) NOT NULL
AUTO_INCREMENT,AUTO_INCREMENT=25;
--
-- AUTO_INCREMENT for table `category`
--
ALTER TABLE `category`
MODIFY `id` int(11) NOT NULL
AUTO_INCREMENT,AUTO_INCREMENT=6;
--
-- AUTO_INCREMENT for table `course`
--
ALTER TABLE `course`
MODIFY `id` int(11) NOT NULL
AUTO_INCREMENT,AUTO_INCREMENT=4;
--
-- AUTO_INCREMENT for table `returns`
--
ALTER TABLE `returns`
MODIFY `id` int(11) NOT NULL
AUTO_INCREMENT,AUTO_INCREMENT=6;
--
-- AUTO_INCREMENT for table `students`
--
ALTER TABLE `students`
MODIFY `id` int(11) NOT NULL
AUTO_INCREMENT,AUTO_INCREMENT=7;
```

```
/*!40101 SET
CHARACTER_SET_CLIENT=@OLD_CHARA
CTER_SET_CLIENT */;
/*!40101 SET
CHARACTER_SET_RESULTS=@OLD_CHAR
ACTER_SET_RESULTS */;
/*!40101 SET
COLLATION_CONNECTION=@OLD_COLLA
TION_CONNECTION */;
```