

Digital Library Information System Development at Malikussaleh University With SDLC (*System Development Life Cycle*)

Dahlan Abdullah

Department of Computer Science, University of Sumatera Utara, Medan, 20155

Department of Informatics, University of Malikussaleh, Aceh, 24354

dahlan.unimal@gmail.com

Abstract - Digital library system and library management system answered the people needs for library services. Library management system contribute to the development of data processing automation membership, circulation and cataloging. Researcher develop a digital library system and library management system then integrate the architecture both of systems. Implementation of web application technologies are needed so the component can be integrated with a digital library system components. The resulting system has the advantage of application utilization borrowing books, membership and cataloging the sharable over the internet, so that the application can be used simultaneously. Catalog information can be submitted between library, without eliminating the digital library function in the joint use of digital resources derived from each librarian uploaded.

Keywords: *Digital Library System, Library Management System, Web Application.*

1. Introduction

Development of information and computer technology today, cause everybody wants to take advantage of these technologies and advanced along. Any person, company, organization and educational institutions of various levels introducing their profiles by utilizing Internet technology. Information about companies, organizations and educational institutions in the advertising on the Internet is done by an application program that is designed well and can be accessed from a variety of users. When visiting the application program, the user will be interested about the information given in the application program. The most frequently visited access is the library. The problem is how to design the good application program and attract users. To present the application program of the university library as the "eyes capture", is inseparable from the design of application programs including content design, visual design and information contained therein. The

application program of a university library that has an attractive visual design and full of creativity and information, will make visitors more interested in exploring it. Today, many universities and libraries are already using web-based applications on the Internet as a tool of presenting an effective information system. This web-based application also receives a new library member registration, ordering books, the data of scientific journals, the data of students final project (thesis and dissertation) and others (M. Fachrul Arian, Design of Library Information Systems, Journal Narotama, 2011).

Library as a very important tool in the students learning process. Digital library development should be implemented immediately due to the growing Malikussaleh University Library of aspects of users (employees, students and faculty), as well as a growing number of books, and therefore required the library information system is ready to accept the development. Digital library development can not be separated from the development of information technology.

Digital library of web-based technology, allows accessing a collection of books / journals by members, anytime and anywhere. At the beginning of the development of digital libraries, researchers pay more attention to the service system and an increasing number of digital resources produced, the existing digital library eventually become a collection of different resources and different systems, it is because the system was developed to serve specific communities and groups - existing user group (Cleveland, 2008: 89). Issues on further development is interoperability. Interoperability is an activity which refers to the ability of diverse systems and organizations to work together (Vullo, 2010). This activity has been predicted by Cleveland, that the post-development (digital library), interoperability between digital libraries (in terms of architecture, metadata and document format) may also occur in the development of a relatively limited system built for a specific purpose and community. This interoperability issue then becomes sharable digital library system uses, one of which was built by the Information Society Technology, namely Delos Digital libraries Management System

(DLMS). DelosDLMS is an open source application a digital library system that can be downloaded and used as a digital library system by any person. DelosDLMS addition, there is also a project called Koha Integrated Library System (ILS) is an open source system that is also free to download and use by any institution for the management of library information system. From these explanations, there are two terms in the development of the library system, which is a digital library system and the integrated library system or library management system.

The similarity of the two systems are open source, are allowed to be used and developed in any library. The difference is that the digital library system is used to manage the digital resource and it accessing ways, while the library management system used to manage the circulation, membership, cataloging and online public access catalog. On the other hand, needs to find a reference use library automation increased at all levels of education providers, be it elementary, middle and high, because it was realized that the use of non - digital resources still can not be replaced by digital resource. Therefore, it needs a non - digital resource search is growing rapidly. The advantages of digital library system is to contribute digital download resource access from anywhere via the internet. But digital library system does not provide information about non - digital resource. Instead, the library management system contributes to the operational management of the library, which automatically provides a non - digital information resource. However, the library management system is not providing digital resources and their utilization (Yudie Irawan, Thesis : Design of Web-Based Information System Application Library, 2011).

The text must be in English. Authors whose English language is not their own are certainly requested to have their manuscripts checked (or co-authored) by an English native speaker, for linguistic correctness before submission and in its final version, if changes had been made to the initial version. The submitted typeset scripts of each contribution must be in their final form and of good appearance because they will be printed directly. The document you are reading is written in the format that should be used in your paper.

2. Research Scope

If assessed, there are many problems in libraries . Therefore, this study only discusses issues that related with the library administration of the University Malikussaleh.

a. Observation and research conducted on:

1. All the information needs related to the administration of the library.
2. The scope includes the inventory and Catalog book library

3. The data collection or registration new members and old (Student /Employee and Lecturer)
 4. Borrow and return books service, known as the Library Book Circulation.
 5. The book library order.
- b. In the process of system development, will be up to the design stage or system design.

3. Research Method

This study using a "Research and Development" approach. Research and Development can be defined as a process to develop a new application or enhance existing applications, which can be accounted for. The application need not be objects or hardware, such as books, modules, learning tools in the classroom or in the laboratory, but it can also software such as a computer program (Syaodih, 2005). According Sugiyono (2011) Methods of research and development is a research method that is used to create an application, and test the effectiveness of the application. The process of implementation of research and development strategies undertaken to create applications and to test the effectiveness of the application in question is; potential and problems, data collection, product design, design validation, the revised design, product testing, product revision, trial use, and mass production (Sugiyono, 2011). In this research, the Research and Development used to create the model of digital library information system at the University Malikussaleh Library.

4. Design System

In this section , we will do the design of a library information system. This design make to improve the previous design , and discussed in accordance with the proposal that will be offered to the management of the Library.

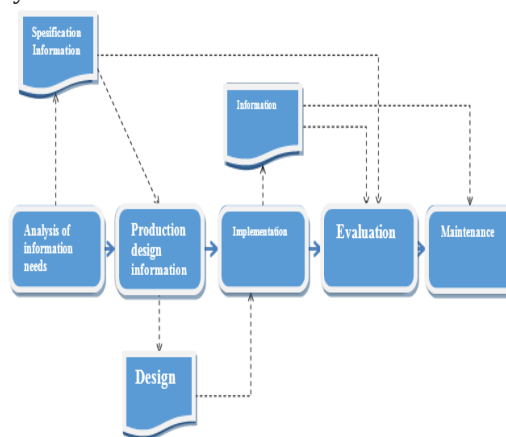


Figure 1. Information Systems Design Based SDLC

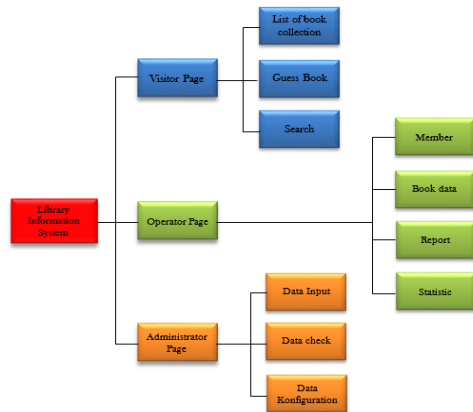


Figure 2. Proposed Design Library Information System

Library information system design proposal is under the main menu there are three sub-menus or known by the name of the page is:

a. Visitor Page

On this page, each user is given access only to know the whereabouts of any books or resources that exist in the University Malikussaleh Library, on this page the user can know the status of books to be borrowed or viewed.

Visitors page consists of three sub-sections:

1. List of Books Collection
2. Guestbook
3. Searching

b. Operator Page

Operator pages are pages that are used by service personnel to do the process of borrowing and returning books and other processes in the University Malikussaleh Library, such as registration of new members .

These pages consist of four sub- sections:

1. Member
2. Data Book
3. Report
4. Statistics

c . Administrator Page

To control all activities will be and has been implemented in the library information system

would require an administrator page, this page to the operator or user of the library information system, system configuration, see the whole configuration of faculties and departments and arranging holidays in the calendar every year.

Administrator page consists of three sub- sections:

1. Input Data
2. View Data
3. Data Configuration

5. Context Diagram

Context diagram is the highest level of DFD diagram that illustrates the relationship system with the outside environment. The following diagram is an overall diagram of the library system to be designed.

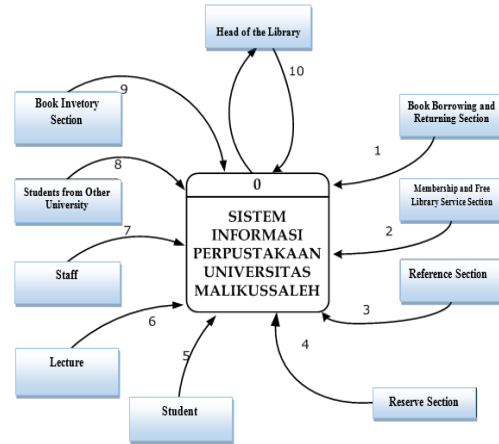


Figure 3. Context Diagram

The image above is a digital library system to be designed in this research . In this system there are 10 entities such as; loan and returns, membership and free library services, resources, reserves, students, lecture, staff, students, inventory books, and head of the library. Each part gives input and output of this digital library system.

Input from students are transaction like borrowing a book, returns and order book, the student also receives the output of search results that have been made to the collection being searched.

Input from library staff are borrowing and returns transactions. Administration libraries provide data publishers, types of collections, catalogs and various other information about the book.

5.1. DFD Level 1 Data Process System

Level 1 Data Flow Diagram (DFD) is used to describe the flow of the data systems, which use very helpful to understand about the library design system logically, structured and clearly. Whole process of the system described in the data flow diagram level 1 these include: setup/ configuration, book inventory, registration, free library card making, book circulation, search, book reservations and visitors. The first data flow diagram is the interaction between system and external entities . DFD is designed to demonstrate a divided system into a part of the smaller sub - systems and to underline the flow of data between the two things mentioned above. This diagram is then " developed " to see more models detail therein. DFD level 1 described the system library process overall has been designed to be scaled on the DFD level 1 in accordance with the existing process. DFD level 1 can be reduced to some parts, such as: administrator, section

circulation (loan and returns), inventory, free library service, up to the membership level that includes member registration, renewal and ordering books by library members.

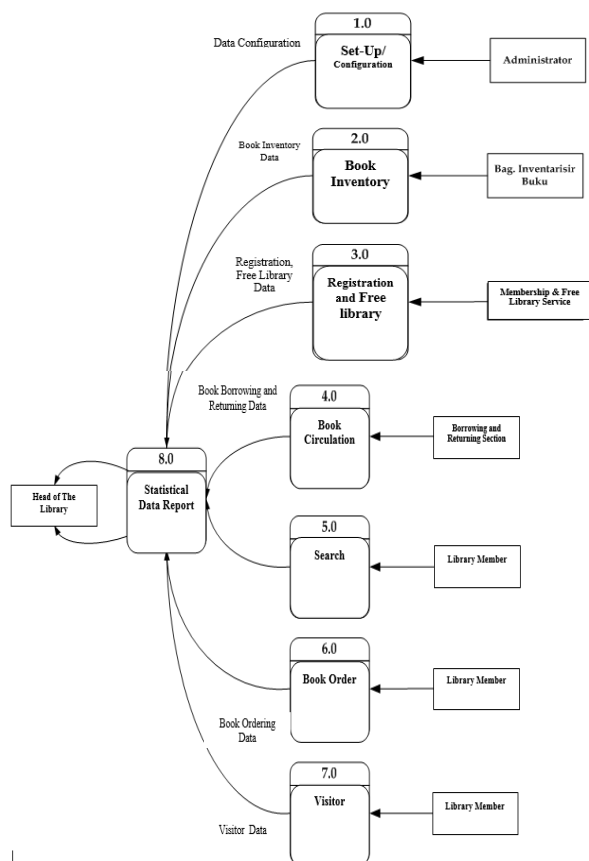


Figure 4. DFD Level 1 : Data Process System

5.2. DFD Level 1 Stage 2 Inventory Book

DFD level 1 stage 2 discusses about the book inventory which the book was ready to given a number and barcode and the it will put into the book inventory system and would be classified if the book as a reserve books, reference or circulation.

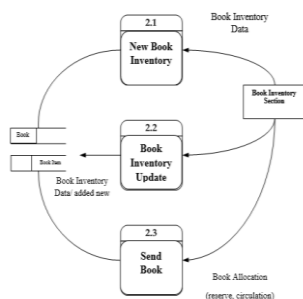


Figure 5. DFD Level 1 Stage 2 Book Inventory

Book inventory section will doing inventory process taken from the book procurement after numbering process or

giving barcode number and will be classified as a reserve books, reference or circulation means which can be borrowed or not . The whole process will be entered in the database library system.

5.3. DFD Level 1 Stage 3 Register Free Library

Stage 3 level 1 discusses the registration process and the making a free library card section in which a member must have own membership data and is closely connected with the making of a free library card.

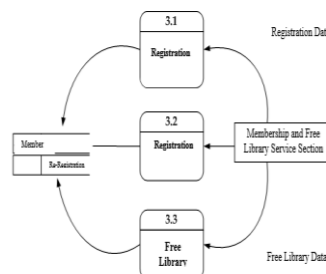


Figure 6. DFD Level 1 Stage 3 Register Free Library

Section membership and free library service will process the data member to ensure data registration is complete and correct, can process the free library data with checking the borrowing books database, whether members of the library have books borrowed or remaining unpaid fines only after the entire finished the whole process is free library can be made .

5.4. DFD Level 1 Stage 4 Book Borrowing

Level 1 stage 4 discusses about borrowing books from each member of the library , where there are 2 data should be in view , namely : book borrowing and returning data. The next process is the calculation of fines from the process of borrowing and returning library books that exceeds the rule book borrowing in the library of University Malikussaleh.Each member is divided into two categories: lecturers and students , as well as the amount of borrowing each book is also divided into two systems, lecturers may borrow books for 7 days and the students during 3 days.

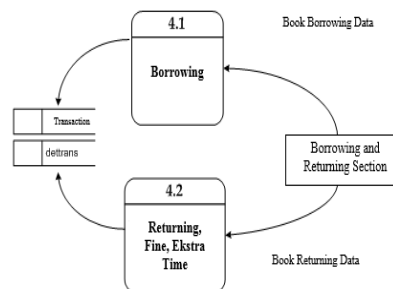


Figure 7. DFD Level 1 Stage 4 Book Borrowing

Data borrow and return books can be displayed using tables and graphs, so that we can know the frequency of borrowing and returning books.

5.5. DFD Level 1 Level 5 Book Search

Level 1 stage 5 discusses the book search, where each member can search a variety of sources that exist in the literature.

Each book search is expected to be done by various methods, such as finding a book based on the book title , author's name, year of publication, and several options lainnya.

Book search results can be displayed on the monitor screen so make it easier for members to browse the books to be borrowed.

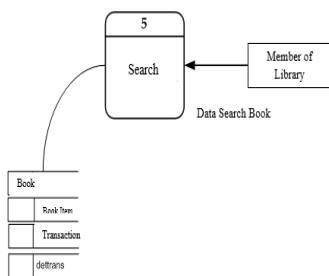


Figure 8. DFD Level 1 Stage 5 Book Searching

The search results can explain the entire contents of library books to be borrowed , where each book contains a variety of information about the book so that members can infer whether the book is required so that the necessary process of book borrowing.

5.6. DFD Level 1 Stage 6 Book Order

Level 1 stage 6 discusses the book reservations made by each member of the library, where each member may order a book that will serve as a data book reservations.

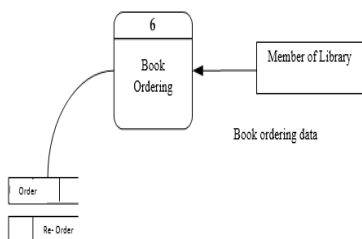


Figure 9. DFD level 1 Stage 6 Book Order

5.7. DFD Level 1 Stage 7 Visitor

Level 1 stage 7 discusses the visitors , which in addition to members of the library , visitors who are not members of the library are also given the facility to view the entire contents of a library.

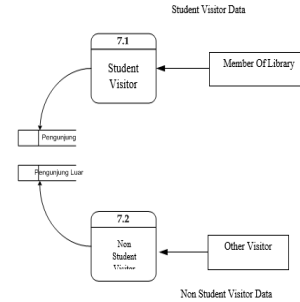


Figure 10. DFD Level 1 Stage 7 Visitor

Data visitors consists of visitors students and non-students, the library system also can accept external members Malikussaleh University as the general public. Each visitor will be entered in the database of visitors.

5.8. Entity Relationship Diagram

In the library information system design of digital –base, relationships needed some entities in the implementation of the library information system itself, as it has been depicted in the figure below.

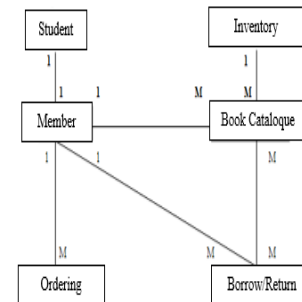


Figure 11. Entity Relationship Diagram

Students can be a member of the library, members of library can borrow or reserve more than one book.

6. Results and Discussion

Digital Library Information Systems of University Malikussaleh built using web-based technology optimized, this system has the flexibility and high data integration, flexible because the system can be run in two platforms are Linux and Windows. Besides that this application in the future be made accessible to the public network (Internet). The system is built to support integrated services in the scope of the library. Start of registration, circulation (borrowing and returning books) until the filing of a free library card, all integrated into one system so that the service can be done quickly and accurately.

Generally , library information system will be proposed:

a. Member registration

Member registration is also equipped with a data-checking the member, if the member is new or old.

b . Circulation (Loan and Returns Books)

Circulation of books including feasibility books to be borrowed and the loan book has a fine or not.

c . Catalog

The book consists of all books that have been inventoried in advance.

d . Book Inventory

The new book will be inventoried in advance to obtain an inventory number and attached to each book.

e . Booking Book

The library also provides the facility to order books may be ordered by anyone.

7. Conclusion

For designing the Digital Library Information Systems at Library University Malikussaleh use the following steps:

Identifying problems, opportunities, and objectives to be achieved. At this stage the author identifies some problems that occur in the books circulation process in the University Malikussaleh library.

a. Identifying problems, opportunities, and objectives to be achieved. At this stage the author identifies some problems that occur in the books circulation process in the University Malikussaleh library.

b. Analyze system requirements such as decisions, actions, alternative conditions, and recommendations on a plan to resolve the problem. Devices and certain techniques will assist in determining the need. The device used is a flowchart to compile a list of input, process and output.

c. Designing SDLC using the information collected at the problem identification and analysis stage to make the design logic of systems and procedures. The author made a design using context diagrams, data flow diagrams and also design the interface for input and output of data with various types Grapichal User Interface (GUI).

7. References

- [1] Andrew Fiade, (2010), Jurnal : Usulan Perkembangan Metodologi SDLC Untuk Sistem Informasi Web, Teknik Informatika, Fakultas Ilmu Komputer, Universitas Mercu Buana, Jakarta.
- [2] Arthur M. Langer, (2008), Analysis and Design of Information Systems, Springer, London.
- [3] Becerra-Fernandez, Irma, (2010), Knowledge Management System and Processes, M.E, Sharpe, Inc.
- [4] Charles, S. Wasson, (2006), System Analyst, Design and Development Concept, Principles, and Practices, A, John Wiley & Sons, Inc, Publication, USA.
- [5] Dennis, Wixom, Roth, (2009), System Analysis and Design, A. John Wiley & Sons, Inc, Publication, USA.
- [6] Emmanuel Udoh, (2011), Cloud, Grid and High Performance Computing : Emerging Applications, Indian Institute of Technology, USA.
- [7] Gary B. Shelly, (2012), Systems Analysis and Design, Course Technology, Cengage Learning, USA.
- [8] Gary, P. Schneider, (2011), Electronic Commerce, Cengage Learning, USA.
- [9] George M. Scott, (2008), Principles of Management Information System, McGraw-Hill.
- [10] Glenn Brookshear, (2012), Computer Science on Overview, Addison-Wesley, USA.
- [11] Gordon B. Davis, (2009), Management Information System: Conceptual Foundation, Structure, and Development, McGraw-Hill.
- [12] Henriyadi, (2009), Jurnal Perpustakaan Pertanian Vol. 18 Nomor. 2 : Pengembangan Katalog Induk Online Perpustakaan Lingkup Badan Litbang Pertanian, Pusat Perpustakaan dan Penyebaran Teknologi Pertanian, Bogor.
- [13] Imam Yuadi, (2010), Jurnal : Perpustakaan Digital Paradigma, Konsep dan Teknologi Informasi yang Digunakan, Dosen Jurusan Ilmu Informasi dan Perpustakaan FISIP Unair, Surabaya.
- [14] Indrajit, Richardus Eko, Aspek Demand dan Supply dari Sistem Informasi, <http://www.indrajit.org/Papers/>
- [15] Jaraoslav Pakorny, (2011), Informations System Development : Business Systems and Services : Modeling and Development, Springer, London.
- [16] James A. Hall, (2011), Information Technology Auditing and Assurance, Cengage Learning, USA.
- [17] James A,O'Brien, (2010), Management Information System, Prentice Hall.
- [18] John Baschab, (2007), The Executive's Guide to Information Technology, A. John Wiley & Sons, Inc, Publication, USA.
- [19] Joseph T. Catanio , (2011), Jurnal : An Interdisciplinary Practical Approach to Teaching The Software Development Life-Cycle, Mathematics and Computer Science, Department, LaSalle University, Philadelphia.
- [20] Kendall, Kenneth E, (2011), Systems analysis and design, Prentice Hall.

- [21] Loudon, Kenneth C. & Jane P. Loudon, (2008), Sistem Informasi Manajemen: Mengelola Perusahaan Digital, Andi Offset, Yogyakarta.
- [22] M. Fachrul Aianto, (2011), Jurnal : Rancang Bangun Sistem Informasi Perpustakaan, Jurnal Narotama.
- [23] Murdick RG, (2010), Sistem Informasi untuk Manajemen Modern, Erlangga.
- [24] Powell, Thomas A. (2008), Web Site Engineering. Prentice Hall.
- [25] Pressman, Roger.S. (2010), Software Engineering : A Practitioner's Approach. 5th. McGrawHill.
- [26] Raymond McLeod, Jr, (2010), Management Information System, Prentice Hall.
- [27] Sommerville, (2007), Software Engineering, Addison Wesley, USA.
- [28] Wanda Lestari Sitorus, (2011), Jurnal : Aplikasi Berbasis Web untuk Pengolahan Data KTP dan KK, Program Studi Manajemen Informatika, Politeknik Telkom, Bandung.
- [29] Whitten, Jeffrey, L, (2007), System Analysis and Design Method, McGraw-Hill.
- [30] William M. Ulrich and Philip H. Newcomb, (2010), Information Systems Transformation, Morgan Kaufmann OMG Press.
- [31] Valacich, Joseph S, (2012), Essentials of systems analysis and design, Prentice Hall.
- [32] Yudie Irawan, 2011, Thesis : Perancangan Sistem Informasi Perpustakaan Berbasis *Web Application*.



Dahlan Abdullah completed a bachelor's degree in Informatics Engineering major at the Indonesia Islamic University in 1999. In 2014, he completed a master's degree in computer science at STMIK Eresha Jakarta. In 2015 was recorded as the doctoral students of Computer Science, University of North Sumatra, Medan. Actively doing research on Computer Networks, Database, Radio Net, Computer Applications, Robotics, Web Based Application, Management Information Systems and Computer Network Infrastructure.