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Development of a web-based citizen contribution management system to optimize the financial management of community associations

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ABSTRACT

This research aims to develop a web-based citizen contribution management system at D'Tar Residence to improve financial efficiency and transparency. Manual management of citizen contributions often causes transparency problems and delays in payment recapitulation. This research method uses the Waterfall system development model which includes the stages of needs analysis, system design, implementation, testing, distribution, and maintenance. Data collection was carried out through interviews, observations, and literature studies involving housing association administrators. This application was developed using the PHP programming language with the CodeIgniter framework and MySQL database. System testing was carried out using the Black Box Testing method to ensure that the application functions according to residents' needs. The results of the study indicate that the developed application can improve the efficiency of citizen contribution management and provide more transparent access to financial information. However, there are three features that require further refinement. Overall, this application is expected to encourage citizen participation in decision-making related to housing finances and increase satisfaction with the financial management of the association.

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Introduction

Effective and efficient financial management is one of the main challenges in managing organizations, including community associations in housing complexes. In many cases, community dues management is done manually using handwritten notes or spreadsheets, which tend to be prone to errors, data duplication, and difficulties in financial reporting and analysis. This can have an impact on the lack of transparency and inability of administrators to manage the funds collected, which in turn can affect residents' trust in the financial management of the community. Therefore, a system is needed that can simplify and increase efficiency in managing contributions and financial reports (Ilham et al., 2020; Riantas & Muizu, 2024; Syachbrani, 2024; Yehorchenkova et al., 2024).

A web-based community dues management system is a solution that can overcome these problems. With this system, all community dues transaction data can be recorded properly and can be accessed in real-time by administrators and community members. The advantage of a web-based system is its ability to present data centrally and can be accessed from various devices connected to the internet, which facilitates the process of monitoring and reporting finances(Feuerriegel & Neumann, 2016; Teniwut et al., 2022). This system can also be integrated with various features that can make it easier for administrators to make decisions, such as dues payment reminders, automatic financial reports, and financial trend analysis(Margaretha & Nababan, 2020; Rafael et al., 2024).

The application of technology in web-based citizen contribution management is expected to increase transparency and accountability in fund management. With clear reports and an easy-to-use system, citizens can better understand the allocation and use of the contribution funds they pay. In addition, this system can minimize human error that often occurs in manual recording, such as forgetfulness or inaccurate calculations(Alasseri et al., 2018; Pereira et al., 2021a). Thus, administrators can focus more on managing the association's programs or activities without worrying about the smooth running of the financial administration process (Abrishambaf et al., 2017; Rafael et al., 2024; Rifuddin et al., 2020; Sari et al., 2023).

One important aspect of financial management at the association level is citizen involvement in the contribution payment system. For this reason, the management system developed needs to pay attention to the user experience aspect so that it is easy to use by all members, including those who are not familiar with technology(Alasseri et al., 2018; Pereira et al., 2021b; Watini et al., 2021a, 2021b). A user-friendly interface, automatic notification of due contributions, and fast payment verification features will be important features in this system. With the right approach, this system can encourage increased citizen participation in the association's financial activities (Dewi & Wulandari, 2023; Margaretha & Nababan, 2020; Teniwut et al., 2022).

On the other hand, the association in D'Tar Housing has special characteristics that need to be considered in developing this system. Various factors such as a large number of members, diversity of age and educational background, and management needs that comply with local rules and regulations require system adjustments in order to function optimally. Therefore, this study aims to develop a web-based citizen contribution management system that is not only effective in terms of financial management, but also in accordance with the specific needs of the community in the D'Tar Housing Complex.

This study is expected to provide a significant contribution to the development of an information system for the purposes of citizen contribution management. Through the development of this system, it is hoped that fund management in the D'Tar Housing Complex can be more transparent, accountable, and efficient. In addition, this study also has the potential to be a reference for the development of contribution management systems in other housing complexes, by considering adaptation to the local context and specific needs of each community. Thus, this study has the potential to provide broad benefits in improving the quality of technology-based financial management at the community level.

Method

In this study, two main models were used, namely the data collection model and the system development model. First, the data collection model adopts a qualitative approach that is included in the constructivist paradigm. This paradigm focuses on understanding social conditions through an inductive approach. Qualitative research procedures include techniques such as interviews, observations, and literature studies. Second, the system development model applied in this study is the Waterfall model. This model follows the process shown in the following figure:

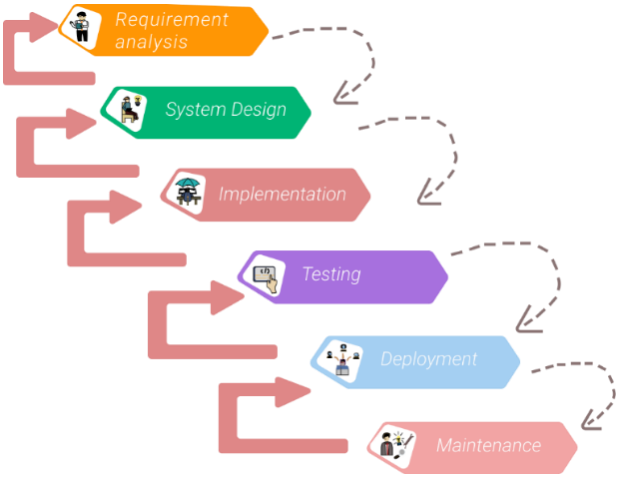

Figure. 1. Waterfall Model

The Waterfall model offers a systematic and sequential approach to software development (Putra et al., 2021; Rachmatullah et al., 2022), starting from analysis, design, coding, testing, to overall system maintenance. Each completed stage will be 'signed off' (Alviana & Kurniawan, 2021; Cashiragi, 2022) before proceeding to the next stage.

1. Requirement Analysis
   The requirements analysis process is carried out through interviews, observations, and literature studies. Based on the results of interviews and observations, it was found that the current contribution payment system is still done manually using a small book, which is considered less effective and efficient.
2. System Design
   After analyzing the existing problems, the next step is to design the application system design. The design begins with the creation of an ERD (Entity Relationship Diagram), which describes the relationships between entities in the system, as well as a DFD (Data Flow Diagram) to describe the data flow in the contribution payment system being built (Fajar Dwi Sulistyo & Ade Rahmat, 2020; Rachmatullah et al., 2022; Siswandi & Muhidin, 2022)
3. Implementation
   At the implementation stage, the system design that has been created is translated into code using the PHP programming language with the CodeIgniter framework and MySQL database to build the application.
4. Testing
   After the implementation is complete, a trial is carried out to ensure the application functions properly before being launched to users. This trial aims to ensure the suitability and performance of the application that has been built.
5. Deployment
   This stage is carried out after the testing process is complete, the application that has been developed is socialized to the association administrators through training activities that have been mutually agreed upon.
6. Maintenance
   After the application has been tested and implemented, the next step is maintenance. During use, it is possible that errors will appear that have not been detected before, or there may be a need to add new features. Therefore, system maintenance and development, data validation, and information updates are very important.

Results and Discussions

The system design developed in this study involves the creation of Entity Relationship Diagram (ERD) and Data Flow Diagram (DFD). ERD functions to describe the relationship between entities in a database, while DFD is used to map the flow or movement of data between the entities involved.

1. Data Flow Diagram

DFD is a diagram used to describe the flow of data in a process or system. The following is a DFD of the citizen contribution payment application that has been designed.

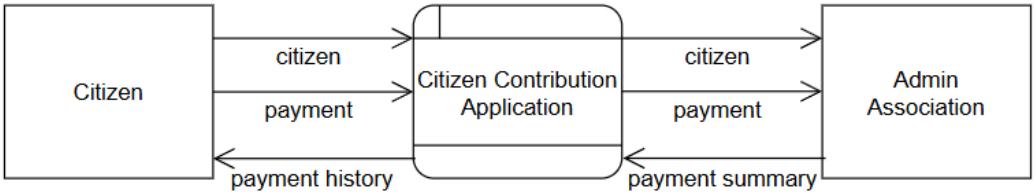

Figure 2. DFD of Citizen Contribution Application

2. Entity Relationship Diagram

ERD in this study is used to visualize the relationship between entities, such as one to one, one to many, many to one, and many to many, so as to facilitate a clear understanding of the relationship between entities. The following is an ERD from the citizen contribution payment application that has been designed

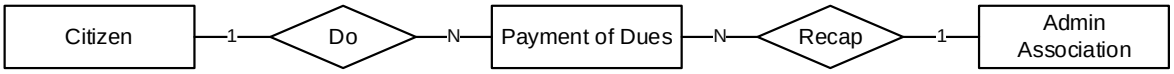

Figure 3. ERD of Citizen Contribution Application

3. Implementation

The implementation of this system is the result of writing lines of PHP code using the CodeIgniter Framework to produce a website-based Citizen Contribution application. The results of the implementation are as follows:

a. Home Menu
This home menu display contains some information and a menu bar located horizontally above, and displays information on the number of residents and the total number of residents who pay dues. The initial menu display is as shown in Figure 4.

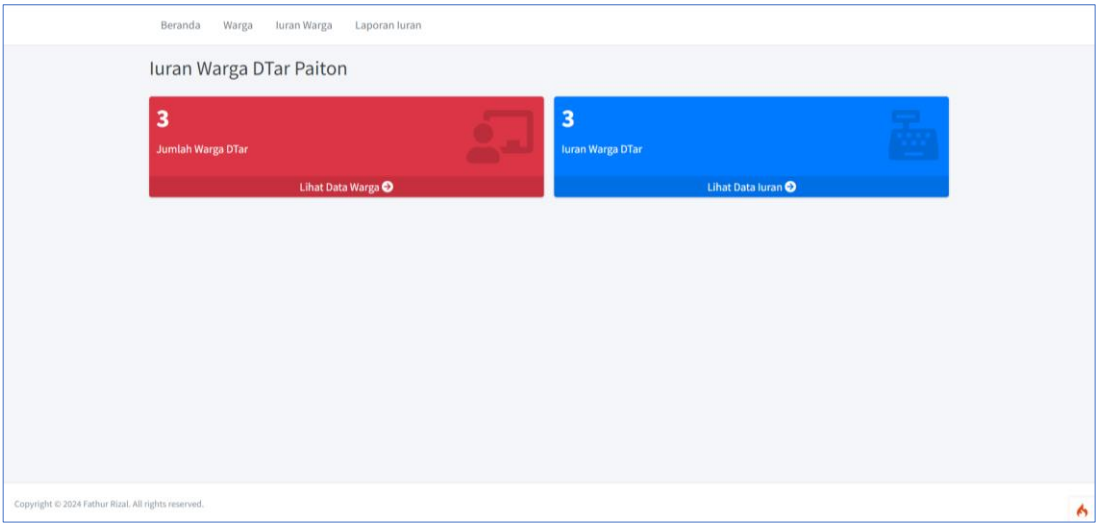

Figure 4. Home Menu

b. Citizen List Menu
The Resident List menu display contains information on the Resident List who live or do not live in the D'Tar Housing which can be seen from the active and inactive status on the Resident List in the displayed menu table as well as information on the resident's house number. In addition, there are also features for editing, deleting and adding resident data. The display of the resident list menu is as shown in Figure 5.

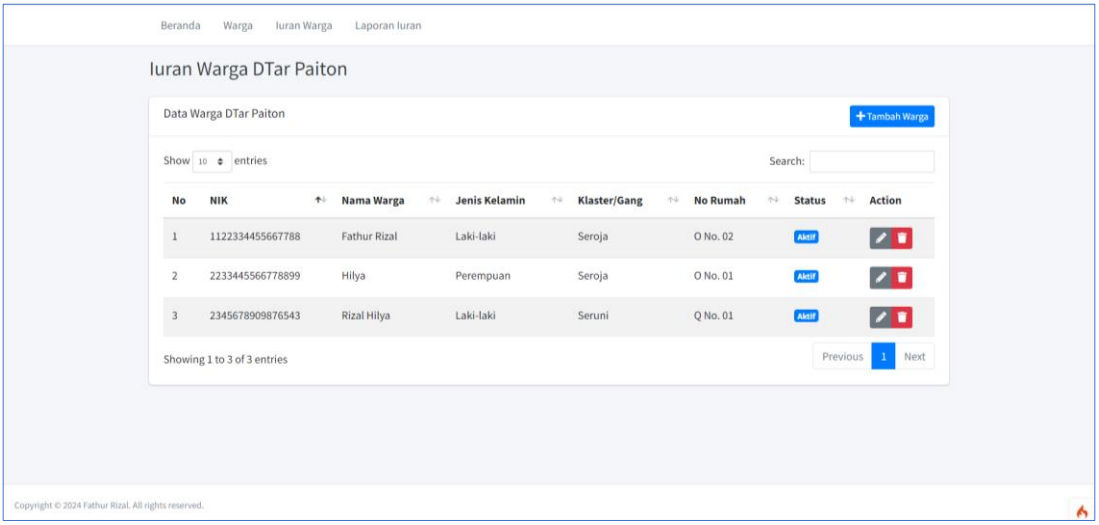

Figure 5. Citizen List Menu

c. Add Citizen Data Menu
The Add Citizen Data menu display contains an Input Form containing NIK, full name, gender, cluster/gang, house number, and status (active, inactive). The display of the add citizen data menu is as shown in Figure 6.

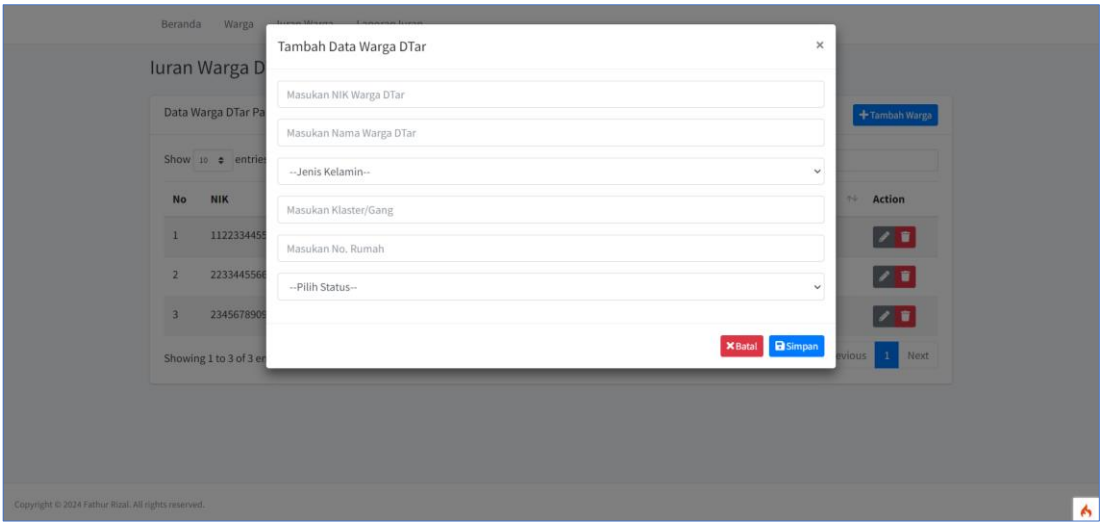

Figure 6. Add Citizen Data Menu

d. Citizen Contribution Menu
The Citizen Contribution List menu display contains information on the list of citizens who have paid contributions as well as information on the payment date, payment month and nominal amount paid. In addition, there is also a feature to delete and add Citizen Contribution data. The Citizen Contribution menu display is as shown in Figure 7.

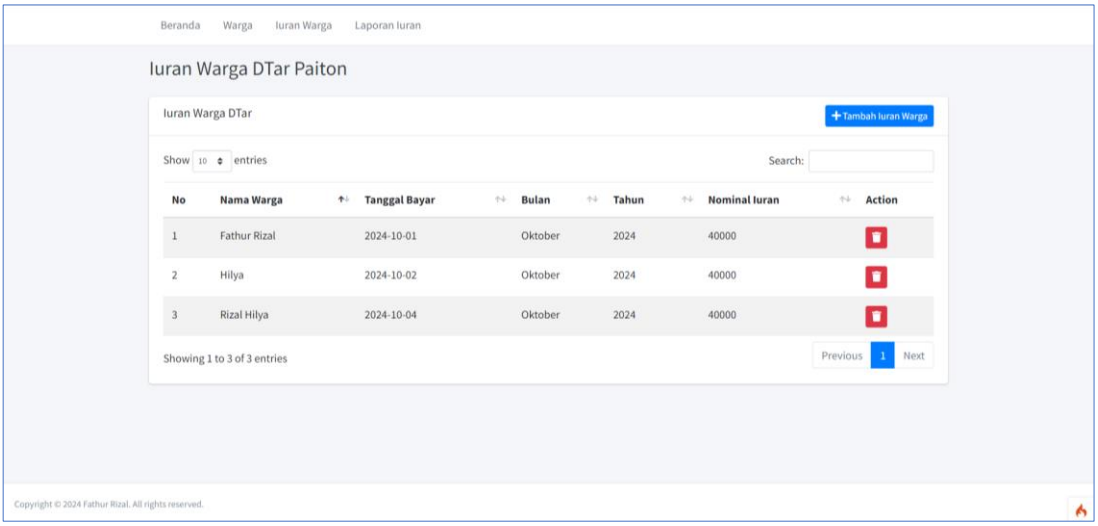

Figure 7. Citizen Contribution Menu

e. Add Citizen Contribution Menu
The Add Citizen Contribution Data menu display contains an Input Form that contains the selection of the citizen's name, payment date, month, contribution year, and contribution amount. The display of the add contribution data menu is as shown in Figure 8.

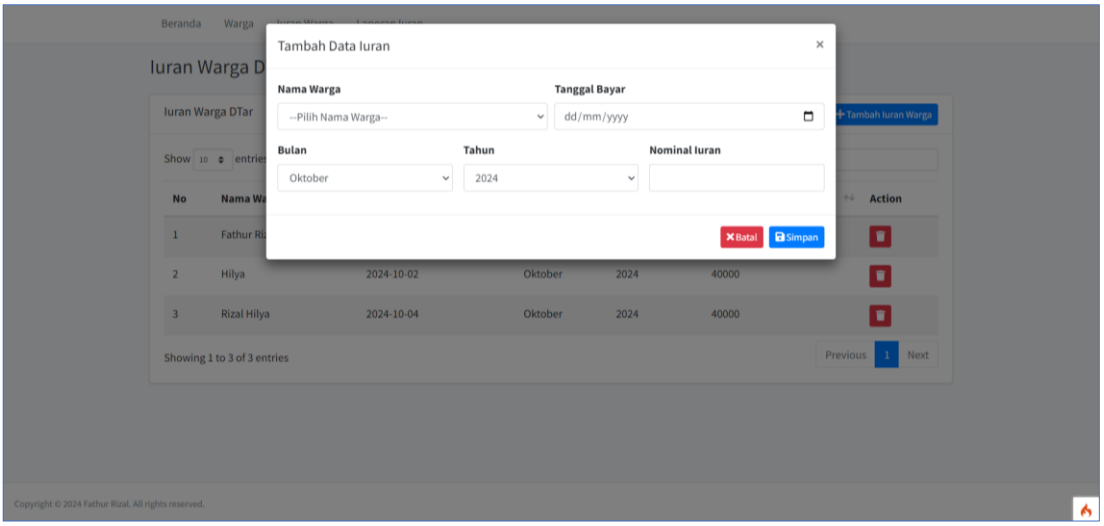

Figure 8. Add Citizen Contribution Menu

f. Contribution Report History Menu
The Citizen Contribution Report menu display contains information on the list of citizens who have paid contributions, the month of payment, the nominal amount paid by each citizen and the total contribution based on the filtered month. In addition, there is a feature to filter payment data by month and year. The contribution report menu display is as shown in Figure 9.

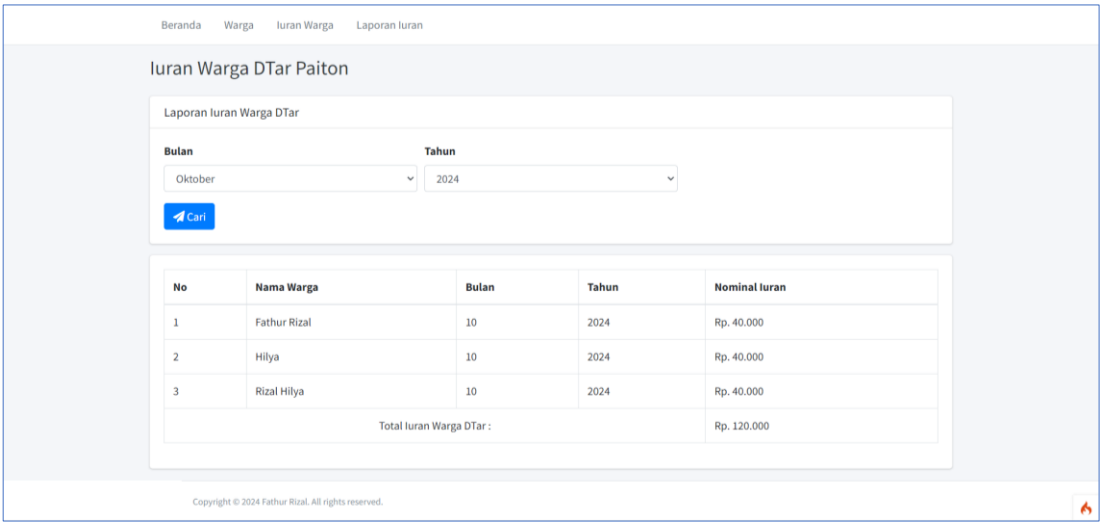

Figure 8. Contribution Report History Menu

4. Application Testing

System evaluation is conducted to determine the suitability between the application that has been developed and the results of the testing or trials conducted. The evaluation is conducted by testing the system on this Website-based Citizen Contribution application using Black Box Testing, where the testing process is carried out by observing all activities on the application that has been created so as to produce the expected results (Fajar Dwi Sulistyo & Ade Rahmat, 2020). The test results can be seen in table 1.

Table 1. Black Box Testing Results for Citizen Contribution Application

Observed Features	Expected results	Test Results
Home Menu	Can display information on the number of residents and the number of residents who have paid contributions and display a list of application menus.	Has been appropriate
Citizen List Menu and Add Citizen Data Menu	Can display list of citizens	Has been appropriate
	Can do citizen data entry	Has been appropriate, but needs to be adjusted again by adding a telephone number.
	Can edit citizen data	Has been appropriate, but needs to be adjusted again by adding a telephone number.
	Can delete citizen data	Has been appropriate
Citizen Contribution List Menu and Add Citizen Contribution Data Menu	Can display a list of residents who have made payments	Has been appropriate
	Can entry data for citizen contribution payments	Has been appropriate, but needs additional payment categories for occupied and unoccupied homes.
	Can delete citizen contribution data	Has been appropriate
Contribution Report Menu	Can display a report on the overall payment of citizen contributions	Has been appropriate
	Can display the overall report of citizen contribution payments based on Month and Year Filters	Has been appropriate

The process of repairing the website-based citizen contribution application is carried out when there is a problem with the system that has been built, the repair is carried out by analyzing the existing problems to determine the length of time for the repair work. In addition, the repair process is not only carried out when there is a problem with the system that has been built, but can also be in the form of adding features and updating the system to adjust the old library.

Conclusions

Based on the research that has been conducted, this study has succeeded in developing a website-based citizen contribution application in D'Tar Housing and this application has succeeded in increasing the efficiency of financial management. Black Box testing shows that this application is in accordance with the needs, although there are three features that require further improvement. This application is able to provide more transparent access to financial information and increase citizen participation in decision making. For further research development, it is recommended to improve application features such as digital payment integration and new payment categories, improve user experience through usability testing, and expand the application of the system to other communities. In addition, data analytics and modern technologies such as blockchain can be applied for better transparency and efficiency, while measuring the social and economic impact of this system.

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