

Mobile Based Application Design of the Catholic Church of the Redeemer of Sumbawa Using the Waterfall Method

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Abstract - The church is a gathering place for Christians to carry out worship. The Sumbawa Redeemer Catholic Church is a church that originates from Sumbawa Besar Regency, West Nusa Tenggara Province. This Catholic Church is the only church in Sumbawa Regency. The purpose of this research is to make the Application of the Catholic Church of the Redeemer of Sumbawa. using the waterfall design method and the ADDIE model. The data collection method was carried out using the Unified Modeling Language (UML) method, use cases and activity diagrams are used as analysis and design tools. The programming languages used include Kotlin and Java, the software used includes the IDE Android Studio 4.0, MS. This research yielded results, namely a program that can be used to make it easier for people to find information about the Sumbawa Redeemer Catholic Church.

Keywords - Catholic Church, Android Studio, Firebase, Java, Kotlin

I. INTRODUCTION

In the current era of globalization, technological developments are increasingly widespread in their use [1]. With so many technologies, it can make it easier for users to access internet information [2]. In everyday life, users always use the internet as one of the information media and can be accessed through websites or applications. Technology is currently able to provide better services in various circles of society so as to make it easier for people to access information media [3]. With the development of technology, there are problems in various circles of society, for example among the church[4]. There are some churches that have not used information media systems in the form of web or applications, so it can be difficult for church people to get information.

The Catholic Church is a whole and universal church, encompassing all those united in the bond of baptism[5]. The Catholic Church of the Redeemer of Sumbawa is one of the catholic churches in the middle of the city center. The Catholic Church of the Redeemer of Sumbawa is located on Jalan Diponegoro, West Nusa Tenggara Province, Sumbawa Regency, Sumbawa Besar District, Uma Sima Village[6]. The Catholic Church of the Redeemer of Sumbawa has been established since November 24, 1990 which has a population of 2311 people and some of its people come from overseas and students. The Catholic Church of the Redeemer of Sumbawa is still difficult in managing the information media system, because the information media system of the Catholic Church of the Redeemer of Sumbawa is still running smoothly. manual, which is the delivery of information through readings that can be obtained during the celebration of the Eucharist [7]. If there are some people who are not present at the Eucharist celebration on Sunday, they cannot get information[8]. The management of people's data is still done manually, so to find out these data, you have to find back the people's data files that

have been stored[9]. Some devotions are still done manually, that is , they are done by reading daily devotions at morning worship. Thus, a solution is needed to help the catholic church of the redeemer of Sumbawa in the information media system so that it cannot facilitate church people in use information media provided by the church[10].

From these problems, research was conducted to design a church information media system, so that it could help manage information data in church services [11]. The information media system that will be built has several features, namely church scheduling, church devotional, community data collection, and church information. The scheduling feature will discuss the schedule of the Eucharistic celebration and the tasks in charge of the Eucharistic celebration, the devotional feature will discuss several daily devotions each day, the church community data collection feature will discuss the data on the names of church members who have been registered in the Sumbawa redeemer catholic church and the information feature will discuss information important church. The information media system to be built is in the form of an application. The application to be built is based on Android and uses the Kotlin programming language. The application to be built uses a database in the form of firebase[12].

Android Studio is an Integrated Development Environment (IDE) software used to develop android applications[13]. Android Studio first appeared in 2013 and began to be released in June 20 14, the stable version was released in December 2014, while the stable version was released in May 2020 . Android Studio is the official software supported by Google. Android Studio provides an interface for creating and managing management apps. For programming language used is kotlin. Android Studio has the advantage of giving access to the Android Software Development Kit (SDK).



Website is a collection of digital pages that contain information in the form of text, images, videos, or a combination that has been connected to the internet [14]. The website can be seen or accessed by various circles of society. There are several web programming languages used namely html, php, css, and javascript. The website first appeared in the world in 1991 and was inaugurated on April 30, 1993 which can be used for free by the public. The website is very important in various circles of society, because that way, many information media can be accessed through the website.

Firebase is an app development platform to simplify the work of mobile developers[15]. With Firebase, developers can focus more on developing applications. Firebase was first established in 2011, the first platform to be developed is the realtime database. Realtime database is useful to help developers store and synchronize data to many users. There are several features that can be used by users such as firebase analytics, firebase cloud messaging, notifications, firebase authentications, firebase remote config, firebase realtime database, and firebase crash reporting.

Kotlin is a programming language that is often used by developers and is based on open source[16]. Kotlin development has been carried out since 2010, in 2012 Kotlin became open source. Kotlin is one of the programming languages that are in great demand by developers, because it can overcome null, concise, no runtime overhead, a large community, and is flexible.

II. RESEARCH METHODOLOGY

2.1 Metode SDLC (System Development Life Cycle)

In this study, researchers used the SDLC (Software Development Life Cycle) method. Software Development Life Cycle (SDLC) is a method used to design and develop a system. The design of this application uses the SDLC (Software Development Life Cycle) method with a waterfall model. The SDLC method consists of several stages, namely analysis, design, design, implementation, trial and management [17]. This SDLC method was chosen because it is in accordance with the application to be designed and can assist researchers in designing and developing applications. In figure 1 is the stage of the SDLC method with a *waterfall* model

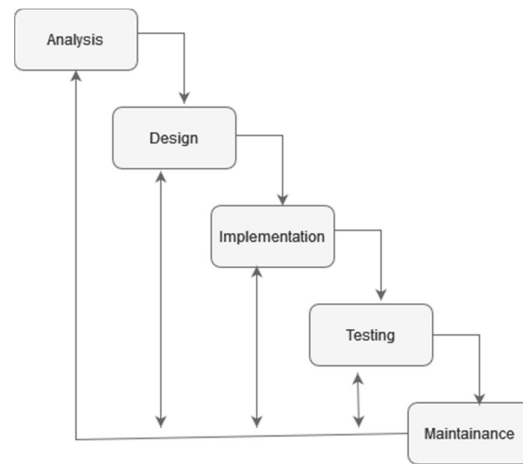


Fig1. Waterfall model stages

2.1.1 Analysis

The initial stage of the SDLC method is the analysis stage. The analysis stage is the stage of collecting data according to user needs. The analysis stage is carried out to find out what needs are needed by users for the software designed and developed [18]. Using analytics, it can be determined the purpose of the application to be shown to the user. There are several methods that can be used in data collection including observation, surveys, interviews and others.

2.2.2 Planning

At this stage is the stage of designing application design based on the analysis that has been done. The results of the analysis that have been carried out are implemented in the design of the software. This stage is carried out to provide an overall picture of the application to be designed and developed.

2.2.3 Implementation

The implementation stage is the stage of implementing designs that have previously been designed into programming codes. At this stage, testing and checking functionality is carried out so that it can assist researchers in designing and developing an application.

2.2.4 Testing

This stage is the next stage of the implementation stage. At this stage, testing is carried out throughout the system to find out whether the application designed is in accordance with its design and function [19]. The testing phase is very important to ensure the application is being designed and developed according to needs and functions.

2.2.5 Management

The last stage of the *waterfall* model is the management stage. System management serves to find out which systems are not detected during the testing phase. At this stage, improvements are also made to the software such as features and user needs.

III. RESULTS AND DISCUSSION

This section is a section that discusses the implementation of the SDLC method with a waterfall model in the Mobile-Based Sumbawa Redeemer Catholic Church Application Design Using the Waterfall Method.

3.1 Analysis

At this stage, the analysis and data collection used is using observation and interview methods. Information data can be found through books, journals, and literature on the internet. Data collection is carried out based on user needs and system needs. Data collection aims to identify what needs are used in application design and development. In this stage, there are software requirements specifications, including the design of *use case diagrams*, the design of *activity diagrams* and the design of input needs (*input*) and needs output (*output*).

The need for software design and development in the information system Application Design of the Catholic Church The Redeemer Sumbawa Mobile Based, as follows:

- a. Register
 - b. Log In
 - c. Access the Main Menu
 - d. Accessing Scheduling Features
 - e. Accessing the Devotional Feature
 - f. Accessing Information Features
 - f. Accessing the Logging Feature
1. Input Needs

This application has several user-specific inputs, namely users who can see church service information. Then another user is an admin who can add and manage data in the application. Here are inputs by different users.

- a. The input given by the user, to login via Android smartphone is username, email, for login purposes and for registration, the user fills out several forms, namely name, email, mobile number, and password.
- b. The input given by the admin, to login via Android smartphone is email, filled with the registered email and password, filled with the registered password.

2. Output Requirement (*Output*)

Output needs analysis is the process of designing and developing the Android-based Sumbawa Redeemer Catholic Church application using the Waterfall method. These needs include hardware needs and software needs. The required devices are Android Studio, Kotlin, Firebase, while for hardware needs, namely laptops, smartphones, and data cables.

3.2 Planning

Unified Modelling Language (UML) is a system design carried out to describe the flow of relationships between users and applications. The system design used to explain how the application works is the *Use case Diagram* and *Activity Diagram*.

a. Use Case Diagram

Use case Diagram is an interaction between the system and the user. In the picture below there is an admin who can manage data, then the admin can input data, edit data and delete data[20]. Then for users can access the features available in the system, following the system workflow *Use case Diagram*.

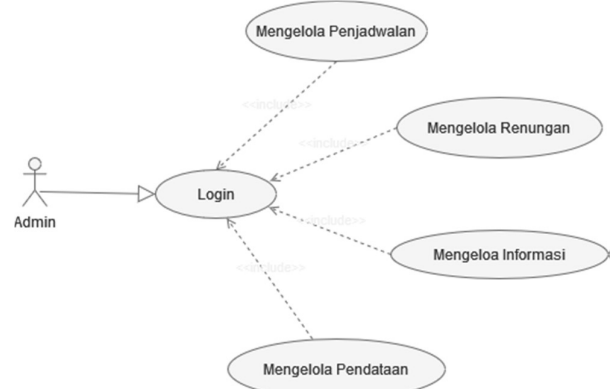


Fig 2. Use Case Admin Diagram

In figure 2, the *admin use case diagram*, the admin is the church administrator who serves as the administrator of the information system. First, the login admin enters the name and password, then goes to the admin page, on the admin page there are several features, namely scheduling features, devotional features, information features, and logging features. The admin has the task of managing people's data, information data, devotional data, scheduling data, uploading images, videos, news and others

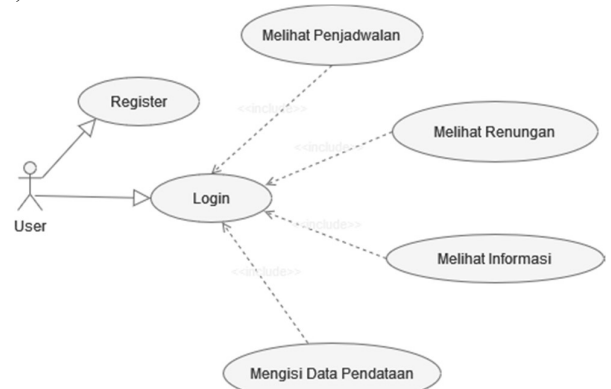


Fig 3. Use Case Diagram User

In figure 3, the *user diagram use case*, which is the user, namely the user or church members. First, the user registers, the user fills in data such as name, email, mobile number, and password. If the user has filled in the data in the register, the user can log in, the user fills in the email or mobile number and password that has been registered before. The user will be directed to the main menu, in the main menu there are several features, such as scheduling features, reflection features, information features, and logging features.

B. Activity Diagram



Activity Diagram is a depiction of the workflow of an application system that is interrelated on the system, along with an activity diagram image.

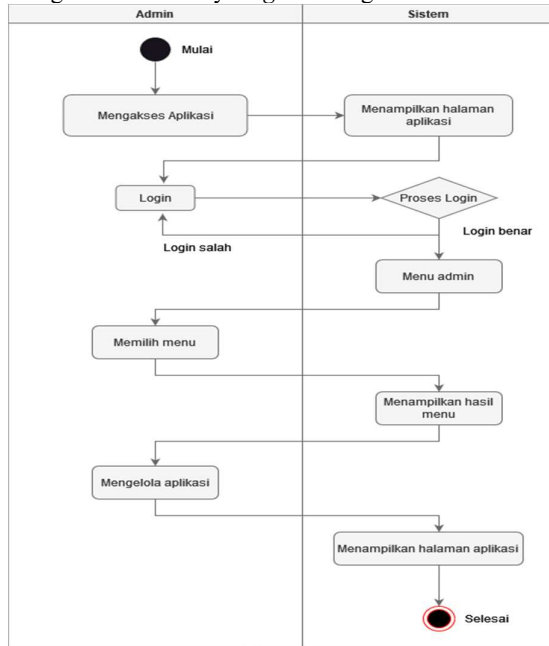


Fig 4. Activity Diagram Admin

Figure 4 is the activity diagram on the admin, first the admin accesses the application.church, then the system will display the login. The admin fills out the login form, then the system will manage the admin data. If it is correct, then the system will go to the admin menu page. Furthermore, the admin will manage the contents of the application and save data from the results of application management. Then the system will save the data previously done by the admin.

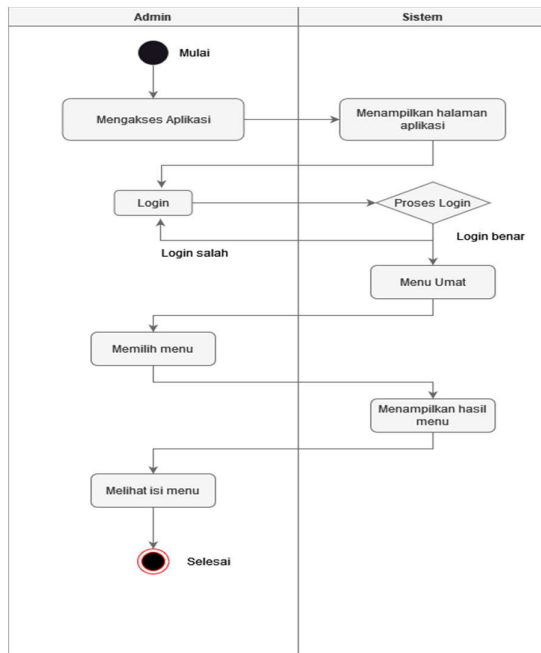


Fig 5. Activity Diagram User

Figure 5 is the activity diagram user, the user user is the church. Church members will access the application and the system will display a login form. Then the church members will fill out the login form that has been provided, then the system will manage the data from church members and will be sent to the database. If the login is incorrect, the system will display a message that is a login error. If the login is correct, the system will go to the church community menu page. Then the church members can choose the desired menu.

3.3 Implementation/Testing

a. Start page

On this page serves as the main page. On this page there is a login and register menu, before going to the login page, church members first register so that they can go to the menu page. On the register page there are several forms, namely name, email, mobile number, and password. If church members have registered, the system will send the church congregation data to the database. If the data is valid, church members can fill out the login form, on the login page there are several forms, namely email and password. If the church members fill in the data correctly, the system will go to the menu page.



Fig 6. Home

b. Menu Page

After going to the menu page, there are several features such as scheduling, planning, information, and data collection of people. On the scheduling menu, there is a Eucharistic celebration officer and a Eucharistic celebration schedule. Devotions contain daily devotions at morning, evening, or evening mass. Information includes church announcements such as pictures, videos, news, and other posts. The data collection of people contains data on people who have just joined the catholic church of the redeemer of Sumbawa, on the menu of the people's data collection contains the name, place of birth, parish origin, and origin of residence.

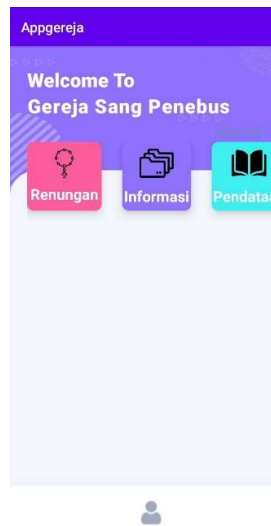


Fig 7. Menu Page

3.4 Testing

This test is carried out using two methods, namely by using *Black Box* testing and *User Acceptance*. *Black Box* testing is used as application testing to obtain system response to applications that have been designed and developed. Testing is conducted by respondents who are selected and pose as users. The results of testing with the *Black Box* method are shown in Table 1.

Table 1. Unit test results

Unit	System Testing	System Reaction	Test Results	Tested By
Register	Fill in name, email, phone, password	Data has been registered	Succeeded	User

Login	Fill in the registered email and password	Display the menu page	Succeeded	User
	Filling in inappropriate emails and passwords	Please fill in the data correctly	Succeeded	User
Scheduling Menu	View Eucharistic celebration schedules and Eucharistic celebration attendants	Displays data on Eucharistic celebration schedules and Eucharistic celebration officials	Succeeded	User
Devotional Menu	View daily devotionals each day	View daily devotional data	Succeeded	User
Information Menu	View a variety of church-related information such as pictures, videos, news and other posts.	Display data of various information	Succeeded	User
Logging Menu	Fill in personal data such as name, place, date of birth, parish origin and origin of residence	Display data of people who have been diagnosed	Succeeded	User

The next test is to use *User Acceptance* testing. This test is carried out to determine whether the application that has been designed is in accordance with user needs at the analysis stage. Testing was conducted with respondents and several questions regarding the application. The results of the answers from respondents are given weight to each assessment. The weighting starts from strongly disagree to strongly agree. Value weighting is shown in Table 2.



Table 2. Value weighting

Valuation	Weight
Strongly disagree	1
Disagree	2
Netral	3
Agree	4
Totally agree	5
Totally agree	

The results of the weighting that have been carried out are then classified and grouped based on the questions that have been asked. This test was conducted involving five respondents. The results of the questions asked with the break-inof predetermined values are shown in Table 4.

Table 3. User Acceptance test results

Respond	Question					Sum
	1	2	3	4	5	
User 1	4	4	3	4	3	18
User 2	4	4	3	5	5	21
User 3	3	5	4	4	5	21
User 4	5	4	4	4	5	22
User 5	4	4	3	5	4	20
						102
Total Score						2040

Based on Table 3 test results using *Black Box* testing, get good results. The entire system has been tested and no system errors were found. All units tested are in accordance with previous analyses. Overall the system can run well and display reactions according to the user's wishes.

Testing with the *User Acceptance* method gets a fairly high score. The results of this test will be calculated to get the final value of user satisfaction with the application that has been designed. The calculation is done using the following formula (1):

$$n = \frac{\text{Jumlah}}{\text{Ju}} \times 100$$

Description:

n = result

Ju = Number of Users

In table 3, the results of the calculation using the formula above get a total score of **102** on all users from 5 questions.

IV. CONCLUSION

Based on the results of research and discussion of the Sumbawa Redeemer Catholic Church Application Design, there are several problems, such as the delivery of information, and the management of church data. This makes it difficult for the church to manage and deliver information to church members, because the church information system is still done manually. Therefore, researchers designed a church application to make it easier for churches to manage and convey church information. Researchers conduct observations and interviews to obtain church data, making it easier for researchers to design and develop applications. Researchers designed six features to assist churches in and manage conveying information such as church scheduling features, church devotional features, church information features, and the church's community data collection feature. In the scheduling feature contains about the schedule and church officials at the Eucharistic celebration, the devotional feature contains daily devotions such as Bible verses, the feature Information contains images, videos, news and other posts, the Church Community Data Collection feature contains a data collection form for people who have just joined in parish of the catholic church of the redeemer of Sumbawa. Researchers also provide testing of users, so that users can make an assessment of the application. There are five users and have different ratings, and result in the number 102, this number divided by the number of users, and multiplied by 100 to produce 2040. By conducting this assessment, it can find out what percentage of user interest in the application designed. In this study, researchers have limitations in developing applications, so that It is hoped that the next researcher can develop ApplicationI such as adding several features and presenting more complete information on people's data.

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