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Implementation of Web-based E-Library Management System

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Abstract

E-Library is an electronic or online library where one can have access the books over the net. The manual activities of the library can have waste time and unnecessary stress. If the library system is implemented as a web-based e-library system, it can be reduced manpower and resources for the benefit of users. Many web applications often have many problems such as failure, deliver late, difficult and sometimes impossible to correct, adapt, and enhance in any reasonable time frame. The aim of this paper is to overcome these web application problems. Therefore, a web-based e-library management system is constructed by using the web engineering process model. This system is employed using the JSP technique to build the front end interface and using MySQL server technology to build the back end database.

Keywords: Web-based Application, Agile, Web Engineering Framework

1. Introduction

In the internet age libraries, an e-library system is a very important element. At present, the level of library management way in most of the universities in Myanmar is still a manual operation. The problems of the manual operation is time-consuming and inconvenience. Moreover, it can have some challenges as data loss, loss of library materials, time wastage, and inadequacy of personnel [2].

There are many traditional software process models such as waterfall model, incremental model, spiral model, rational unified process model, and prototyping model. These models have their own approach, limitations and

strengths. In the early days of the web, the developers built systems using informality, urgency, intuition and art. This approach can and often does lead to problems. The most frequent problems are evolved requirements over time, occurred changes frequently, and short time lines. Nowadays, Business strategies and rules change rapidly. The agile approach helps cope with the fluidity and uncertainty.

The web application is the vehicle that acquires information, structures it, builds a packaged presentation, and delivers it. A web based system emerges when a web application is combined with client and server hardware, operating systems, network software, and browsers [1]. The web-based applications can have many attributes such as network intensiveness, concurrency, unpredictable load, performance, availability, data driven, content sensitive, continuous evolution, immediacy, security and aesthetics.

To build a quality web applications, web engineering approach reduces risk and has a higher likelihood of success. Web Engineering is the application of systematic and quantifiable approaches (concepts, methods, techniques, tools) to cost effective requirements analysis, design, implementation, testing, operation, and maintenance of high-quality web applications. In this paper, e-library management system is constructed by using web engineering process model.

2. Related Works

The authors helped librarian to manage the library using a computerized system. The librarian was able to generate different kinds of reports such as book-list, student-list, and etc. [3]

The authors developed a project for the interconnection of different public libraries and their automation. This system helped the users to access the book from website or an android application. The librarian provided the users with a unique QR code for each transaction. The central admin created the different libraries and controlled the functioning of all interconnected libraries. [4]

The authors wrote the e-library system for allowing multimedia sources that could be accessed by the users. This system was able to eliminate the problems of unavailability of library resources, inadequate space, physical bounding and restricted access that characterized the traditional library system. This system was developed by using PHP programming language and MySQL database. [5]

The authors developed the cloud computing in integrated library management and retrieval system. This system was the basis of global recommendation include Service Oriented Architecture, Open Library Environment Project and the recommendation of Integrated Library System for Discovery Interface. [6]

The authors proposed the Radio Frequency Identification (RFID) system for providing a solution to effectively collect, manage and distribute books. Their project implements RFID tags that are embedded on books as well as user issue card. These cards were scanned by the RFID readers and the data was sent serially to microcontroller that undergoes processing. [7]

The authors were focusing on reviewing open source library management system packages currently available. The review would focus on the abilities to perform four basic components such as traditional services, interlibrary load management, managing electronic materials and basic common management system. [8]

3. Web Engineering Framework

A framework establishes the foundation for a complete Web engineering process by identifying a small number of framework activities that are applicable to all web application projects, regardless of their size or

complexity. In addition, the framework encompasses a set of umbrella activities (e.g., risk management, quality assurance, and content management) that are applicable throughout web engineering process.

In Figure 1, each framework activity is populated by a set of Web engineering actions. Each action is a collection of related tasks that produces a work product. The set of tasks for each action are work tasks, work products, quality assurance points, and project milestones.

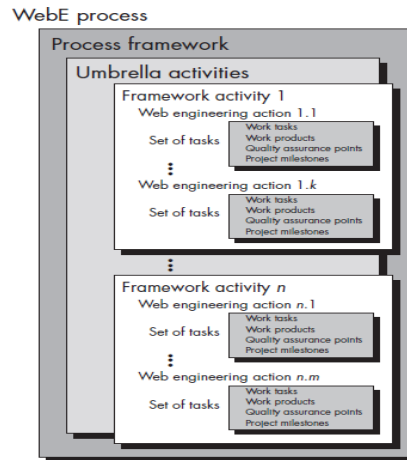


Figure 1. A Web Engineering Process Framework

The web engineering activities of a generic framework are as follows:

- Communication involves heavy interaction and collaboration with the customer and other stakeholders and encompasses requirements gathering and other related activities.
- Planning establishes an incremental plan for the web engineering work. It describes the web engineering actions that will occur, the technical tasks to be conducted, the risks that are likely, the resources that will be required, the work products to be produced, and a work schedule.
- Modeling encompasses the creation of models that assist the developer and the customer to better understand web

application requirements and the design that will achieve those requirements.

- Construction combines both the generation of HTML, XML, Java, and similar code with testing that is required to uncover errors in the code.
- Deployment delivers a web application increment to the customer who evaluates it and provides feedback based on the evaluation [1].

4. Proposed System Design

In the e-library management system, there are three users: Admin, Teacher and Student. Admin can add new book, can upload pdf file, can view and edit book, can view reservation book list, can issue book, can receive the return book, can view due date booklist and can also send email to the student/teacher. The two users, Teacher and Student, are the same process. They can register, can search and reserve book, can view and cancel reserve book, can view rent book list, can download e-book and can edit their profile.

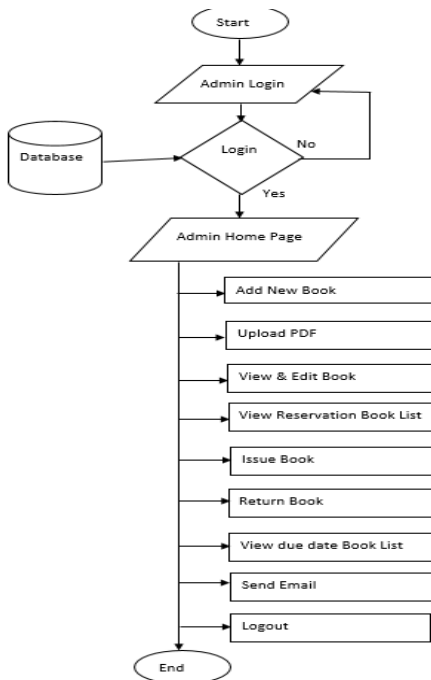


Figure 2. Flow chat diagram for admin

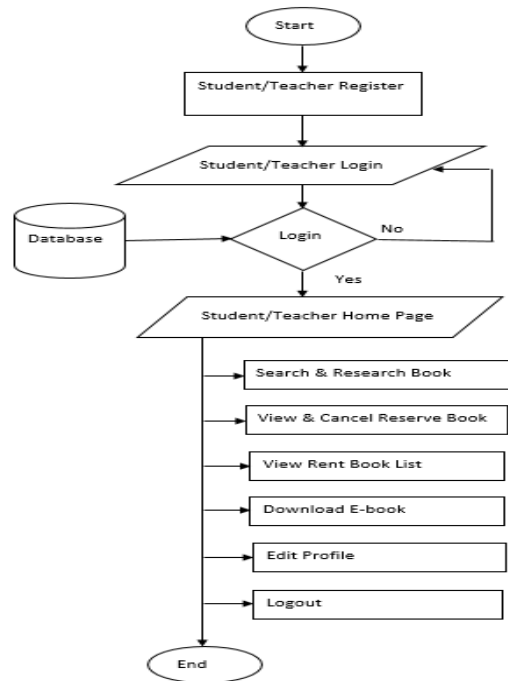


Figure 3. Flow chat diagram for teacher/student

Figure 2 shows the flow chat diagram for Admin of e-library management system. Figure 3 shows the flow chat diagram for Teacher/Student of e-library management system.

5. Implementation

The Web Engineering process begins with the communication activity. Therefore web engineering team asked the librarian about the fundamental questions of the library. Then the team elicited the requirements for the library management system and negotiated needs such as time, resources and technology. The team collected the e-books from the internet.

A Web engineer manages day-to-day work such as planning, monitoring, and controlling technical tasks. A team leader plans, monitors, and coordinates the combined work of a Web Engineering team. Web engineering team considers risk at two different levels of granularity: project level, increment level. In this system, it is 9 increments for Admin, 7

increments for Teacher/Student. Thus, it is total 16 increments.

- Increment 1: login/logout for Admin
- Increment 2: add new book
- Increment 3: upload pdf file
- Increment 4: view and edit book
- Increment 5: view reservation book list
- Increment 6: issue book
- Increment 7: return book
- Increment 8: view due date booklist
- Increment 9: send email
- Increment 10: Register for Teacher/Student
- Increment 11: login/logout for Teacher/Student
- Increment 12: search and reserve book
- Increment 13: view and cancel reserve book
- Increment 14: view rent book list
- Increment 15: download e-book
- Increment 16: edit profile

Web Engineering team can conduct pair walkthroughs or may schedule team walkthrough. The team leader estimate people, effort and time. Therefore, Web Application project scheduling is an activity that allocates the estimated effort for specific Web Engineering tasks across the planned time line (duration) for building an increment.

1st week: Increment 1, 10, 11, 16

2nd week: Increment 2, 3, 4, 12

3rd week: Increment 5, 13, 6, 14

4th week: Increment 7, 8, 9, 15

In Modeling include two main actions: analysis and design. For analysis modeling, web engineering team draw the flow chat diagram and database design. For design modeling, web engineering team draw the User Interface Design.

In Construction, the e-library management system was developed using JSP (Java Server Pages) and CSS (Cascading Style Sheets) for the design, J2EE (Java 2 Enterprise Edition) programming language for coding with MySQL as a backend database technology that runs on Apache Tomcat (version7) server and Mozilla Firefox web browser. After developing, e-library system was tested using some input like e-books gathered and the output obtained from the specifications. Each module was tested separately, and they were all performing desired output.

In this system, the teacher/student can search book by category, or by title, or both. If the book searched by teacher/student is in Book table, these books will be showed to reserve or issue from teacher/student. If the search book is not in Book table, “Nothing found to display.” message will appear. For registration, password and confirm password are not matched, “password and confirm password are not matched” message will appear. And Also NRC format, Email format are checked to valid.

From Figure 4 to Figure 9 show some of the user-interface design of the proposed e-library management system such as home page of the system, add new book page, send email page, registration page, search and reserve page, download e-book page.

For the backend database design, it is used ten tables to implement this e-library management system. The details of the table for this system are shown in below.

- Admin Table consists of adminid, adminname, nrcno, gender, password, address, phone, email, issuedate, expiredate and userstatus.
- Book Table consists of bookid, categoryid, title, author1, author2, author3, isbn, edition, noofbook, cover and bstatus.
- Book_Loan Table consists of bookloanid, issuedate, returndate, duedate, bookid, memberid and fees.
- Book_Reserve Table consists of reserveid, reservedate, rstatus, availabledate, memberid and bookid.
- Category Table consists of categoryid and categoryname.
- Ebook Table consists of ebookid and ebookname.
- Member Table consists of memberid, membername, nrcno, gender, password, address, phone, email, issuedate, expiredate, userstatus and usertypeid.
- User_Type Table consists of usertypeid, usertype, loanperiod and amount.
- View_Loan Table consists of bookloanid, issuedate, returndate, duedate, fees, categoryname, title,

author1, author2, author3, isbn, edition, noofbook, cover, memberid, membername, bookid and email.

- View_Reserve Table consists of memberid, membername, title, author1, author2, author3, isbn, reservedate and cover.



Figure 4. Home page of the e-library management system

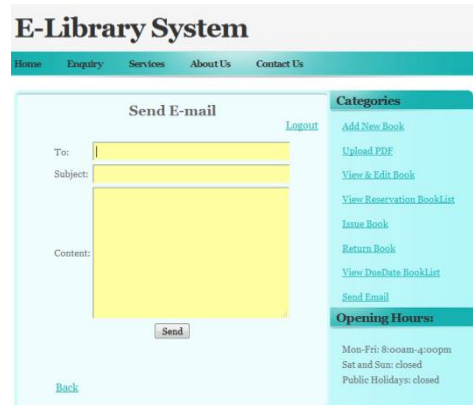


Figure 6. Send e-mail page



Figure 7. Student/Teacher registration page

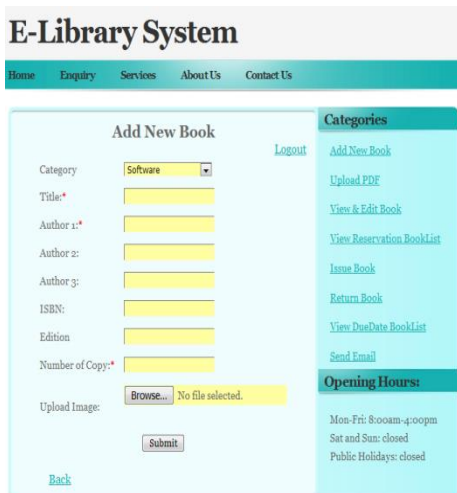


Figure 5. Add new book page



Figure 8. Search and reserve page

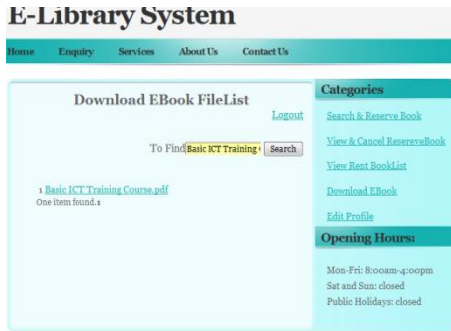


Figure 9. Download e-book page

6. Conclusion

A web-based e-library management system was proposed for school. This system is implemented by using web engineering process model instead of traditional software process model. The web engineering process model can solve the modern business demands adaptation, business strategies and rules change rapidly, management demands near-instantaneous responsiveness by using agility. The top problems of the large scale web application such as failure to meet business needs, project schedule delays, budget overrun, lack of functionalities, and poor quality of deliverables can also be solved by using web engineering process framework. Therefore, this e-library management system is implemented by using web engineering process framework.

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