Cloud-Based Library System Implementing Responsive Web Design Framework

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Abstract - This study aims to develop a Cloud-based Library System using a Responsive Web Design Framework to help users in implementing the process of Acquisitions of: i) newly acquired books, ii) Cataloguing, iii) Account management, iv) Borrowing and Returning of books, v) dynamic searching, and vi) Inventory. Moreover, we aim to create modules that will generate visualization and graphical reports on: i) book borrower's statistic per program, ii) user's attendance, iii) the most utilized book for each program, and iv) smart phones for online transactions. We used Rapid Application Development (RAD) as a software methodology for a Cloud-based Library System Implementing Responsive Web Design Framework. To ensure the functionality, efficiency, usability, security, and maintainability of the Cloud-based Library System, we tested the system in all aspects and sub-characteristics based on ISO/IEC 25010:2011, which is a standard procedure to test a software capability. We achieved the specific objectives of the study and can recommend it as a tool for library resources for academic and learning processes.

Keywords - Cloud-Based; Library System; Web Design; Distributed Computing

I. INTRODUCTION

Library, as a collected work of learning resources provides substantial information and made reachable to sustain community needs in terms of borrowing of a book and in a radical sense of reference, [1].

It also endows with a helpful place for enumerable learning showcasing facilities of group study and group collaboration. In addition, the library is the heart of the school, it is where learning starts for everybody aside from the classroom [2]. The library is established and organized by a professional librarian using the Dewey Decimal System (DDC) and the Library of Congress (LC). The DDC is normally used in a library with small collection particularly elementary libraries while the LC is used with quite bigger collection specifically college libraries [3][4]. Moreover, aside from deciding which system is to be used book numbers and author's number should be assigned for each collection [5]. In this process the Cutter's table is the basis of this manual processes, card catalogs are prepared to facilitate the easy location of books. It is now the time whether to use the close or open system of lending books.

In ASIATECH College at Sta. Rosa, Laguna, traditional library transaction was tedious during a manual record of book acquisition. These are the processing method of book acquisition: (1) When processing of book acquisition it is necessary to write down the book details like accession number for the tracking of each book, title of the book, author of the book, volume, pages, book edition, source of fund, cost price, publisher, book year and remarks. (2) Place the accession number on the top of the book; (3) put the book stamp for the distinctiveness of school for each book on the side, left, right, bottom, top, inside and the back side of the book, (4) place book card at the back of the book and write down again the book details and last the plastic cover.

When borrowing books they cannot reserve it, they need to go to the Library to ask if the book is available. It takes time for both the students and librarian the process because the manual procedure was done; (1) the user (Admin, Faculty, Staff and Student) seek assistant to the librarian for the book availability; (2) once the book is available the user (Admin, Faculty, Staff and Student) write down the following information (surname, name, year level, program and student number, (3) The details of the book provide the information in the log- sheet form like title of the book, date borrow and return, and accession book number for the book monitoring (4) last, the Librarian take the available book to the shelf and take the book card behind the book. The Librarian required the user (Admin, Faculty, Staff, and Student) to leave their library card and book card for the book monitoring.

This study aims to develop a Cloud-based Library System using a Responsive Web Design Framework that could help the users in terms of implementing the following processes: book acquisition, borrowing, returning, cataloging and searching to easily access through a smart phone when they want an online transaction. Thus, this work is essential for library resources, academic learning, and enhancement of knowledge.
A. Objectives of the Study

A1. General Objective: The aim of this study is to create and develop a computerized system intended for ASIATECH library processes using a cloud-based platform and responsive web-design framework.

A2. Specific Objectives:

SP-1. To design modules for the following processes:
   i. Acquisitions of newly acquired books;
   ii. Cataloguing;
   iii. Account management;
   iv. Borrowing of books;
   v. Returning of books;
   vi. Dynamic searching;
   vii. Inventory.

SP-2. To create modules that will generate visualization or graphical report relative to:
   i. Book borrower's statistic per program;
   ii. User's Attendance;
   iii. Most utilized book for each program.

SP-3. To Evaluate the system using ISO/IEC 25010:2010 with regards to the following criteria:
   i. Functionality of the system,
   ii. Efficiency in terms of performance,
   iii. Compatibility and usability issues,
   iv. Easy to adapt with the growing needs, and
   v. Portability.

B. Significance of the Study

This study intends to benefit the following clientele:

A. System Administrator: This study will be of great help to the system administrator because this software enables to allow them to generate a list of books report and student information.

B. Faculty/Staff: This study contributes a wide selection of learning materials and can be easily accessed through the cloud-based.

C. Librarian: This study contributes in terms of recording, inventory and tracking all the library transaction including documentation in generating report through graphical statistics.

D. School: This study contributes a big help to the institution for an open-handed accessible way of information to the user's a fast and easiest way of learning resources.

E. Students: This study contributes to and improves their studies and learning process in fast and reliable access using library resource through the web.

F. Researcher: This work enhances the skills and knowledge of the researcher in system developing and designing which is important for an IT professional.

G. Future Proponents: This study will be beneficial to future researchers as they can use it for their own references.

C. Scope and Delimitations

This study was conducted at the Asia Technological School of Science and Arts in Laguna. It encompasses the development of a Cloud-based library system with implementing a Responsive Web Design Framework. The development of the study will cover system inception to system testing and evaluation. In addition, the following are the structure blocks of the proposed system: (1) Administrator Module - this module handles the creation of users and its privileges and notifies thru email verification to confirm their password in order to use their account; (2) Librarian Module – the pertinent transaction includes input newly acquisition of books, borrowing, returning, books penalty, book inventory and generating the library attendance through statistics report. It helps the Librarian to evaluate the utilization of usable book and determine the number of users in each program; (3) User Module - the users can make an online transaction using gadgets through borrowing and reservation of books.

The proposed system will be developed using open source language such as PHP and My SQL for data storage. Also, Bootstrap serves as the framework of the program of better user interface design that is suitable both desktop and mobile devices. However, the study covers the Asia Technological School of Science and Arts in Laguna. Also, the system itself does not include the book donation and journal references.

II. RELATED LITERATURE

A. Cloud-Based/Cloud-Computing

See reference [6]. In this study, the database of the system was stored at Asia Technological School of Science and Arts in Laguna. All the record will be stored in the cloud through the use of internet, domain, and hosting [7]. At present, cloud computing technology has been utilized in almost all areas of innovation specifically ranging from education to new learning solutions. Furthermore, [8] cloud computing compensates the educational services that enable the community to learn and acquire the skills needed especially in global information stability.
Figure 1 depicts the different use of platform used at cloud computing make it as sophisticated services which entail the capabilities of such applications that can be accessed over an online mode Buyya, Raj Kumar (2013).

A1. Library System: See reference [9] J. Dean and S. Ghemawat (2014), research of Dean and Ghemawat emphasize that a knowledge sharing model is to be provided in order to identify present conditions in the library. Therefore, it is valuable that borrowing of books online rather than manual process. In order to deliver this concern, the researchers agreed to create and implement local area cloud library. [10] Some libraries have a huge purpose and role to the patron for the enhancement built the creative learning using new technology.

A2. Responsive Web Design: See reference [11] Marcott is an expert developer and father of Responsive Web Design (RWD) he paying attention doing a fluid grid, flexible images, and media queries as the procedural pillars for RWD. He also determined the needs for the new approach platform in technology. See reference [12]. Effective web design responsive to the needs of the user helps to understand the user experience using smartphone and laptop devices while using the web-based health portal. Using measure and evaluation, the results show that the user with smartphone device is more likely effective and with a better experience rather than using a laptop.

A3. Framework: See references [14][15]. Using framework in order to: (1) save time using framework as a big help styles and rules for the button styles, grid, font size, CSS3 on other aspect to build a website; (2) Community extension a famous framework will most likely have a likely active community extends framework; (3) cross-browser community this function was sure of how many different painful one to used. It has been tested used in IOS, Android, and Window Phone 7 browser.

III. METHODOLOGY

We used the Rapid Application Development (RAD) as a software methodology in the progress of Cloud-based Library System Implementing Responsive Web Design Framework.

Figure 3 depicts phases of the system development cycle and the researcher used the Rapid application developments (RAD) in creating the system. With the RAD methodology, required phases and explanation were taken out in order to build a very efficient and effective system as follows:

See reference [16]. The step by step process of Rapid application developments (RAD) Software Prototyping with the planned procedures in the system development are explained or discussed in the following: The first phase or process is the Requirements or identification wherein the researcher determines first the overall system objectives and functionalities. The overall objectives and functionalities were taken and identify during and after the conducted survey and interview from the target participants or respondents involved and would be benefited with the system and the institutions which the system is prepared to apply. In the study, requirement gathering process was started by studyin the background of the study along with the persons involved in the process of Cloud-based Library System in order to understand well the objective of the study. Studying and understanding the problems encountered in order to improve the information for online access with proper validation and security through the development of Cloud-based Library System.
See reference [17]. The second phase is the Design wherein the interpreted information of the researcher through the gathered data in conducting survey and interview, the developer comes up with different scenario and situations that the system developer must focus, finding the strength and solving or limiting the weakness of the system depending on analysis. In addition during this phase, the developer removed unnecessary data or entity which are not suitable for the newly developed system and select prepared information and processes for the cloud-based library system model. In addition, the researcher also studies other related studies and system in order to know the existing and none existing processes in order to solve the gap that is found in the previous studies or system which are applicable or relevant in designing, developing and improving models and architectures of the proposed system. The discussions with regards to Analysis and Data Gathering Requirements are explained and elaborated at the latter part of this study.

IV. RESULTS AND DISCUSSION

This study sought to understand the summary of the objectives: (1) the acquisition of newly acquired books can easily input the book’s information and access to the Librarian to figure out the last accession number of the books; (2) Cataloging process simply generate the cutter’s table by selecting the books category; (3) Account management each user have the dashboard to easily manage their account in the system; (4) Borrowing of books process can expedite in terms of online borrowing; (5) Returning of books process was helpful to the student and to monitoring the remaining book through online viewing of their account; (6) Dynamic searching process is a vast searching to simplified finding the book title, author and year by each category; (7) Inventory process can effortlessly generate report by category through PDF. The objectives are precisely achieved the following process:

1. The acquisition of newly acquired books was achieved by easily distinguish the automatic accession books number.
2. Cataloging process was convenient to the Librarian in order to classify the books by each category rather than using a cutter’s table.
3. Account management each user have the various dashboard to prevent duplication when in terms of borrowing and returning of books.
4. Borrowing of books can easily locate which book is still available.
5. The returning of books can easily determine the number of books to be borrowed and help a lot in order to make generate reports.
6. Dynamic searching it is used when the numerous books to be searched by the Librarian.
7. Inventory process can easily generate reports in different or versatile choices of the books.
8. Moreover, there are three visualization reports: 1. Book borrower’s statistics per program where simplified the percentage of the user, 2. User’s Attendance in this process it can be generated, monthly users, 3. Most utilized book for each program

In addition to visualization reports the system generates a book of borrower’s statistics per program with simplified percentage of users.
In this Figure 5 depicts Book borrower's statistics per program. Each color represents the various programs of the user and the percentage of the Book borrower.

(2) User’s Attendance

![Pie Chart for Students](image_url)

Figure 6. User’s Attendance

In this Figure 6 User’s Attendance depicts the Pie Chart of the student per program.

(3) Most utilized book for each program

![Pie Chart for Books](image_url)

Figure 7. Most utilized book for each program

In this Figure 7 depict most utilized book for each program. Each color represents the various programs of the user and most common borrow books of the title per program.

ISO/IEC 25010:2011 it is a standard that will be used conducting the system to achieved the specific objectives of the study. The research study executes various testing to meet the system's objectives in order to follow the standard criteria. The ISO/IEC 25010:2011 standards in terms of Functionality of the system, efficiency in terms of performance, compatibility and usability issues, easy to adapt to the growing needs of the system portability of the software, reliability of the data in use and maintain security of the data. ISO/IEC 25010:2011 it is a standard that will be used conducting the system to achieved the specific objectives of the study.

V. CONCLUSION AND FUTURE WORKS

The researcher achieved the specific objective of the study to endow a helpful tool to each user. To having a convenient transaction to the student and librarian rather than manual process. First, the researcher successfully designs a Cloud-based library system and being developed locally to help the Faculty and students of the institution. Compare to the old way of the manual transaction were computerized to make it more productive and efficient. Through the advent of technology, library a source of knowledge of every student significantly adapted the capabilities of technology and improves the process of the library system.

Second, the Cloud-based Library System is capable to generate several of report book lists, Faculty, Staff and Student information and lastly is a graphical report thru hard copy, Microsoft Excel format or Portable Document format or knows as PDF.

Third, to ensure the efficiency, usability, and maintainability of the Cloud-based Library System, the research test the system in every aspects and sub-characteristics based on ISO/IEC 25010:2011 which is a standard procedure to test a software capability. As a result, positive feedback is gathered from satisfied users. Appendix D indicates the actual survey to 18 respondents of the system.

Based on our findings we make the following recommendations:

1. It is better to recommend to the future researcher the features of book images for the user references.
2. It can also recommend to the future researcher the additional module in the system to produce a library card to the user.
3. It is better to recommend for the institution to implement the Cloud-based Library System to facilitate better library transaction services to the institution.

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REFERENCES


