Library Application and Book Return Schedule Reminder using Short Message Service (SMS) at State Vocational School of Jenawi

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Abstract—**The Library of the State Vocational School of Jenawi implements a manual database system where the transaction process is slow and inefficient. The frequent delay in returning books also adds to the problems. This study aims to build a library application that manages library data, including member data, borrowing-returning books data, calculating fines for returning books, and book searches. The method used is SDLC (System Development Life Cycle) which consists of the analysis, design, implementation and testing. The application built with Delphi can manage library data, handle book circulation, and automatically send Short Message Service (SMS) to the borrower as a reminder of the book's return schedule.**

Keywords-Jenawi; Library; SDLC; SMS

I. INTRODUCTION

Information Technology is rapidly growing. With the advancement of information technology, access to data or information can take place quickly, efficiently, and accurately. It also has an impact on school library management. Libraries are places, buildings that are provided for the maintenance and use of collections of books and so on [1].

Library management increasingly demands quality and professionalism so the results can be fully utilized by users. Technological development became a supporting tool in the construction of digital systems that handle library functions. The system is related to book data management, member data, circulation data, borrowing books, and other administrative data. However, the phenomena were just the opposite. Most libraries are still implementing manual database systems where all transaction processes are paper based. This condition also occurs in the State Vocational High School of Jenawi, Sragen, Indonesia.

Based on these conditions, it is necessary to build a system that can support the processing of library administrative data and remind the schedule of returning books to borrowers. With this computerized library application, it is expected to increase the effectiveness of library management at that school.

II. METHOD

The study uses the System Development Life Cycle (SDLC) framework to build the application needed. SDLC is a cycle in building a system with a disciplined and systematic approach that divides the software development process in several phases: analysis, design, development or implementation, and testing of systems [2].

III. IMPLEMENTATION

The implementation of this research refers to phases on SDLC framework which is explained as follows:

A. Analysis

The analysis is a phase to get data needed in application development. The steps taken are literature study, observation, and interviews. The collected data are analyzed and organized into several classifications, namely: problem analysis, system requirements analysis and functional requirements analysis.

1) Problem Analysis

The results of observations at the State Vocational School of Jenawi found that: (1) the list of collections of books was still written on paper so it was difficult to sort and manage the collection of books; (2) checking the availability of books cannot be done; (3) recording borrowing and returning books often experiences writing errors that make library operations slower; (4) writing format is sometimes not the same between one library officer and another one; (5) students are often late in returning books because of forgotten factors, and; (6) calculation of delay's fees for returning books is done manually.

2) System Requirements Analysis

This analysis intends to identify the needs and specifications of the system to be developed. Based on the results of the problem analysis described earlier, the solutions offered are the creation of library applications and reminder of book's return schedule with system specifications as follows:

a) Desktop based application for library staff.

b) The application can process member data, search for books needed, handle borrowing-returning book circulation, and calculate the fees of delay returning books.

c) Applications can browse book borrowers.

d) The Application uses a GSM modem to activate the SMS feature.

e) The application can automatically send SMS as a reminder of the schedule for returning books to borrowers.

f) The application can automatically reply to SMS from library members regarding book lending data.

g) The application can be used to send SMS

3) Functional Requirements Analysis

This analysis aims to identify what (facilities and activities) should be done by the system. The functional requirements of the system study are:

a) Function of login

b) Function of add, change and delete book data

c) Function of add, change and delete member data

d) Function of add, change and delete officers data

e) Function for the process of borrowing books

f) Function for the process of returningbooks

g) Function of viewing and searching circulation data

h) Function of viewing and searching book data

i) Function of tracking borrowed books

j) Function of viewing and deleting incoming SMS

k) Function to view and delete outgoing SMS

l) Function of sending SMS messages

m) Function of checking phone credit

n) Function of managing book categories

o) Function of application startup

p) Function of configuring connections with databases

q) Function of modem setup

r) Function of SMS service startup

s) Function of managing application background

t) Function of changing the application theme

B. Design

The results obtained from the analysis phase are then designed in the following four forms:

1) System Architecture Design

System architecture shows an overview of the components used and the interrelationships between components. This application is connected to the database with the ZeosDB

component, while the Comport 3.0 component connects the application with the modem. System architecture design can be seen on Figure 1.
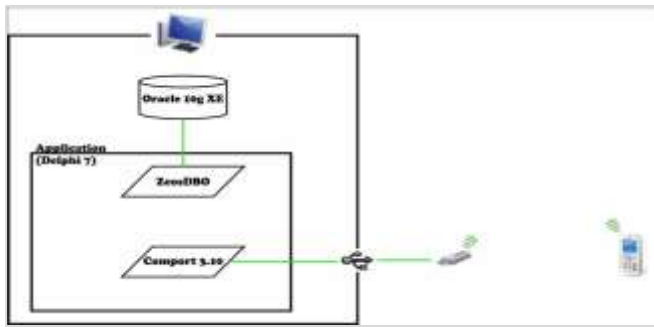

Figure 1.   System Architecture

The application can also send SMS to borrowers regarding the schedule for returning books. SMS or Short Message Service is a telecommunications protocol that allows users to send short messages (as many as 160 characters) in the form of alphanumeric characters. SMS has now become the standard service of every digital mobile phone network provider [3]. To connect the SMS application and features, a link is needed in the form of an SMS gateway [4]. The SMS gateway architecture can be seen on Figure 2.
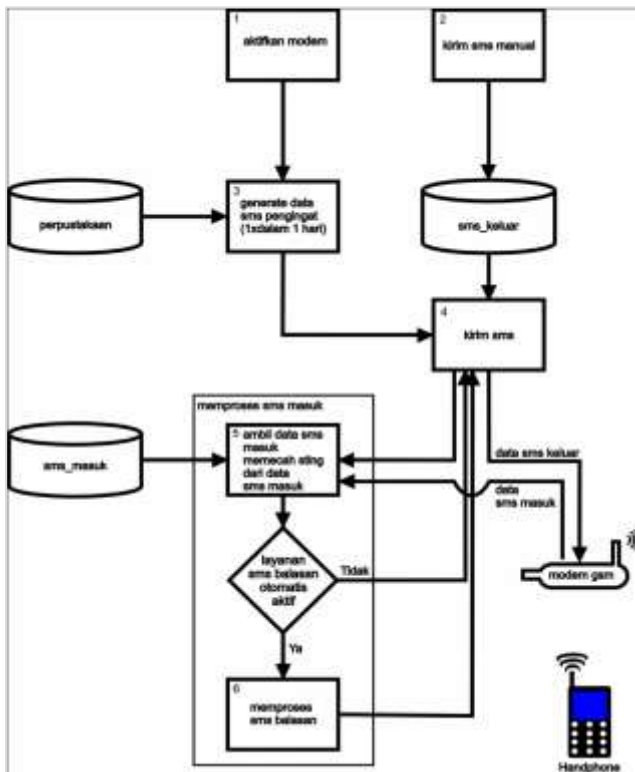

Figure 2.   SMS Gateway Architecture

2)   DFD Design

DFD or Data Flow Diagram describes the flow of data, processes and also all entities that will interact or engage with the system [5]. The design of the DFD from the development of this application are as follows:

a)   Level 0 DFD / Context Diagram

Context diagram shows all business processes in one single process and also all external entities that receive information from or provide information to the system [5]. Figure 3 is a context diagram of an application designed in accordance with the analysis result.

Figure 3.   Context Diagram

b)   Level 1 DFD

Level 1 DFD provides a more detailed description of the context diagram related to data flow. There are two processes that are running, namely the library data management process and the SMS service process, where each handles functions according to functional requirements. The design of this application is shown on Figure 4.
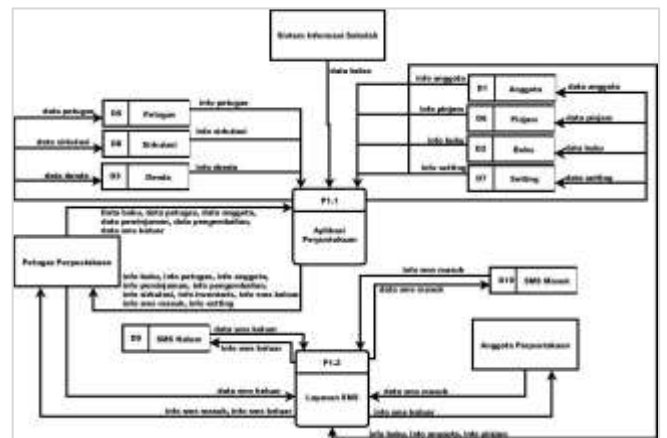

Figure 4.   Level 1 DFD

3)   ERD Design

Entity Relationship Diagram or ERD is a graphical notation of relationships between data in a database based on objects represented in certain entities [6]. The ERD design of the development of this application is shown on Figure 5:
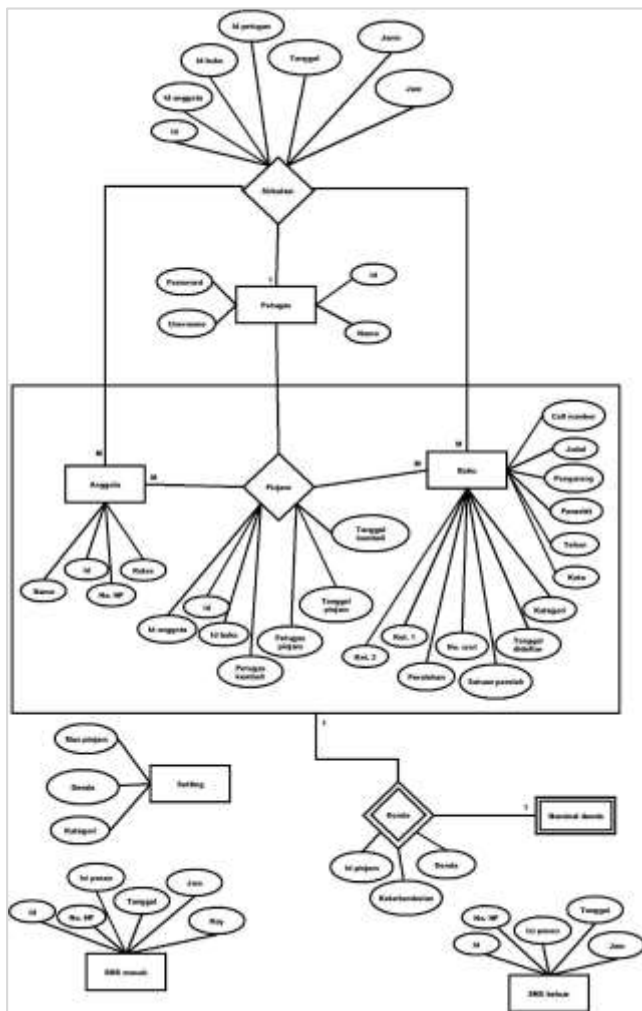
Figure 5. ERD Design

4) Database Design

This application uses two databases, namely Oracle 10g XE and text database. Oracle Database 10g Express Edition (Oracle XE) is a freeware database server product from Oracle Corp [7]. This database is used to store library principal data. The database consists of tables of members, tables of books, tables of fines, tables of officers, tables of borrowing, table of circulation, and SMS tables. Whereas all application settings related to application requirements are stored in the form of text databases. The text database contains settings for connection with Oracle databases as well as various strings for application settings.

C. Development

The development phase is implementation of the design results into an application that is ready for use. This application was developed with the Delphi and the Oracle 10g XE database. Delphi is an IDE Compiler for the Pascal programming language and software development environment [8].

The results of functional requirements analysis are implemented in the form of menus in the application header section with the following arrangement (Figure 6):

1) Books Data; used to view, change, add and delete books data.

2) Members Data; used to view, change, add and delete members data.

3) Officers Data; used to view, change, add and delete officers data.

4) Borrowing; used to process the borrowing of books conducted by library officers.

5) Return; used to process the return of books carried out by library officers.

6) Circulation; used to view circulation data containing borrowing and return data.

7) Book Inventory; used to view book data, book availability and search for book borrowers.

8) SMS Service; used to send SMS, view and delete incoming SMS, view and delete outgoing SMS and check phone credit.

9) Setting; used to configure application for general settings, database settings, SMS service settings, and application display settings

10) Login; used to log in by library officers. The login menu will ask for a username and password for authentication.

11) Control Panel; used to configure the connection with the hardware. The Control Panel menu is in the Windows system tray.

Figure 6. Main Menu Interface

D. Testing

System testing aims to know the weaknesses or errors of the system. This can be used as an evaluation material used to improve software that has been built. System testing uses method which is a testing method by focusing on the functional system and paying attention to the results of the system whether it has been running as expected.

1) Alpha Testing

Alpha testing is a system test that is carried out directly by the system developer. It is done by entering the correct data

and incorrect data. Testing is focused on functional applications.

Based on the results of alpha testing, overall the application and book's return schedule reminder can functionally work and produce the expected output. All functions in the application can work properly.

2) Beta Testing

Beta testing is an objective system testing by involving stakeholders or related parties to find out the opinions of them on the system being built. Beta testing uses a questionnaire involving 20 respondents consisting of 1 person from the staff of State Vocational School library of Jenawi, 15 students from the School and 4 people who are competent for the assessment of system development.

Assessment is divided into four scores on a scale of 1-4. The number of questions is 14 items. Analysis of the application functionality testing questionnaire is as follows:

- The highest number of scores (highest score*number of items*number of respondents), 4*14*20 = 1120.

- The lowest number of scores (lowest score*number of items*number of respondents), 1*14*20 = 280.

- Number of data collection scores, (111*4) + (169*3) + (0*2) + (0*1) = 951.

- Percentage of success (total score from data collection/the highest score* 100%), 951/1120*100% = 85%

Based on the results of these tests, it can be concluded that the Library Application and Book Schedule Reminder can be said to be successful with a percentage of 85%.

IV. CONCLUSION

Library application and book's return schedule reminder using SMS have been successfully developed. Based on the results of testing, this application can be used for processing library data and reminding the schedule of returning books via SMS.

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