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Web-based GKS Papindung Congregation Data Management Information System

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Abstract

Sumba Christian Church (GKS) Jemaat Papindung which is one of the churches in Pandawai District, Mauliru Village, East Sumba Regency, which was established on September 07, 2009, which at that time was still a branch of GKS Mauliru, which was later divided in 2021, becoming GKS Papindung until now. The Sumba Christian Church (GKS) Papindung congregation faces obstacles in the congregation data management system, which was previously recorded manually using the congregation's master book. The loss of the congregation data book in 2021 caused difficulties in re-recording, given the large number of congregants, namely 490 people. The main problems faced are difficulties in searching and grouping data, inconsistency in recording, and the risk of data loss or damage. This research aims to design and develop a web-based congregation data management information system to improve the efficiency and accuracy of data recording. This system was developed using the Waterfall method with PHP, MySQL, and HTML technologies. Testing is done using the Black Box method to ensure the accuracy of system functionality. The test results show that this system can assist the church secretary in managing congregational data more effectively, as well as facilitate the pastor in viewing and exporting congregational data as needed.

Keywords: *Information System, Congregation Data Management, Website, Waterfall Method, GKS Papindung*

1. Introduction

The development of information technology has had a significant impact in various aspects of life, including data management in religious institutions. Churches as social and religious institutions need a system that can support the recording and management of congregational information efficiently. One of the churches that experience problems in managing congregational data is the Sumba Christian Church (GKS) Papindung Congregation.

Since its establishment in 2009, GKS Jemaat Papindung has relied on manual recording in a master book to record congregation data, including information on family heads, congregation members, baptism status, and sidi. However, in 2021, the church experienced a loss of the congregation's master book, which caused difficulties in re-recording and managing data on the congregation of around 490 people. The main problems in this manual recording include the risk of data loss, recording errors, duplication of information, and lack of efficiency in searching and updating data.

To overcome these problems, a web-based information system is needed that can assist the church in managing congregational data more efficiently and accurately. This system will utilize PHP and MySQL technology as the main platform for data management and apply the Waterfall software development method to ensure the system can be built in a structured and systematic manner.

Based on the background that has been described, the problem formulations in this study is how to build a congregational data management information system that can improve the efficiency of recording and searching data at GKS Jemaat Papindung. The objectives of this research are as follows: Developing a web-based information system for congregational data management at GKS Jemaat Papindung; Improve efficiency and accuracy in recording, searching, and updating congregational data; Testing the effectiveness of the developed system through functional testing methods such as Black Box Testing and usability evaluation using the System Usability Scale (SUS).

2. Research Methodology

2.1. Information System

An information system is a system consisting of various components that work together to collect, process, store, and distribute information to support decision making in an organization Information systems are very important in data management because they can increase efficiency and accuracy in recording and storing information [1], [2], [3], [4].

2.2. Website

A website is a collection of pages that contain digital information and can be accessed through the internet network using a browser. Websites consist of two main types, namely static websites, whose content does not change without manual editing, and dynamic websites, which can be updated automatically with user interaction or backend systems [5], [6], [7], [8].

2.3. Software Development Method (Waterfall)

The Waterfall method is one of the software development models that carries a systematic and sequential approach, where each stage must be completed before proceeding to the next stage. The stages in the Waterfall method are as follows [9], [10], [11], [12]:
Requirements analysis - identifying system requirements based on existing problems.
System design - designing the system structure, including UML diagrams and user interfaces.
Implementation - developing the system using the selected programming language.
Testing - evaluating the functionality of the system using predefined test methods.
Maintenance - performing system updates and improvements according to user needs.
The Waterfall method was chosen in this research because of its systematic structure and is suitable for projects with a clear scope, such as this congregation data management information system.The Waterfall model is a software development methodology that proposes a systematic and sequential approach to software that starts at the system level of progress throughout analysis, design, code, testing, and maintenance. The waterfall SDLC model is also often called the linear sequential model (Sequential linear) or classic life cycle. The waterfall model provides a sequential or ordered software life cycle approach starting from analysis, design, coding, testing, and support stages. The following is a picture of the waterfall method and an explanation of each process [13], [14], [15], [16].

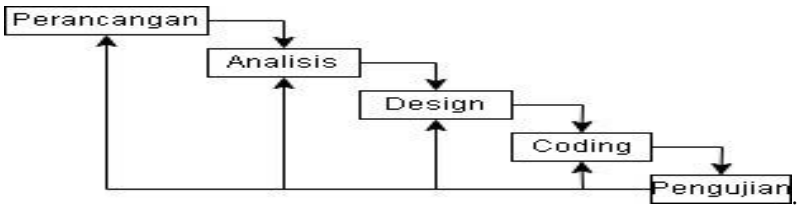

Fig. 1: Waterfall Method

1) Analysis
   System requirements analysis is needed to understand the basis of the program to be created, the scope of information and functions required for this, a system requirements analysis is needed, at this stage the author analyzes the documents obtained from. The documents analyzed include congregational data. The author collects information from this document which will then be developed into a website. This is considered the main point of the web design process.
2) Design
   Design is designing or designing a good system whose contents are operational steps in the data processing process to support system operations. Without design, software creation will not run well. Design is a process of defining something that will be done using various techniques and it involves a description of the architecture as well as detailed components and limitations that will be experienced in the work process.
3) Implementation
   The result of this stage is a computer program according to the design that was created at the design stage. In solving this problem, modular, top down and button up techniques are used. The programming language used in developing this web-based school library information system is the PHP programming language using the MYSQL database in the XAMPP application with reference to the design analysis that has been created.
4) Testing
   Testing focuses on the software from a logical and functional perspective and ensures that all parts have been tested. This is done to minimize errors and ensure that the output produced is as desired. System testing is carried out after the program code writing process is complete, to ensure that the program created is in accordance with what has been designed and to ensure that there are no errors. The method used is black box testing [17], [18], [19], [20], [21], [22], [23].

3. System Design

3.1 Use Case Diagram

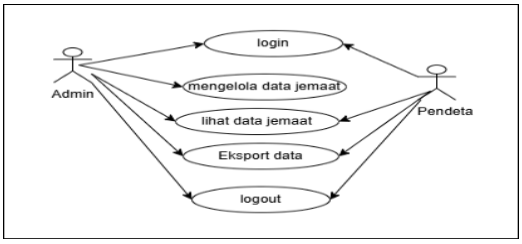

Fig. 2: Use Case Diagram

Figure 2 explains the flow or work process which is divided into two actors with their respective tasks, namely accessing the system by logging in to the system, entering username and password, and the process of managing congregational data. In this system, the admin has

the right to create, edit, view and delete data that is his job. The assembly is given access rights to the system by creating congregation data, as well as viewing congregation data. The congregation only has the right to create congregational data and view congregational data but is not given the right to delete it.

3.2. Activity Diagram

3.2.1. Activity Diagram Login

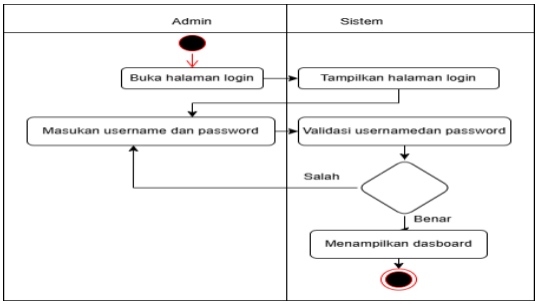

Fig. 3: Activity Diagram Login

In Figure 3, the admin Activity Diagram explains that the admin in charge of managing web data must log in first. If the username and password entered are correct, the system will display a dashboard page. However, if the username and password are incorrect, the system will display the login page again. After successfully logging in, the admin can perform various actions such as creating new congregation data, updating congregation data, reading congregation data, and deleting congregation data

3.2.2. Data management diagram activities:

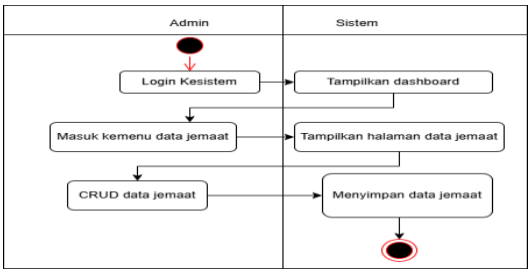

Fig. 4: Data management diagram activities

Figure 4 explains the activity diagram for managing congregational data where the admin can log in and then enter the congregational data menu and the system will display the congregational data page. After that, the admin CRUDs the congregation data and then the system saves the data.

3.2.3. Data export diagram activity:

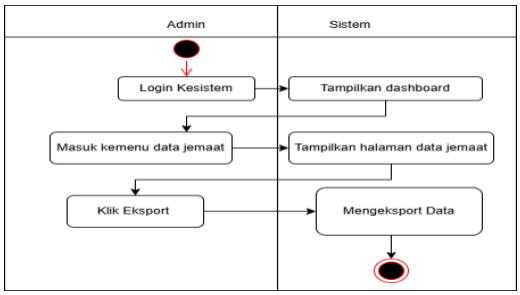

Fig. 5: Data export diagram activity

Figure 5 explains the activity diagram of exporting congregation data where the admin can log in and then enter the congregation data menu and the system will display the congregation data page. After that, the admin exports the congregation data and then the system exports the data.

3.3. Sequence Diagram

3.3.1. Admin Sequence Diagram:

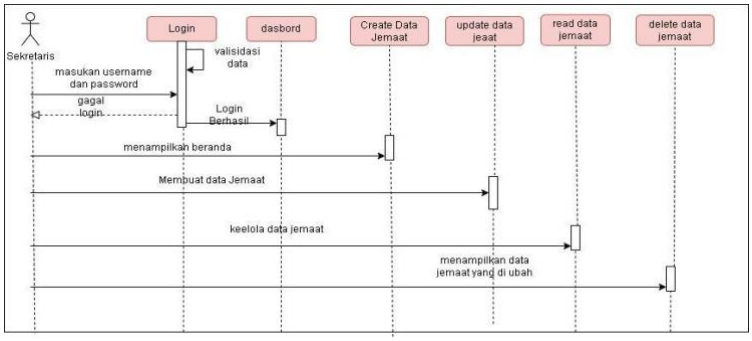

Fig. 6: Admin Sequence Diagram

Figure 6 explains the process of admin activities in interacting with the system starting from logging in, when the username and password match, the data verification is successful and will then enter the dashboard page. The next stage, the admin will be directed to manage data by managing congregation data.

3.3.2. Pastor Sequence Diagram:

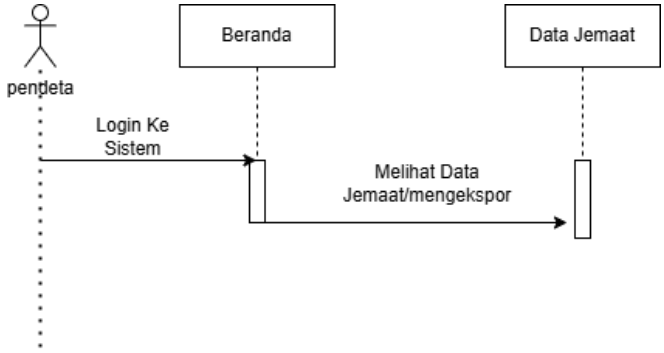

Fig. 7: Pastor Sequence Diagram

Figure 7 explains the process of pastor activities when interacting with the system, the pastor is given access rights to view congregation data, export congregation data.

3.4. Class Diagram

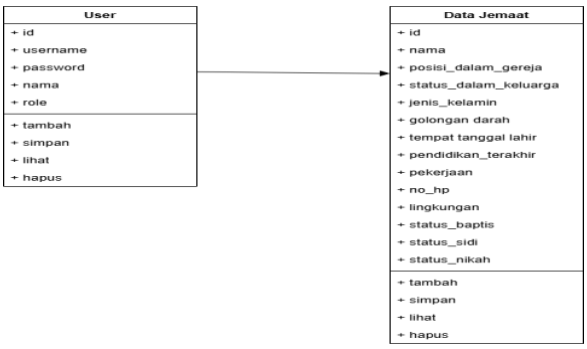

Fig. 8: Class Diagram

Figure 8 explains the structure and relationships between classes that have objects or attributes in them, in the login table there is access to the user column, then to the congregation data, after that to the congregation, but the user stands alone.

4. Results

4.1. System Implementation

The Papindung GKS congregation data management information system was developed using the Waterfall method, which consists of several stages, namely requirements analysis, design, implementation, and testing. The system is web-based and built using PHP, MySQL, HTML, CSS, and JavaScript to support accessibility and efficiency in managing congregational data.
The main features developed in this system include:

1. Login and Access Rights - The system has two main types of users, namely admin (church secretary) and pastor.
2. Congregation Data Management - The admin can add, edit, delete, and search congregation data based on certain categories (head of family, baptized member, sidi member, etc.).
3. Data Export - Congregation data can be exported in PDF format for reporting and documentation purposes.
4. Interactive Dashboard - Provides summary statistics regarding the number of congregants, baptized members, and congregational membership status.

This system aims to overcome the obstacles faced by churches in manual data management, such as the risk of data loss, duplication of information, and difficulty in searching congregational data.
Login Page:

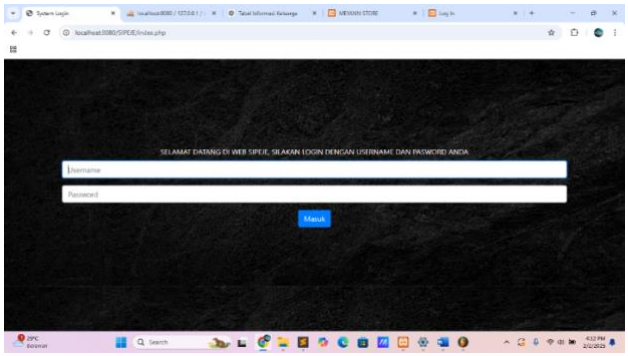

Fig. 9: Login Page

Figure 9 is a display of the admin login page. On the page there is a username and password form. When you want to login, the admin will input the username and password. After inputting the username and password, click the login button and the system will verify the username and password entered. If the username and password entered are correct, you will be directed to the home page. If the username and password are wrong, you must re-enter the username and password.
Admin Home Page:

Fig. 10: Admin Home Page

Figure 10 is the Admin Home page is the main display after the admin successfully logs in to the system. This page functions as a dashboard that provides an overview of the data and activities that are currently taking place in the system.
Congregation Data Page:

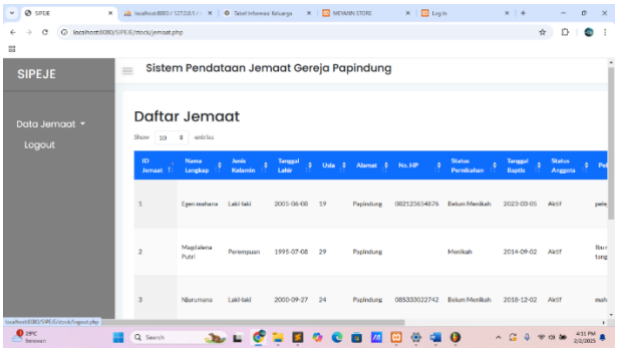

Fig. 11: Congregation Data Page

Figure 11 is a feature in the system used to manage information about registered congregations. On this page, the admin can view congregation data in the form of a table containing important information such as congregation name, address, telephone number, gender, and membership status. In addition, this page also provides search and filter features to make it easier for admins to find specific congregation data. Admins can perform various actions such as adding, editing, and deleting congregation data as needed.
Eligible Member Page:

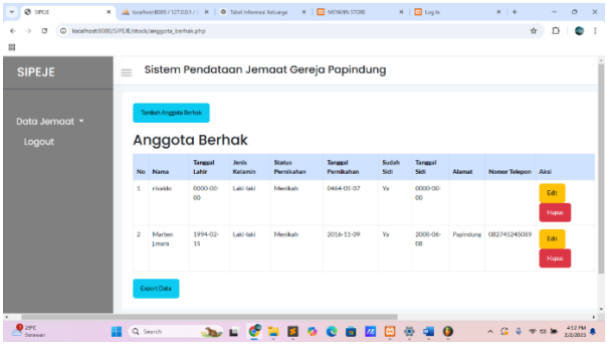

Fig. 12: Eligible Member Page

Figure 12 is part of the system used to manage member data that has certain rights. On this page, the admin can see a list of members who have met the criteria as entitled members, which is displayed in a table with information such as member name, address, and telephone number. This page is also equipped with a search and filter feature to make it easier for the admin to find certain member data. In addition, the admin can add, edit, or delete entitled member data according to needs.
Head Of Family Page:

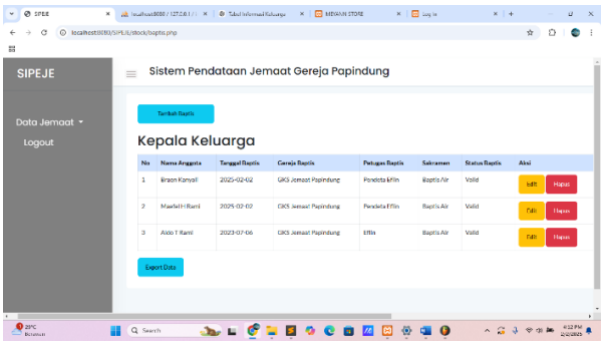

Fig. 13: Head of Family Page

Figure 13 explains that admin in managing head of household data can include various tasks to ensure accurate, organized, and easily accessible data. Admin can add new data, edit or delete head of household data. This includes information such as name, address, marital status, number of family members, and others. Admin is responsible for ensuring that the data entered by users or officers is in accordance with the specified criteria and is valid.
Baptism Page:

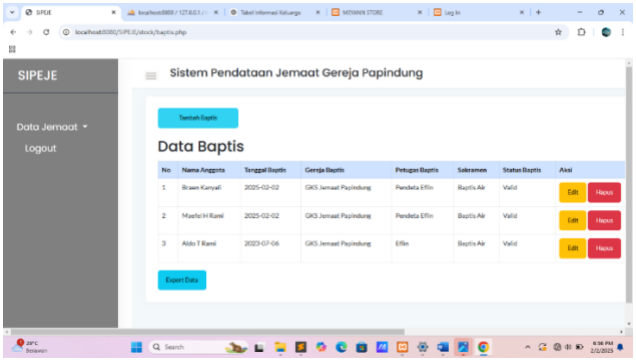

Fig. 14: Baptism Page

Figure 14 explains that the admin can see a list of congregations that have been baptized in the form of a table containing information such as the name of the congregation, baptism date, baptism place, and the name of the pastor who baptized. In addition, this page also provides search and filter features to make it easier for admins to find certain baptism data. Admins can perform various actions such as adding, editing, and deleting baptism data as needed.

4.2. Black-Box Testing

Table 1: Black-Box Testing

Menu	Input	Output	Result
Login	Input username dan password	Successful login and the homepage appears	Succeed
Congregration Data	Click the congregation data menu and manage data	The congregation data page appears and the data is stored in the database	Succeed
Eligible member data	Click the head of family data menu and manage data	Display the head of family data page and data is stored in the database	Succeed
Head of family data	Click the head of family data menu and manage data	Display the head of family data page and the data is stored in the database	Succeed

Baptist data	Click the baptist data menu and manage data	Display the baptist data page and the data is stored in the database	Succeed
Export data	Click the export button on the data menu that you want to export	Data can be exported to pdf	Succeed
Log out	Click the log out button	Successfully loguot and display the login menu	Succeed

4.3. System Usability Scale

Table 2: SUS Count Results

Respondents	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Quantity	Quantity x 2.5
R1	4	4	4	3	4	3	3	4	4	3	36	90
R2	4	3	3	4	3	3	4	4	4	4	36	90
R3	3	4	4	4	4	4	3	3	4	4	37	92.5
R4	4	3	4	3	3	4	4	3	4	3	35	87.5
R5	3	4	3	3	4	3	4	4	4	4	36	90
R6	3	4	3	4	3	3	4	4	4	4	36	90
R7	4	4	4	3	4	4	3	3	3	4	37	92.5
R8	4	4	4	3	4	3	3	4	4	3	36	90
R9	3	4	3	4	4	3	4	4	4	4	37	92.5
R10	4	4	4	4	4	3	3	4	4	3	37	92.5

Calculating the SUS Average:

Add up all SUS scores:

90 + 90 + 92.5 + 87.5 + 90 + 90 + 92.5 + 90 + 92.5 + 92.5 = 907.5

Calculate the SUS Average:

Rata-rata SUS = $\frac{907.5}{10}$ = 90,75

The average SUS score was 90.75.

With an SUS score of 90.75 this information system is categorized as very good and can be used easily by users. Based on the results of implementation and testing, this information system is proven to be effective and efficient in overcoming the problems of congregational data management in GKS Jemaat Papindung. Some of the main analysis points are as follows:

1. Effectiveness of Data Management
   - o The web-based system allows for more structured data management compared to the previous manual method.
   - o Data search becomes faster and more accurate.
   - o The risk of data loss is reduced because storage is done in a MySQL database.
2. Improved Ease of Use
   - o Based on the SUS test results, the system has a high level of ease of use.
   - o Simple and intuitive user interface helps users to operate the system without the need for special training.
3. Security and Accessibility
   - o The system is equipped with a login feature to ensure that only authorized users can access the data.
   - o Congregation data can be accessed in real-time, allowing churches to manage information more responsively.
4. Reduction of Recording Errors
   - o The system minimizes writing errors and data duplication that often occur in manual methods.
   - o Input validation ensures the data entered is in the correct format.

The results of this study show that the implementation of a web-based information system can optimize congregational data management compared to the manual method previously used. This system not only speeds up the process of recording and searching data but also increases the security and accuracy of information.

Some findings and implications of this research are as follows:

1. Change from Manual to Digital System
   - o Before the system was implemented, the church experienced problems in managing congregation data due to the loss of the master book.
   - o With this digital system, congregation data is securely stored in the database, and recording can be done more quickly.
2. The Role of Technology in Church Administration
   - o This research shows that the use of information technology in the church environment can help in administrative management and recording congregational data.
   - o This can serve as a model for other churches in adopting similar information systems.
3. Evaluation and Further Development
   - o Although this system has fulfilled the basic needs of the church, some additional development can be done, such as integration with email or SMS notifications for communication with the congregation.
   - o Further research can explore the use of cloud-based technology to improve scalability and data security.

5. Conclusion

Based on the test results, the system showed a very high level of usability with a SUS score of 90.75, which is included in the Best Imaginable category. This indicates that the system has been well designed, easy to use, and provides optimal experience for users. In addition, the results of Black-Box Testing on 12 main menus showed that all features functioned as expected, without any bugs or critical errors. Each menu, including Login, Dashboard, Congregation Data, Eligible Members, Head of Family, and Baptism, has been tested and can perform its duties well, ensuring the system works accurately and responsively. Thus, this system has met good usability and functionality standards, although it can still be further optimized in terms of interface appearance and response time.

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