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Web-Based Congregation Data Management Information System for the Pamalar Sumba Christian Church

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Abstract

Information technology plays an important role in improving efficiency, accuracy, and accessibility in administrative processes. Churches with large and dispersed congregations often face difficulties in managing and searching congregation data. The Sumba Christian Church, located in Umbu Langang Village, Central Sumba Regency, also experiences these challenges. The congregation consists of 1,231 members, including 589 males and 642 females, and the number continues to grow. Currently, congregation data is still recorded manually in books, making data updates slow, inefficient, and prone to errors or data loss due to non-centralized storage. To address these problems, this study developed a web-based Congregation Data Management Information System using the Waterfall development method. The system aims to simplify data recording, updating, and searching processes, making church administration more effective and efficient. The implementation of this system is expected to improve the speed, accuracy, and reliability of congregation data management. System testing was conducted using the Black Box Testing method, which showed that all system features functioned successfully with a 100% success rate. In addition, usability evaluation using the System Usability Scale (SUS) produced an average score of 80.75, indicating that the system is highly usable and acceptable for church administration activities.

Keywords: *Information System, Congregation Data Management Information System, Sumba Christian Church, Waterfall, Web-Based System*

1. Introduction

In today's digital era, information technology has developed rapidly and has influenced almost every aspect of human life, including social, religious, and community service sectors. Information technology has become an important tool for improving efficiency, accuracy, and accessibility in various administrative processes. In the context of church ministry, especially in Christian churches, congregation data management is one of the most essential administrative activities. Congregation data management not only serves administrative purposes but also supports spiritual services, social activities, and other church programs. However, in several churches, particularly those with large and geographically dispersed congregations, the process of managing and searching congregation data becomes increasingly difficult.

The Sumba Christian Church, located in Umbu Langang Village, Central Sumba Regency, West Umbu Ratu Nggay District, is one of the churches facing challenges in congregation data management. The church was originally established in 1967 as a branch of GKS Parewa Tana. In 2012, it officially became independent and was established as GKS Pamalar, serving as the main church. As a religious institution, the church has a significant responsibility in managing congregation data. However, the increasing number of congregation members has made the data management process more difficult.

Based on interviews conducted at the Pamalar Sumba Christian Church, particularly with Mrs. Ahat R. Day as the BPMJ Secretary, information was obtained that the congregation continues to grow, consisting of 589 male members and 642 female members, with a total of 1,231 members. Nevertheless, the current congregation data management system is still considered ineffective because all data recording processes are carried out manually using ledger books. Church officers must visit congregation members' homes one by one to collect data, making the process time-consuming and highly dependent on the availability of members at home.

In addition, data updates are often delayed. For example, birth records are frequently documented only when a child is about to be baptized, while changes in congregation status, such as baptism, confirmation (sidi), marriage, and death, are not updated immediately after the events occur. As a result, the stored congregation data is not always accurate or up to date. The use of ledger books also complicates the process of updating data quickly, increases the risk of recording errors, and creates the possibility of data loss or damage due to non-centralized storage. Consequently, church administrative processes, including baptism, confirmation, and marriage records, become less efficient and more prone to errors in data entry and archiving.

By utilizing web technology, the data management process can be carried out more efficiently, quickly, and in an integrated manner. A web-based system enables data to be stored centrally and securely, making it accessible anytime and anywhere [1]. In addition, web technology simplifies data updates and retrieval, reduces the risk of information loss, and improves accuracy and transparency in congregation data management. The use of web technology can also support the automation of administrative processes, accelerate church services, and assist in making more accurate and reliable data-based decisions [2].

To address these challenges, a web-based information system is needed to store, manage, and access congregation data more effectively. The implementation of this system is expected to assist the church, particularly the BPMJ Secretary, in managing congregation data in a more structured and integrated manner. A web-based congregation data management system offers advantages such as easy access whenever needed and the ability to manage data more securely and efficiently. The system can also facilitate the collection of congregation information, including member identities and membership histories, which can help church administrators make decisions based on accurate data. Therefore, this study aims to design and develop a Web-Based Congregation Data Management Information System for the Pamalar Sumba Christian Church to support more optimal congregation data management and church activities.

2. Previous Research

2.1. Information System

An information system is a system within an organization that integrates daily transaction processing needs to support operational and managerial functions, as well as strategic activities, in order to provide relevant information to certain external parties for decision-making purposes [3].

An information system is also defined as a collection of interconnected elements that work together in an integrated manner. These elements are responsible for collecting data, processing it, and storing the resulting information. Furthermore, the system functions to distribute information to the parties who need it. Therefore, information systems assist in decision-making processes and improve operational efficiency [4].

2.2. Data Collection

Data collection is an activity carried out to gather data and information, such as population data collection programs implemented by village governments and communities. Population data collection programs in villages aim to determine the number of residents in the area, including those who move in, move out, give birth, or pass away [5].

Data collection can also be defined as a process or activity of systematically gathering and recording data for specific purposes. This activity includes the stages of collecting, recording, and classifying data so that it can be used as a basis for decision-making or further analysis. In other words, data collection is an important initial step in obtaining accurate and relevant information through the process of searching for and gathering data from various sources [6].

2.3. Website

A website can be defined as a collection of web pages that display information in the form of text, still images, moving images, animations, audio, video, and combinations of these elements, whether static or dynamic, which are interconnected through page networks [7].

A website is also part of internet technology, where technology refers to a system created by humans for specific purposes in order to simplify tasks, improve outcomes, and save energy as well as available resources [8].

2.4. Waterfall

The Waterfall method is one type of development model that can be analogized to a waterfall, where each stage is carried out sequentially from top to bottom. The development of the web-based examination information system in this study uses the Waterfall model as the software development method [9].

The Waterfall model is one of the most commonly used models in the development of information systems or software. This model applies a systematic and sequential approach. The stages in this model begin with the planning phase and continue through to the maintenance phase, with each stage carried out step by step. Developers need to understand the development process and the characteristics of the Waterfall model when applying this approach [10].

The system development process in this study uses the Waterfall Method, which is considered one of the oldest software development methods. One of its advantages is its structured and adaptable nature in system development. The Waterfall Method consists of five main stages: Planning, Analysis, Design, Implementation, and Maintenance.

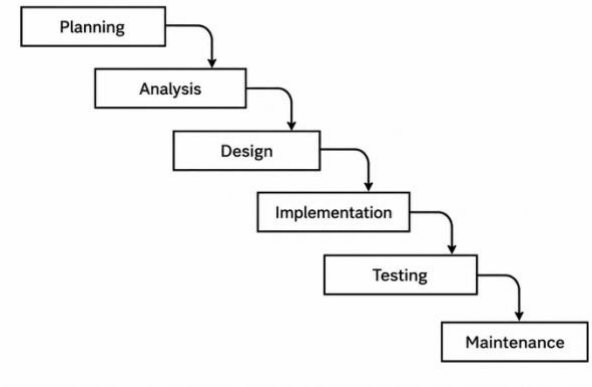

Fig. 1: Waterfall

Description:

1. Planning
   At this stage, emphasis is placed on gathering user requirements and describing the relationship concept between users and the interface. This process produces the specifications for the web-based customer relationship management system.

2. Analysis
   At this stage, an analysis of problems, requirements, and necessary data is conducted in designing the system based on the existing concepts.

3. Design
   At this stage, the results of the analysis are transformed into system designs in the form of Use Case Diagrams, Activity Diagrams, Sequence Diagrams, Class Diagrams, and User Interface designs.

4. Implementation
   This stage involves coding or developing the software based on the completed design. During this stage, developers write the source code and implement the system logic to be built.

5. Testing
   The implemented system is tested to ensure that the software functions according to the specifications. This includes functional testing, integration testing, and performance testing.

6. Maintenance
   The maintenance stage involves system upkeep, bug fixing, functionality improvements, and necessary modifications after deployment.

One of the advantages of the Waterfall model is that the system development process is well planned and easier to control. In addition, the development stages are clearly structured, and each stage is completed before moving to the next stage, thereby preventing overlap in the implementation process.

2.5. Black Box Testing

Black Box Testing is one of the easiest testing methods to apply because it only requires determining the lower and upper limits of the expected data. The estimated amount of test data can be calculated based on the number of input data fields to be tested, the input rules that must be fulfilled, and the upper and lower boundary cases that meet the requirements. Through this method, it can also be identified whether the system functionality still accepts unexpected input data, which may result in invalid stored data [11].

Black Box Testing is a simple testing method carried out by testing the input and output of each system functionality. This testing method is based on testing scenarios consisting of test cases, expected results, actual test results, and testing status. In this method, testers are not required to understand the system's source code, but they must understand the expected system workflow. This testing method is also known as Functional Testing because it focuses primarily on the functionality of the system [12].

2.6. SUS (System Usability Scale)

The System Usability Scale (SUS) is a mechanism used to evaluate the usability of a product by testing it with real users. John Brooke from MIT developed the System Usability Scale in 1986 as a "quick and dirty" measurement instrument. SUS can be used to evaluate hardware, software, websites, applications, and various other products and services. When using SUS for usability evaluation, factors such as small sample size, limited time, and low cost are taken into consideration [13].

3. Results And Discussion

Data collection methods are techniques used to obtain the information and data required in designing the Web-Based Congregation Data Management Information System for the Pamalar Sumba Christian Church, which requires accurate and up-to-date data. Therefore, data collection was conducted through several methods, including:

1. Interview
   Interviews were conducted as one of the data collection methods to obtain the information needed to formulate and achieve the research objectives. The interviews were carried out through direct question-and-answer sessions with the informants. In this study, interviews were conducted with the BPMJ Secretary, Mrs. Ahat R. Day, and Yeselfrino Umbu Tayi. The results showed that congregation data management at the Sumba Christian Church is still performed manually, causing difficulties for the secretary due to the large and continuously growing number of congregation members. From these interviews, information regarding the annual congregation data collection process was obtained.

2. Dokumentasi
   Documentation was used as a method of collecting data through congregation record books authorized by the church. This study applied documentation techniques by reviewing congregation data records and documenting the interview process as supporting evidence for the research. The documentation results showed that the required congregation data includes member name, gender, place and date of birth, address, education, baptism date, confirmation date, marriage date, ministry role, discipline status, occupation, and additional remarks. These data fields are important for supporting administrative needs and structured congregation data management. However, the "Not Yet Baptized" field was considered unnecessary because the status can already be identified through the Baptism Date field. If the Baptism Date field is empty, it can automatically indicate that the congregation member has not yet been baptized.

4. Implementastion and Testing

4.1. Implementastion

The outcomes of this research represent the results obtained from a series of research activities conducted according to the predetermined procedures and stages. The developed output is a Web-Based Congregation Data Management Information System designed to address problems related to congregation data management at Sumba Christian Church. After the development process was completed, system testing was carried out using the Black Box Testing approach to evaluate whether each feature and function operated properly and met user needs effectively.

1. Admin Login Interface

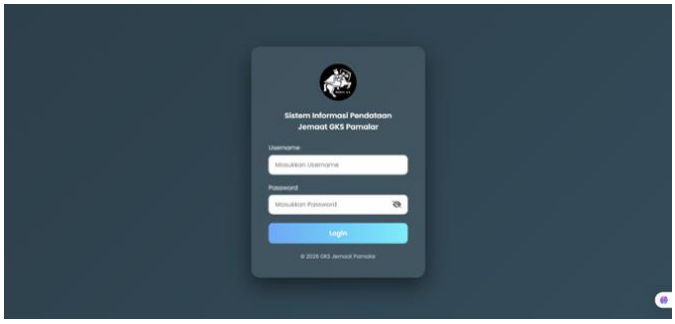

Fig. 2: Admin Login Interface

Figure 2 illustrates the login page used by administrators to access the Congregation Data Management Information System. Through this interface, administrators can enter their username and password to gain access to the system. When the entered credentials are valid, the system will direct the administrator to the dashboard page where congregation data can be monitored and managed. On the other hand, if the login attempt is unsuccessful, the system will provide an error notification indicating invalid login information and request the user to try logging in again.

2. Admin Dashboard Interface

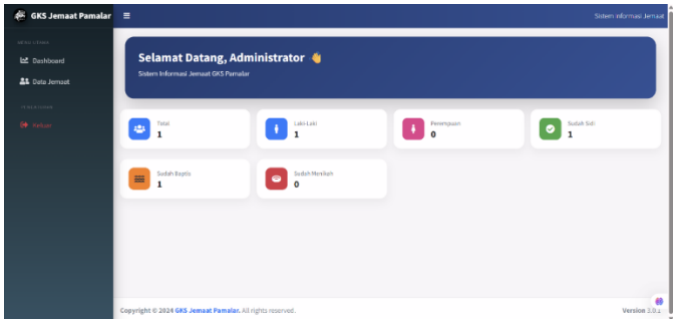

Fig. 3: Admin Dashboard Interface

Figure 3 presents the dashboard page displayed after the administrator successfully accesses the system. The left section of the interface contains several navigation menus such as Dashboard, Congregation Data, and Logout. Each menu serves different functions, where the Dashboard menu is used to return to the main page, the Congregation Data menu is intended for managing congregation information, and the Logout menu is used to end the session. In the main section of the page, statistical information related to congregation data is provided, including the total number of members, male and female members, confirmed members, baptized members, and marriage records.

3. Congregation Data Interface

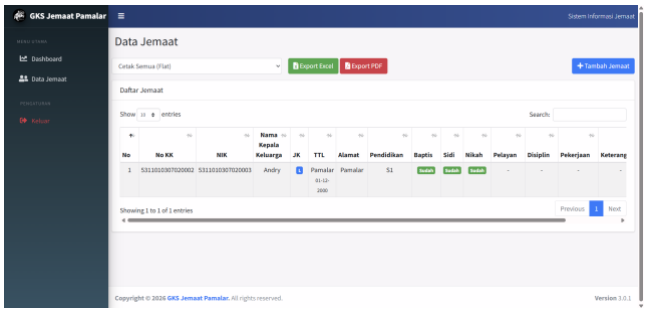

Fig. 4: Congregation Data Interface

Figure 4 illustrates the congregation data page used to present registered congregation information stored in the system. The displayed data includes Family Card Number, National Identity Number (NIK), member name, gender, place and date of birth, address, baptism status, confirmation status, marital status, ministry role, discipline status, occupation, and remarks. The page also provides several action buttons such as Member, Edit, and Delete, which allow administrators to manage the data efficiently. In addition, an Add button is available to input new congregation records into the system. Export features are also provided to download congregation data in Excel and PDF formats.

4. Add Congregation Data Interface

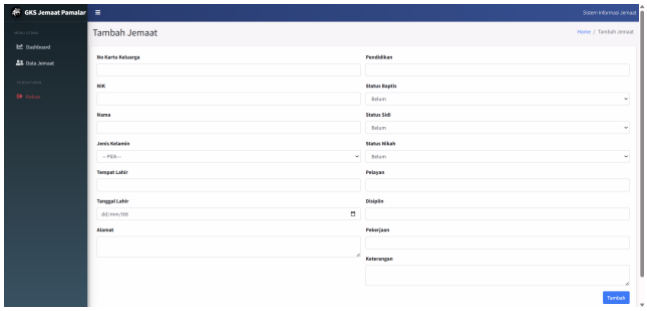

Fig. 5: Add Congregation Data Interface

Figure 5 demonstrates the interface used by administrators to add new congregation data into the system. The form contains several input fields, including Family Card Number, National Identity Number (NIK), member name, gender, place and date of birth, address, baptism information, confirmation status, marital status, ministry role, discipline status, occupation, and remarks. The baptism and confirmation sections are designed dynamically to adjust according to the selected status. For example, if the administrator selects the “Completed” option, an additional field for entering the confirmation date will appear automatically. Conversely, if the “Not Yet” option is selected, the additional field will remain hidden. After all required information has been entered correctly, the administrator can save the data using the Add button provided at the bottom of the page, and the stored information will subsequently appear in the congregation data list.

5. Edit Congregation Data Interface

Fig. 6: Edit Congregation Data Interface

Figure 6 displays the Edit Congregation Data page used by the Admin to modify or correct inappropriate congregation information. This page contains a form with input fields such as Family Card Number, National Identification Number (NIK), congregation member name, gender, place and date of birth, address, education, baptism status, confirmation status, marriage status, ministry role, discipline status, occupation, and remarks. Similar to the Add Data page, the Baptism and Confirmation status sections are dynamic. If the Admin selects the “Completed” status, additional fields for entering baptism or confirmation dates will appear. Otherwise, the date fields will remain hidden. All fields must be checked and completed correctly to ensure the updated congregation data matches

the actual condition. After the editing process is complete, the Admin can click the Edit button at the bottom of the page to save the changes into the database. The updated data will then be displayed again on the congregation data page.

6. Delete Congregation Data Interface

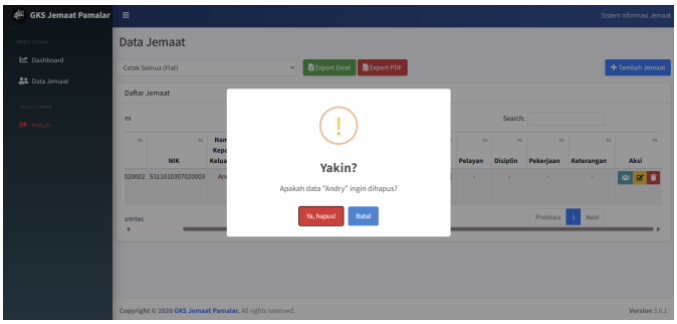

Fig. 7: Schedule Data Addition Interface

Figure 7 illustrates the interface used to remove congregation data from the system. Before the deletion process is completed, the system displays a confirmation dialog asking the administrator whether the selected data should be permanently deleted. If the administrator chooses the "Yes" option, the selected congregation record will be removed from the database. However, if the "No" option is selected, the deletion process will be canceled and the existing data will remain unchanged. This feature is implemented to minimize accidental data deletion and maintain data reliability within the system.

7. Member Data Interface

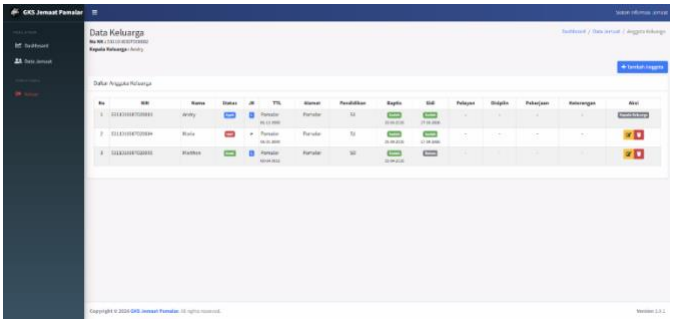

Fig. 8: Member Data Interface

Figure 8 presents the member data page, which is designed to display information related to registered congregation members. The page provides a table containing several data fields such as National Identity Number (NIK), member name, family status, gender, place and date of birth, address, educational background, baptism status, confirmation status, ministry role, discipline status, occupation, and remarks. In addition, action buttons such as Edit and Delete are available to assist administrators in managing member information. An Add button is also provided to enable administrators to insert new member data into the system easily.

8. Add Member Data Interface

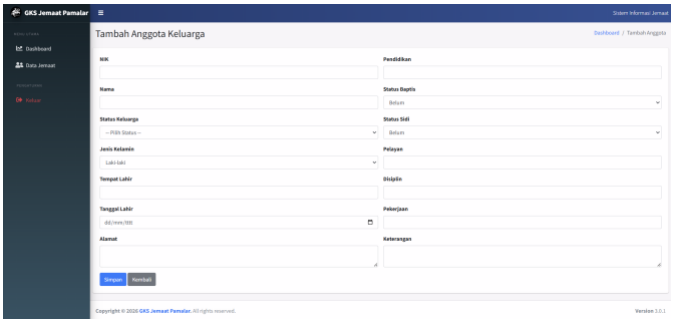

Fig. 9: Add Member Data Interface

Figure 9 demonstrates the form interface used for entering new member information into the system. The administrator is required to complete several input fields containing personal and congregation-related information. The form is designed to simplify the data entry process and ensure that the information entered is organized properly within the database. After all required data has been completed correctly, the administrator can save the information so that it becomes part of the member data records stored in the system.

9. Edit Member Data Interface

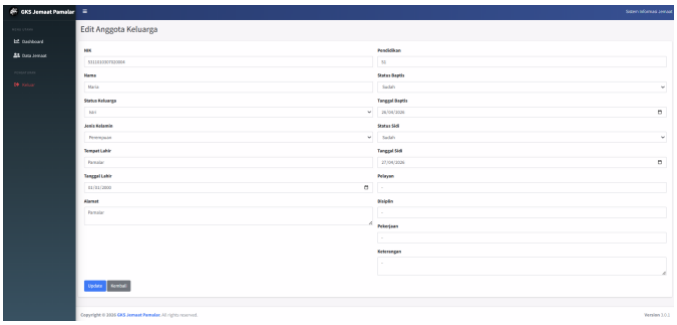

Fig. 10: Edit Member Data Interface

Figure 10 shows the Edit Member Data page used by the Admin to modify or correct inappropriate member information. The page provides a form with several input fields, including National Identification Number (NIK), member name, family status, gender, place and date of birth, address, education, baptism status, confirmation status, ministry role, discipline status, occupation, and remarks. The Baptism and Confirmation status sections are dynamic. If the Admin selects the "Completed" status, additional fields for entering baptism or confirmation dates will appear. Otherwise, if the "Not Yet" status is selected, the date input fields will remain hidden. All information on the form must be checked and completed correctly to ensure the updated member data matches the actual condition. After the editing process is completed, the Admin can click the Edit button at the bottom of the page to save the changes into the database. The updated data will then be displayed again on the member data page.

10. Delete Member Data Interface

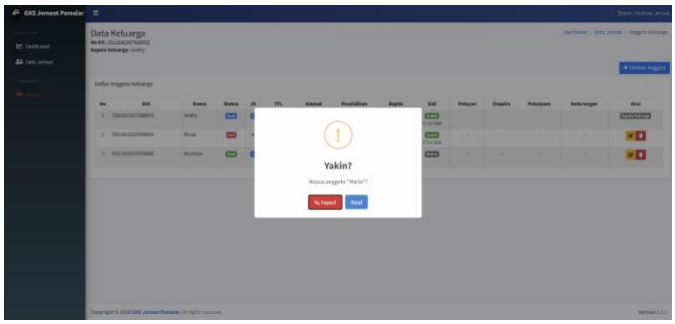

Fig. 11: Delete Member Data Interface

Figure 11 illustrates the interface used by administrators to delete member data that is no longer required in the system. Prior to removing the data, the system provides a confirmation dialog to ensure that the administrator intentionally performs the deletion action. If the administrator confirms the action by selecting the "Yes" option, the selected member record will be permanently removed from the database. Conversely, selecting the "No" option will cancel the deletion process and keep the data unchanged. This confirmation mechanism is implemented to reduce the possibility of unintended data removal and to maintain the integrity of member information stored in the system.

4.2. Testing

1. Testing Black Box

Testing of the Web-Based Congregation Data Management Information System at the Sumba Christian Church was performed using the Black Box Testing method. This testing approach was applied to evaluate whether each system feature and function operated according to the expected requirements. The results obtained from the testing process are presented in Table 1.

Table. 1: Testing Black Box

Tested Function	Testing Method	Expected Result	Test Result
Login	Enter a valid username and password	The user is successfully authenticated and redirected to the Admin Dashboard page	[✓] Successful
Login	Enter an incorrect username or password	The system displays an error message: "Incorrect username or password"	[✓] Successful
Display Congregation Data	Admin opens the congregation list page	The system displays the congregation data list	[✓] Successful
Add Congregation Data	Administrator completes all required fields and submits the form	The data is successfully added	[✓] Successful
Add Congregation Data	Admin leaves the add congregation form empty	The system generates a validation warning indicating that mandatory fields must be completed	[✓] Successful
Edit Congregation Data	Admin modifies existing congregation information	The congregation data is successfully updated	[✓] Successful
Delete Congregation Data	Admin deletes existing congregation data	The system successfully deletes the selected data	[✓] Successful
Display Member Data	Admin opens the member list page	The system displays the member data list	[✓] Successful
Add Member Data	Admin fills in all fields and clicks save	The data is successfully added	[✓] Successful

Add Member Data	Admin leaves the add member form empty	The system displays an error message: "This field is required"	[✓] Successful
Edit Member Data	Admin modifies existing member information	The member data is successfully updated	[✓] Successful
Delete Member Data	Admin deletes existing member data	The system successfully deletes the selected data	[✓] Successful
Logout	Admin clicks the logout button	The system logs out from the admin account and returns to the login page	[✓] Successful

Table 1 presents the outcomes of the Black Box Testing performed on the Web-Based Congregation Data Management Information System developed for the Sumba Christian Church. The testing results demonstrate that all system functions operated successfully in accordance with the expected behavior. Based on these findings, it can be concluded that the application functions properly and is capable of supporting user activities according to the designed system requirements.

2. SUS (System Usability Scale) Testing

The usability evaluation of the Web-Based Congregation Data Management Information System was carried out using the System Usability Scale (SUS) method. The assessment involved 10 respondents consisting of church council members from the Pamalar Congregation. Data collection was conducted through a questionnaire containing 10 assessment statements. The results obtained from the respondents are summarized in Table 2.

Table. 2: Respondents' Score Results

Respondent	Question									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
No***	5	2	4	3	5	1	5	1	3	3
Ye***	2	1	2	1	2	1	4	2	5	1
Ra***	5	2	5	4	5	2	4	1	5	4
Yu***	5	2	3	1	3	1	5	1	4	1
Ma***	4	4	5	4	5	1	4	3	5	2
Af***	3	1	3	1	5	1	5	1	5	1
Al***	5	2	4	1	4	2	5	2	4	2
Ah***	2	1	2	2	3	1	4	1	5	1
Sa***	5	1	4	3	5	2	5	2	4	3
Ag***	5	2	5	1	5	1	4	1	5	2

Table 2 presents the results of the testing conducted by 10 respondents through a questionnaire consisting of 10 statements. The SUS testing data was analyzed using the calculation procedures defined in the System Usability Scale (SUS) method.

Table. 3: SUS Score Analysis

Respondent	SUS Question										Total	SUS Score
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
No***	5	2	4	3	5	1	5	1	3	3	32	80
Ye***	2	1	2	1	2	1	4	2	5	1	29	72.5
Ra***	5	2	5	4	5	2	4	1	5	4	31	77.5
Yu***	5	2	3	1	3	1	5	1	4	1	34	85
Ma***	4	4	5	4	5	1	4	3	5	2	29	72.5
Af***	3	1	3	1	5	1	5	1	5	1	36	90
Al***	5	2	4	1	4	2	5	2	4	2	33	82.5
Ah***	2	1	2	2	3	1	4	1	5	1	30	75
Sa***	5	1	4	3	5	2	5	2	4	3	32	80
Ag***	5	2	5	1	5	1	4	1	5	2	37	92.5
Total												807.5

The total SUS score obtained from the 10 respondents was 807.5, as shown in Table 3. The average SUS score was then calculated using the following formula:

$$\bar{x} = \frac{807{,}5}{10} = 80{,}75 \quad (1)$$

Definition 1: Average SUS score

The calculation results indicate that the average SUS score reached 80.75. Based on this average score, the feasibility of the information system was determined according to the grading standards of the SUS method, as shown in Figure 4.11

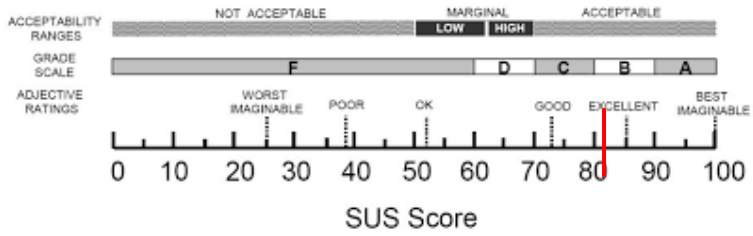

Fig. 12: SUS Score

The assessment of Acceptability Ranges, Grade Scale, and Adjective Rating was applied to evaluate user satisfaction toward the Web-Based Congregation Data Management Information System developed for the Sumba Christian Church. Based on the average SUS score of 80.75 obtained from respondents, the system can be categorized as "Acceptable." According to the Grade Scale classification, the application achieved a grade of "B," while the Adjective Rating categorized the system as "Excellent." These results indicate that users provided a highly positive evaluation of the developed system.

5. Conclusion

Based on the analysis, design, implementation, and testing processes that have been carried out, it can be concluded that the Web-Based Congregation Data Management Information System successfully assists the Sumba Christian Church in managing congregation data more effectively and efficiently. The system simplifies several administrative activities, including data entry, modification, deletion, and information retrieval, thereby reducing the difficulties previously encountered in manual data management processes. In addition, the developed system supports faster and more accurate access to congregation information, enabling church administrators to manage data in a more organized manner. The results of Black Box Testing demonstrated that all primary system functions operated properly and fulfilled the expected functional requirements. Features such as login, logout, data addition, editing, deletion, and searching were executed successfully during the testing process. Furthermore, usability evaluation using the System Usability Scale (SUS) method produced an average score of 80.75, indicating that the system achieved a good level of usability and user acceptance. Therefore, the developed application can be considered suitable for implementation in supporting church administration services, particularly within the Pamalar Congregation environment. It is expected that the implementation of this system will contribute to improving the effectiveness of congregation data management and assist decision-making processes through more structured and accurate information management.

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