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Design and Build E-Stm Using Real-time Push Notification in Sumber Padi Village

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Abstract

Relief societies (STM) are important in helping people in need through various social programs and activities.This study addresses the issue of STM member logging and financial data management, then addressing misinformation reported by managers or citizens and making it easier for citizens to pay STM dues. This study uses Firebase Realtime database for data storage and Firebase Storage to store photo media; Research and development methods (R&D used as a method in this study, and uses the Rapid Application Development (RAD) method as its system development method. The author also uses Realtime push Notification by using firebase cloud messaging to build STM applications. The results of the black box system test show that the application runs by the needs of the system, the research carried out has high relevance to facilitate the management of member data, contributions and activity information on STM.

Keywords: E-STM; Realtime Push Notification; RAD; Firebase, Android.

Abstract

Perkumpulan tolong menolong (STM) memiliki peran penting dalam membantu masyarakat yang membutuhkan melalui berbagai program dan kegiatan sosial, penelitian ini membahas masalah pencatatan anggota STM dan pengelolaan data keuangan, kemudian mengatasi kesalahan informasi yang dilaporkan oleh pengurus atau warga dan memudahkan warga dalam membayar iuran STM. Penelitian ini menggunakan database Firebase Realtime untuk penyimpanan data dan Firebase Storage untuk menyimpan media foto; Metode penelitian dan pengembangan (R & D digunakan sebagai metode dalam penelitian ini, dan menggunakan metode Rapid Application Development (RAD) sebagai metode pengembangan sistemnya. Penulis juga menggunakan Realtime push Notification dengan menggunakan firebase cloud messaging untuk membangun aplikasi STM. Hasil pengujian sistem black box menunjukkan bahwa aplikasi berjalan sesuai dengan kebutuhan sistem, penelitian yang dilakukan memiliki relevansi yang tinggi untuk mempermudah pengelolaan data anggota, iuran dan informasi kegiatan pada STM Teknologi Industri Pertanian.

***Keywords**: Convolutional Neural Network, Transfer Learning, EfficientNet, Disease Detection, Rice Leaf Images*

1. Introduction

In this era of technology, society can carry out tasks and obtain information with great ease and speed [1] [2]. From calculating technology to decision-making, the use of computers has undergone significant advancements[3]The use of web-based information systems has great potential to enhance efficiency and productivity in the management of mutual aid organizations in the ever-evolving era of digital and information technology. Such information systems can be used to track and manage finances, program funding, and the inventory of goods necessary for social activities [4] [5].

The charitable organization, also known as a mutual aid society (MAS), is responsible for assisting communities in need through various programs and social activities [6] [7]. Collecting and managing funds and inventory for social and humanitarian activities is one of the main activities of STM, particularly in the village of Sumber Padi. However, in its management, STM still faces issues with financial and inventory management, which are still conducted manually, leading to errors and inefficiencies. The second issue is that the management also still conducts the collection of humanitarian funds manually through a door-to-door system to residents' homes, and the dissemination of news is still done through announcements from the mosque's loudspeaker, which is sometimes not heard by the surrounding residents, resulting in misinformation.

The previous research correlates with this research. The research conducted by Harry Susanto indicates that this information system facilitates the STM management in conducting membership data collection within the organization. Based on the black box testing, this organizational system is functioning as intended [8]. The subsequent research was conducted by Ika Devi Pewitasari and her colleagues, with the STMKu web serving as a source of information for members and the community regarding financial management and organizational activities. This study aims to create a financial management system for the STM of Kelambir Lima Kebun Village. The waterfall development model is utilized to build a web-based application [6]. Based on the results of previous research described earlier, there are differences in the methods and platforms used; this research utilizes real-time push notifications in the application development. Real-time push notifications are sent directly to users' devices from the application and provide the latest information without manually opening the application [9] [10]. The development of the system implemented using the Rapid Application Development method (RAD).

Based on the background of the research that has been explained, the author aims to implement the E-STM application for activity information using Real-time Push Notification. This system will address the issues of member data collection and financial data management, subsequently resolving the problems of misinformation announced by the managers or residents and facilitating residents in paying STM dues, as the types of payment can be made through cash and digital payments. The creation of this application is expected to assist STM managers in information notification and financial management to become more effective and efficient.

2. Method

This research consists of 2 stages of methods, namely, first for the research, the Research and Development method is used. Subsequently, for system development, the Rapid Application Development (RAD) method is employed, which includes the stages of requirement planning, design workshop, and implementation, along with the addition of Real-time Push Notification utilizing Firebase Cloud Messaging, which can directly send information and activities to the STM organization. The following is the research flow framework.

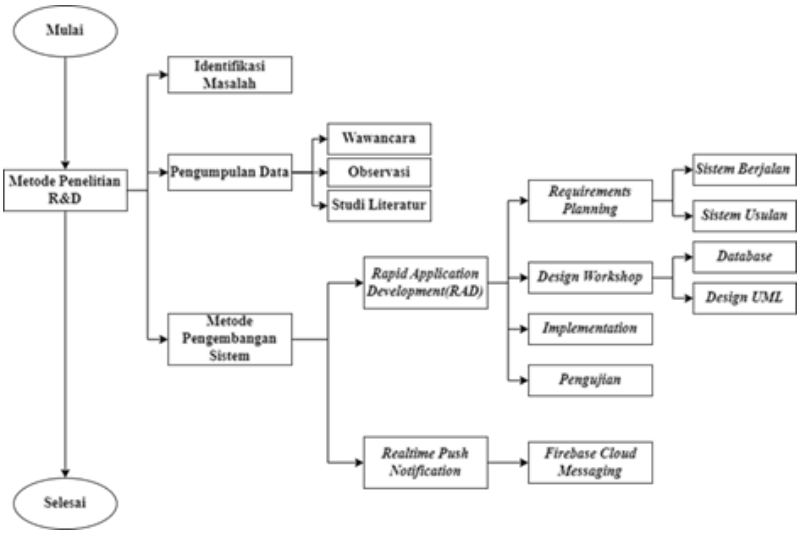

Figure 1. Research Flow Framework

2.1 Metode R&D

The research and development method, or R&D, is used to create specific products and test how effective those products are [11]. The following are the steps of this R&D, which can be seen in the following **Figure 2**.

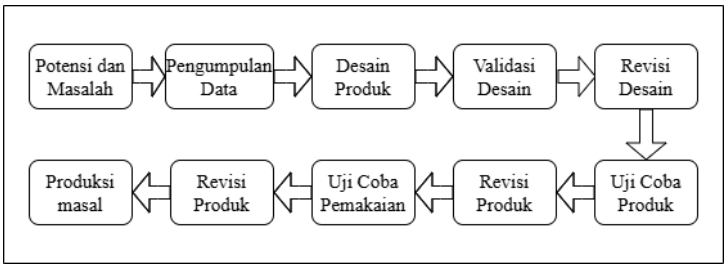

Figure 2. Research and Development Steps

The first stage, which involves identifying potential issues and problems, is breaking down, searching, and systematically organizing information to draw conclusions that can be understood. Subsequently, the data collection phase of this research employs several methods, including direct observation and interviews regarding the management of the rice source STM, as well as conducting literature studies. The next stage involves designing the system, which is

the process of planning the components of the system to achieve specific objectives. The design is carried out by creating a flowchart to illustrate the sequence and structure of the system to be developed. The design that has been created is then followed by the design validation process, which involves a series of important steps to ensure that the system developed meets user requirements. Once the design has been tested, the system can be implemented; a usage trial or system validation test will be conducted after the implementation process is completed.

2.2 System Development Methodology

The linear sequential software development process (RAD) prioritizes a short development cycle, but the short construction time does not affect the quality of the product [12]. The Rapid Application Development (RAD) method consists of three stages: Requirements Planning, Design Workshop, and Implementation **[9] [12].**

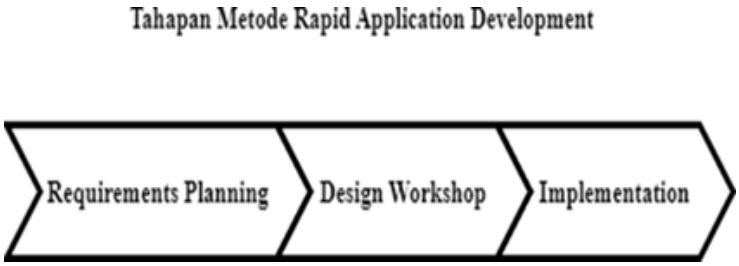

Figure 3. RAD Method Steps

2.2.1 Requirements Planning

The Requirements Planning Stage aims to identify the system needs to be developed by collecting data from STM managers through direct observation and interviews.

2.2.2 Design Workshop

At this stage, design is a visual communication language used to convey information. The first step is to implement information systems using use case and activity diagrams.

2.2.3 Implementation (Implementasi)

After completing the workshop design, the system is implemented as a program that machines can understand. After the implementation stage, the system is ready to be operated. Before it is ready for operation, there is a testing phase to ensure the application conforms to the design and its intended purpose. The testing objective also includes identifying system errors that can be rectified.

In addition to using the Rapid Application Development method in the system development process, the author also employs Real-time Push Notification utilizing Firebase Cloud Messaging, which is used to build the STM application. Real-time Push Notification is a

powerful tool for enhancing user experience, providing relevant and timely updates, and maintaining user engagement with the applications or services used.

3. Results and Discussion

3.1. *Requirements Planning*

After the observation and interviews, the data obtained indicated that the number of STM members is 252, with contributions collected only when needed, such as in cases of misfortune like illness, death, or other calamities, as well as information on community service activities or others. This research aims to facilitate the management in handling member data, providing information in real-time and accurately, and easing the members in making the required contributions. The E-STM application focuses on identifying the user needs that will be met by the application, as well as planning resources and project scope.

3.1.1 Running system

The system currently in operation is still manual and has not yet been computerized; the information announced by the management is disseminated through the mosque's loudspeaker, collection is conducted door-to-door, and data is still recorded manually in a ledger, which poses a risk of being damaged or lost.

3.1.2 Proposal System

This system is created using realtime push notifications using Firebase cloud messaging. Made so that existing announcements can be delivered in real time and accurately, this system will also have digital payment features and computerized data collection.

The requirements planning above shows that the research conducted is highly relevant to facilitating the management of member data, contributions, and activity information in the STM organization.

3.2 Design Workshop

The next step is to process raw data into structured data to design the application system to be created. UML is the standard visual method for E-STM application development using real-time push notifications. The process includes creating a Use Case Diagram, and an Activity Diagram, to illustrate the activities in the system **[13] [14]**.

3.2.1 Use Case Diagram

A use case describes how a system works from the user's point of view **[15]**. The way use cases work uses scenarios that are descriptions of steps that explain what the user does to the system

and vice versa [16]. The following are the use cases of the system design, which have been made based on the system's needs to be implemented.

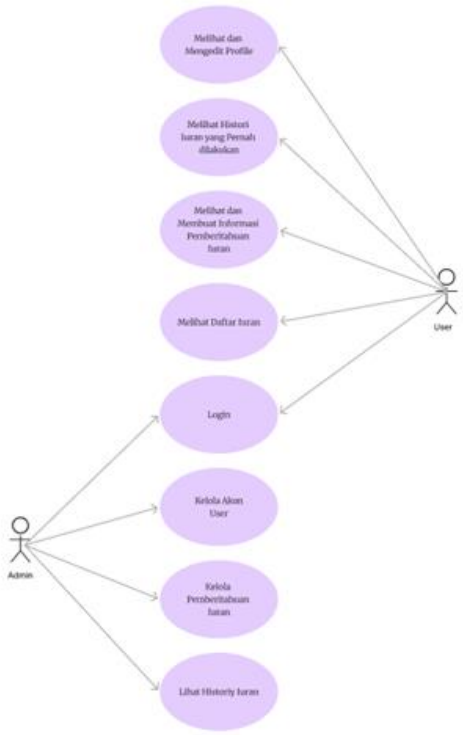

Figure 4. Use Case diagram App E-STM

In Figure 4, the use case diagram above explains that the E-STM application system can be accessed by 2 actors: admin (STM Manager) and user (STM Member). In this system, only admins can access user data and contribution payment data, in this data admins can delete, edit and add data, in addition to that users can access available pages such as logging out, viewing information and making information such as grief information, cooperation information, contribution information and other information, there are also payment features and history information.

3.2.2 Activity Diagram

Activity diagram is a modeling of the work system of an object or a system. Activity diagrams illustrate the work process from start to finish of the use case, with notation appropriate to the function [17]. The following is the activity diagram of the E-STM application:

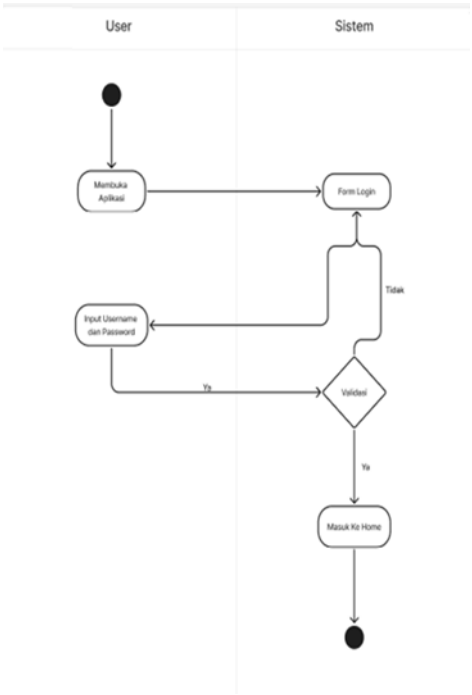

Figure 5. Login User

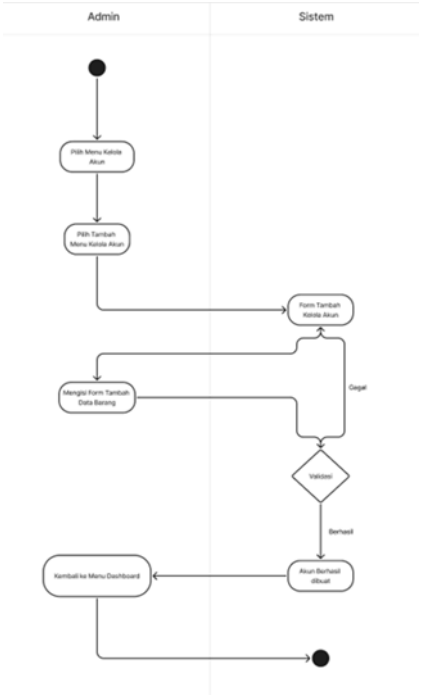

Figure 6. Manage Account

Figure 5 activity diagram above shows how the user or user logs in to his account, then Figure 6 shows how the system works when the admin manages the user account. Final state The shape of a full-filled circle that is at the end of the system **[18]**.

3.2.3 Realtime Push Notification

The push notification method refers to a system that sends information in the form of notifications from the server to the client without needing a special request. Firebase Realtime Database is a database platform used in realtime applications. It is stored in the cloud and compatible with Android, iOS, and Web platforms. Apps connected to Firebase will be automatically updated on every device, either through the website or phone, when data changes occur **[19]**.

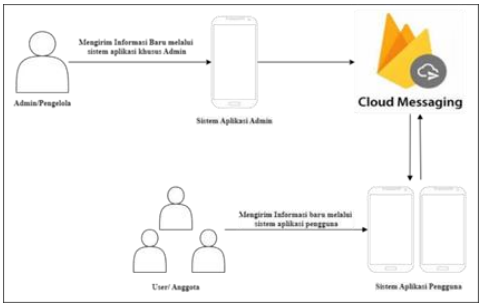

Figure 7. Realtime Push Notification Steps

Figure 7 explains how real-time push notification works in this study. The admin sends new information through an application that has been provided specifically for the admin to

manage user data or to send information on mutual cooperation activities, finance, sad news, or other information.

3.3 System Implementation

In this section, it explains the implementation of the system that has been designed in this study, here is the explanation,

3.3.1 Admin and User Login page

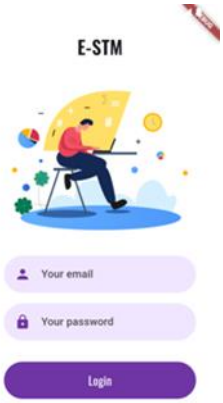

Figure 8. User and admin login page

This page is the portal to enter the E-STM Application account, shown in Figure 8. Users and admins must enter the username and password previously given by the manager (Admin) to access the system's main page.

3.3.2 Halaman Utama User dan Admin

Figure 9. Admin Home Page

Figure 10. User Home Page

Figure 9 on the main page of the admin there is a user management menu, information notification and contribution history, here only the admin can access this page, and in Figure 10 is the main page of the user which contains a mutual help menu, namely a menu for payment of

contributions, then a notification information menu to make information, both users and admins can make notifications through this system, Then there is the History menu, which contains past news. The account contains information about the user's profile, and finally the menu about the application contains a brief description of the village and the number of residents.

3.3.3 User data information page and mutual help menu

Figure 11. User data information

Figure 12. Mutual Help Menu

In Figure 11 there is STM user account information data, this page can only be accessed and managed by admins only, then there is Figure 12, namely the mutual help menu, this menu is a forum for users to make donations or contributions, there is a category of contribution payment, namely sad news is a mandatory contribution that users must pay, then cooperation donations are sincere contributions, and finally, the contribution of sick relatives is also not mandatory and the amount is not determined.payment of contributions can be done digitally through ewallet mbanking or ATM.

3.3.4 Notification Information Page

Figure 13. Notification Information

This page contains notification information created by admins and users. This information is real-time, and if there is a new notification, it will appear through notifications sent in real time.

3.4 Testing

The test method is black box testing to test the application's functionality. The main focus in this test is to test the application's features to see if the features used are working well. The following is a table of test results:

Table 1. Black box Texting Admin

No	Page Test	User Actions	System Reaction		Result
			True	False	
1.	*Login*	Click the Login Button	Log in to Admin dashboard	Not Logged in to Admin Dashboard	Valid
2.	Manage User Accounts	Add data, Edit Data, View and Delete data	Can add, edit, display and delete data	Cannot add, edit, display and delete data	Valid
3.	Notification of information	Add data, Edit Data, View and Delete data	Can add, edit, display and delete data	Cannot add, edit, display and delete data	Valid
4.	Contribution Information	View data and status of paid contributions	Can display contribution information	Unable to view contribution information	Valid
5.	Log out	Click the Logout Button	Can Log Out and Can Return to the Login Page	Can't log out and can't return to the login page	Valid
6.	Push Notification	Submit information	Notifications can appear on the user's Smartphone	Notifications cannot appear on the user's Smartphone	Valid

Table 2. Black Box Testing Users

No	Test Halaman	Aksi Pengguna	Reaksi Sistem		Hasil
			True	False	
1.	*Login*	Click the Login Button	Log in to the User dashboard	Not Logged in to the user dashboard	Valid
2.	About the App	Click the About app menu	Can display about the app	Can't display about the app	Valid
3.	Saling Bantu	Click the Menu Saling Bantu	Can set up a page containing a gotong royong menu, sad news, and kerabat sakit	Can't get a page containing a gotong royong menu, sad news, and kerabat sakit	Valid
4.	Gotong Royong	Display information data and pay contributions through Digital payment	Can display information and pay contributions through digital payment	Unable to display information and pay contributions through digital payment	Valid
5.	Sad News	Display information data and pay contributions through Digital payment	Can display information and pay contributions through digital payment	Unable to display information and pay contributions through digital payment	Valid
6.	Kerabat sakit	Display information data and pay contributions through Digital payment	Can display information and pay contributions through digital payment	Unable to display information and pay contributions through digital payment	Valid
7.	Notification Information	Appear, and add information	Can display information and add information	Can't display and add information	Valid
8.	Contribution History	Show History	Can display user contribution history	Can't view user contribution history	Valid
9.	User Accounts	Click on the User Account Menu	Can View user data and edit user data	Cannot View user data and edit user data	Valid
10.	Logout	Click the Logout Button	Can Log out and log back in	Unable to Log Out and Log Back in	Valid

The result of the Black Box texting above is that admins and users with adjusted access rights have run well as expected. The tests successfully tested all key features, including real-time push notification delivery, interactive menu display, and information notification page.

This application is ready to be implemented in rice-source villages and is used by the

community and village government, believing that critical features work as expected. Further testing can be performed in more complex scenarios, such as further testing on unstable network conditions and application resiliency and scalability tests.

4. Conclusion

Based on the research that has been conducted by the author on the implementation of the E-STM application by applying the realtome push notification method using firebase realtime database as a place to store user data and payment data and firebase storage for Figure media storage, the final result of this research leads to the formation of an E-STM application using the realtime push notification method.

This system will later overcome the problem of data collection of STM members and the management of information announced by managers or residents because this system has a push notification that functions to convey messages in real time to application users and makes it easier for residents to pay STM contributions because the type of contribution payment can not only be done through cash but can also be through digital payments, the creation of this application is expected to help STM managers in Information notification and financial management become more effective and efficient

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