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Design of a Web-Based Household Worship Scheduling Information System at GBI Wangga

Intan G. Lika Yanggu[1*], Pingky A. R. Leo Lede[2]

Program Studi Teknik Informatika, Universitas Kristen Wira Wacana Sumba
intangeovanilikay@gmail.com[1]*, pingky.leo.lede@unkriswina.ac.id[2]

Abstract

The rapid development of information technology has increased the need for effective information management in various organizations, including churches. At GBI Wangga, the scheduling of Household Fellowship Worship (PA) is still conducted manually through written records and verbal announcements, resulting in delays and uneven distribution of information among congregation members. This study aims to design and develop a web-based Household Fellowship Worship Scheduling Information System to facilitate schedule management and improve access to information. The system was developed using the Waterfall method, which includes requirements analysis, system design, implementation, and testing. The resulting system enables users to access worship schedules quickly and accurately through a web platform. It is expected to improve scheduling efficiency, reduce information delivery errors, and support better church services for the congregation.

Keywords: *Information System, Scheduling, Household Fellowship Worship, Web-Based, Waterfall*

1. Introduction

The rapid development of information technology has made information a primary necessity in an organization, including within church ministries. The utilization of information technology is expected to assist organizations in managing data and disseminating information quickly, accurately, and efficiently. One of the organizations that has begun utilizing information technology is Gereja Bethel Indonesia (GBI), particularly in supporting ministry activities for its congregation. As a place of worship for Christians, the church not only functions as a means of communicating with God but also serves as a venue for various religious activities such as Sunday School services, Youth Fellowship services, WBI (Women of Bethel Indonesia) services, and Household Fellowship Worship (PA). Household Fellowship Worship is one of the routine activities conducted every week and involves the active participation of congregation members in its implementation. However, in the scheduling of Household Fellowship Worship (PA) at GBI Wangga, the process of managing and disseminating schedules has not been carried out optimally. Worship schedule information is delivered through announcements during Sunday services, making the dissemination of information limited to specific times. This condition results in not all congregation members receiving complete schedule information, especially those who do not attend the service when the announcement is made.

In addition, the established worship schedules do not have a storage and dissemination medium that can be easily accessed again by congregation members. As a result, congregation members often experience difficulties in obtaining or confirming the worship schedules that have been determined. On the other hand, church elders are required to repeatedly convey the information to certain members, which reduces the efficiency of communication and coordination processes. These problems indicate that the current process of managing and disseminating household worship schedules still has limitations in terms of accessibility, effectiveness, and efficiency. This situation may also lead to the absence of congregation members from worship activities due to the lack of timely information. Based on the explanation above, a web-based information system is needed to assist in the management and dissemination of household worship schedules in a more structured, accessible, and timely manner for all congregation members. Therefore, this study is entitled “Design and Development of a Web-Based Household Worship Scheduling Information System at GBI Wangga” as a solution to improve the quality of church services provided to the congregation.

2.Research Methodology

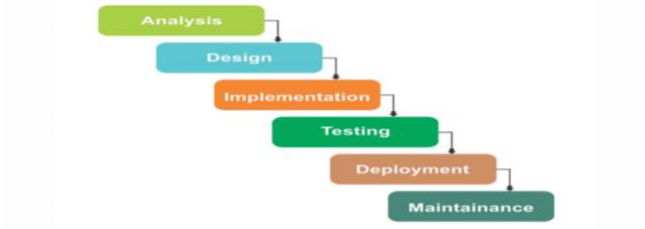

Fig. 1: Waterfall Method

1. Requirements Analysis, At this stage, data and information related to the system requirements are collected through observation, interviews, and literature studies. The purpose of this stage is to identify user needs, system functionalities, and problems that occur in the current scheduling process..
2. System Design, After the requirements have been identified, the system design is created. This stage includes designing the database structure, system architecture, user interface, and process flow diagrams. The design serves as a blueprint for system development.
3. Implementation, In this stage, the system design is translated into program code using appropriate programming languages and technologies. Each module and feature of the system is developed according to the design specifications.
4. Testing The developed system is tested to ensure that all functions operate correctly and meet the specified requirements. Testing is conducted to identify and correct errors, ensuring that the system performs as expected.
5. Maintenance After the system is implemented and used, maintenance activities are carried out. This stage includes fixing errors, updating system features, and improving system performance to ensure the system continues to function effectively according to user needs.

3. Results

3.1 System Design

Use Case

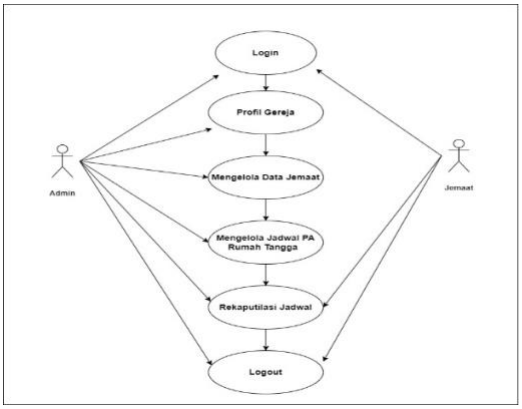

Fig. 2: Use Case

The use case diagram illustrates the interaction between two actors, namely the Admin and the Congregation Members, within the Household Bible Study (PA) Worship Scheduling Information System. The Admin has full access rights, starting from logging into the system, managing church profile information, managing congregation data, creating and organizing household PA schedules, viewing and printing schedule recapitulation reports, and finally logging out of the system. Meanwhile, congregation members have more limited access rights. They can log in to view church profile information, access the scheduled household PA worship schedules, and view the schedule recapitulation before logging out. This diagram demonstrates that the system is designed with a clear separation of access rights between the Admin as the data manager and the congregation members as information users, thereby making the scheduling process more structured, controlled, and transparent.

Activity Diagram

1. Congregation Data Activity Diagram

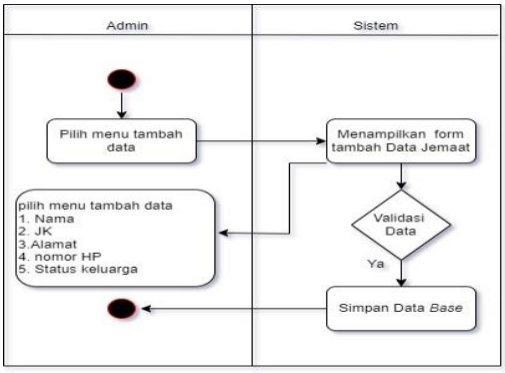

Fig. 3: Congregation Data Activity Diagram

Based on the activity diagram in Figure 3 above, the process of adding congregation data begins when the administrator (pastor/elder) selects the Add Congregation Data menu. The system then displays the congregation data entry form. The administrator is required to fill in the congregation's information, such as name, gender, address, phone number, and family status. After the data is entered, the system validates the information. If the data is complete, the system saves it to the database and displays the congregation data page. However, if the data is incomplete, the system returns to the Add Congregation Data form so that the administrator can complete the required information.

2. **Congregation Data Edit Activity Diagram**

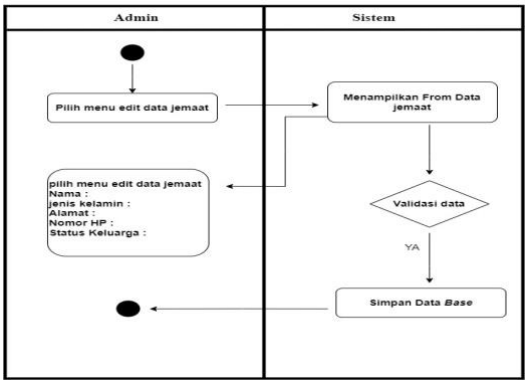

Fig. 4: Congregation Data Edit Activity Diagram

Based on the activity diagram in Figure 4 above, the process of editing congregation data begins when the administrator selects the Edit Congregation Data menu. The system then displays the congregation data form. From this form, the administrator can edit congregation information such as name, national identification number (NIK), gender, address, phone number, and family status. After the data has been updated, the system validates the entered information. If the data is complete, the system saves the changes to the database and displays the congregation data page. However, if the data is incomplete, the system returns to the Edit Congregation Data form so that the administrator can complete the required information.

3. Delete Congregation Data Activity Diagram

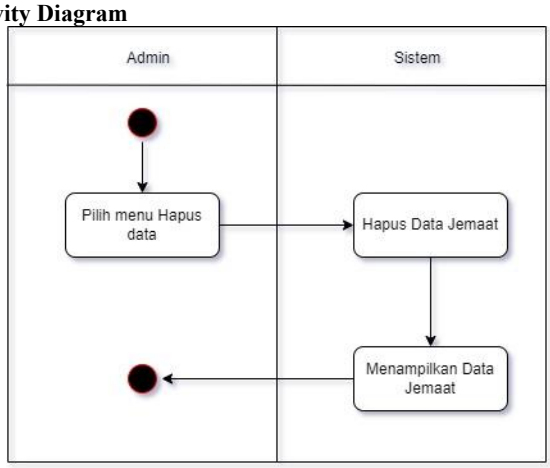

Fig. 5: Delete Congregation Data Activity Diagram

Based on the activity diagram in Figure 5 above, the process of deleting congregation data begins when the administrator selects the congregation data to be deleted. The system then processes the deletion of the selected congregation data from the database. After the data has been successfully deleted, the system displays the congregation data page.

4. Add Schedule Activity Diagram

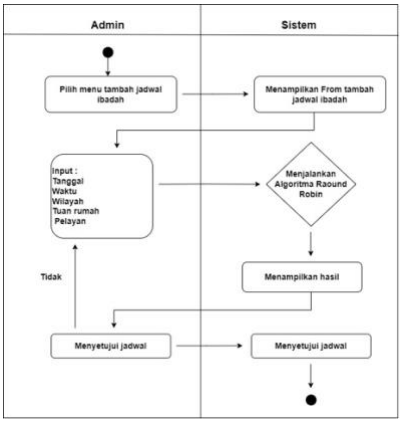

Fig. 6: Add Schedule Activity Diagram

Based on the activity diagram in Figure 6, the process of adding a household worship schedule involves interaction between the administrator and the system. The process begins when the administrator selects the Add Schedule menu, after which the system displays the Add Schedule form page. The administrator enters data such as the date, time, region, host, and assigned minister. After the data is entered, the system executes the Round Robin algorithm to organize the schedule rotation in a structured and fair manner, and then displays the generated schedule to the administrator. The administrator reviews the schedule and decides whether to approve it. If the schedule is

not approved, the process returns to the data input stage for corrections. However, if the schedule is approved, the system saves the schedule to the database, and the process ends.

5. Edit Schedule Activity Diagram

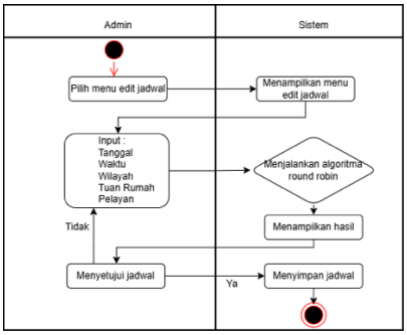

Fig. 7: Edit Schedule Activity Diagram

Based on the activity diagram in Figure 7, the process of editing a household worship schedule involves interaction between the administrator and the system. The process begins when the administrator selects the Edit Schedule menu, after which the system displays the Edit Schedule page containing the existing schedule data. The administrator modifies the schedule information, such as the date, time, region, host, and assigned minister. After the data is updated, the system executes the Round Robin algorithm again to adjust the rotation fairly and systematically, then displays the updated schedule to the administrator. The administrator reviews the revised schedule and decides whether to approve the changes. If the changes are not approved, the process returns to the data input stage for further revisions. However, if the changes are approved, the system saves the updated schedule to the database, and the process ends.

6. Delete Schedule Data Activity Diagram

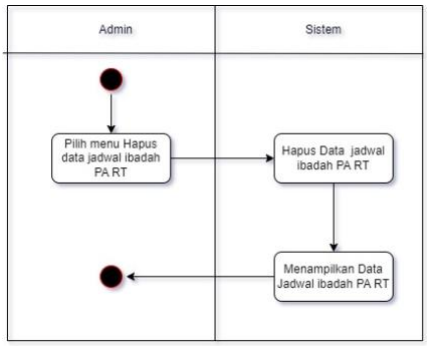

Fig. 8: Delete Schedule Data Activity Diagram

Based on the activity diagram in Figure 9 above, the process of deleting a household Bible Study (PA) worship schedule begins when the administrator selects the schedule data to be deleted. The system then processes the deletion of the selected worship schedule data from the database. After the schedule data has been successfully deleted, the system displays the household Bible Study (PA) worship schedule data page.

7. Schedule Recapitulation Activity Diagram

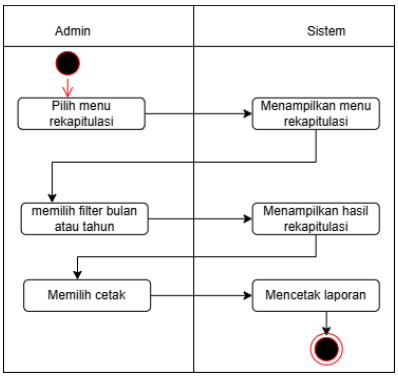

Fig. 9: Schedule Recapitulation Activity Diagram

Based on the activity diagram in Figure 9, the schedule recapitulation process involves interaction between the administrator and the system. The process begins when the administrator selects the Recapitulation menu, after which the system displays the recapitulation page containing the stored schedule data. The administrator then selects a filter based on a specific month or year to determine the period of data to be displayed. The system processes the selected filter and presents the recapitulation results accordingly. After the results are displayed, the administrator may choose the print option, and the system processes and generates the recapitulation report for printing. The process ends once the report has been successfully printed.

8. Class Diagram

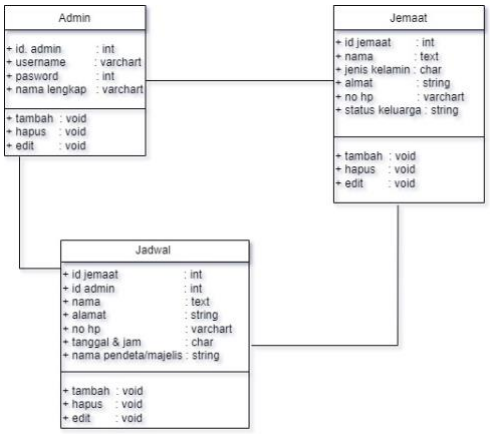

Fig. 10: Class Diagram

Figure 11 presents three main classes, namely Admin, Congregation Member, and Schedule, which are interconnected. The Admin class functions to manage the system, including adding, updating, and deleting congregation member data, as well as creating and organizing household Bible study schedules. The Congregation Member class stores information about church members who will be assigned service duties, including their identity and other supporting information. Meanwhile, the Schedule class contains worship scheduling data, such as the date, week number, and the congregation member assigned to serve. The relationships among these classes indicate that the Admin has access rights to manage both Congregation Member and Schedule data, while the Schedule class is associated with the Congregation Member class because each worship schedule is linked to a congregation member who is assigned a service role. With this structure, the system can manage scheduling in an organized and integrated manner.

3.2 Implementation

1. Login Page

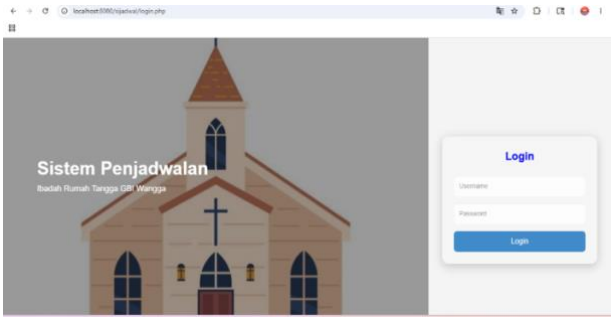

Fig. 12: Login Page

Figure 12 shows the login page of the GBI Wangga Household Worship Scheduling System. This page serves as an authentication gateway for users before they can access the system. On the left side of the page, a church illustration is displayed along with the application name, namely Scheduling System, and a description indicating Household Worship of GBI Wangga. Meanwhile, the right side contains a login form consisting of Username and Password fields, as well as a Login button used to process user authentication data. The page is designed with a simple and user-friendly interface, making it easier for administrators and users to log into the system according to their respective access rights.

2. Dashboard Page

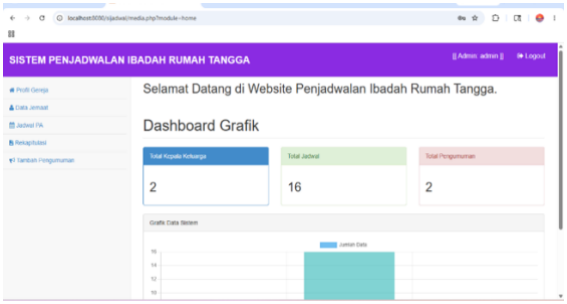

Fig. 13: Dashboard Page

Figure 13 displays the main page (dashboard) of the Household Worship Scheduling System after the user has successfully logged in. This page contains a navigation menu on the left side, consisting of Church Profile, Congregation Data, Bible Study Schedule, Recapitulation, and Add Announcement. The main section of the dashboard presents summary information, including the total number of households, the number of worship schedules that have been created, and the number of announcements available in the system. In addition, a graphical visualization is provided to present system data in a more accessible format, enabling administrators to monitor stored information

effectively. This dashboard serves as the central hub for data management and monitoring, allowing users to access various system features more easily and efficiently.

3. Church Profile Page

Fig. 14: Church Profile Page

Figure 14 displays the Church Profile page of the Household Worship Scheduling System. This page is used to store and present general information about the church that serves as the subject of system management. The information displayed includes the church name, church address, pastor's name, church vision, and church mission. In addition, the page also displays the church logo or image as a visual identity. An Edit button is provided, allowing the administrator to update the church profile information whenever changes occur. This page aims to provide complete and easily accessible church information for system users.

4. Congregation Data Page

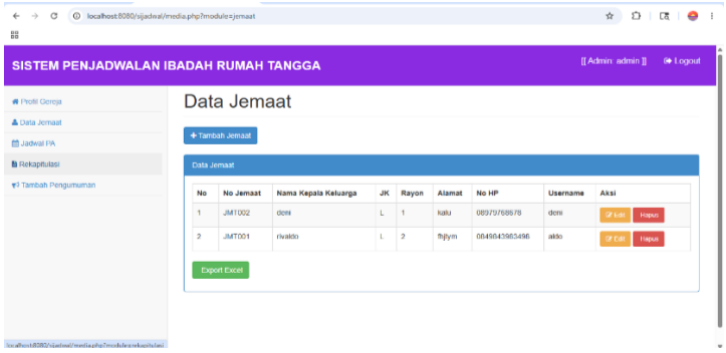

Fig. 15: Congregation Data Page

Figure 15 shows the Congregation Data page used to manage congregation data in the Household Worship Scheduling System. This page displays a list of congregation members in a table containing information such as congregation number, head of household name, gender, district (rayon), address, phone number, and username. Administrators can add new congregation data through the Add Congregation button, modify existing data through the Edit menu, and delete unnecessary records through the Delete menu. In addition, an Export Excel feature is available to export congregation data into Excel format, making data storage and reporting more convenient. This page assists administrators in managing congregation data in a more structured and efficient manner.

5. Worship Schedule Page

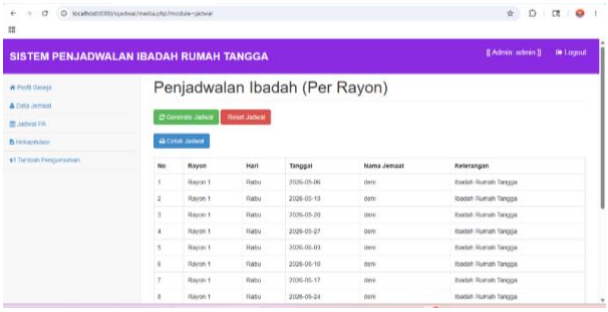

Fig. 16: Worship Schedule Page

Figure 16 shows the Worship Scheduling (Per District) page, which is used to manage and display household worship schedules based on districts (rayons). This page provides a Generate Schedule button for automatically creating schedules, a Reset Schedule button for deleting or resetting existing schedules, and a Print Schedule button for printing the scheduling results. The schedule data is displayed in a table containing information such as number, district, day of implementation, date, the name of the congregation member assigned for service, and activity description. This page assists administrators in organizing, managing, and distributing household worship schedules systematically, ensuring that worship activities are carried out according to the predetermined schedule.

6. Recapitulation Page

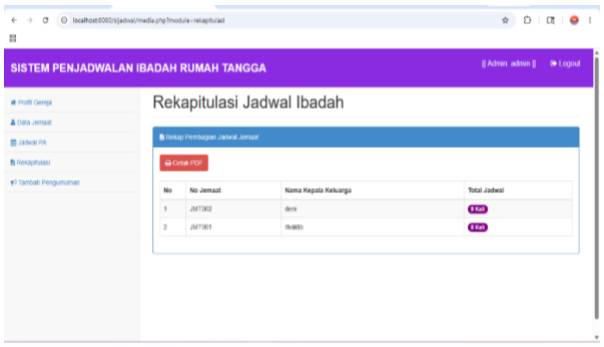

Fig. 17: Recapitulation Page

Figure 17 shows the Worship Schedule Recapitulation page, which is used to display a summary of household worship schedule allocations for each congregation member. On this page, data is presented in a table containing the congregation number, head of household name, and the total number of schedules assigned to each congregation member. This information is used to evaluate the fairness and distribution of worship schedules, ensuring that each congregation member receives an equal opportunity to serve. In addition, a Print PDF feature is available to generate recapitulation reports in PDF format, making documentation, storage, and report distribution more convenient. This page assists administrators in monitoring and evaluating the results of the worship scheduling process that has been carried out.

7. Announcement Page

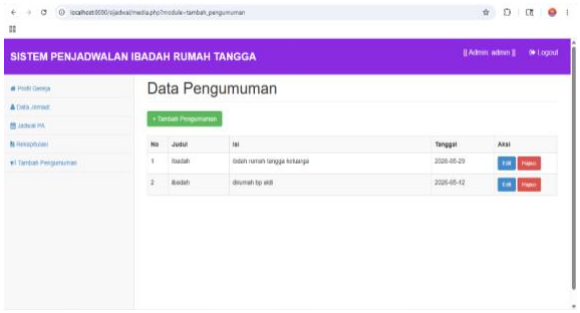

Fig. 18: Announcement Page

Figure 18 shows the Announcement Data page, which is used by administrators to manage information and notifications that will be delivered to congregation members. On this page, announcements are displayed in a table containing the announcement number, title, content, and publication date. In addition, an Add Announcement button is provided to allow administrators to add new information to the system. Each announcement record is also equipped with Edit and Delete buttons, enabling administrators to modify or remove data as needed. This page plays an important role in supporting effective information dissemination, ensuring that congregation members can receive the latest news and announcements related to church activities and household worship services.

8. Congregation Home Page

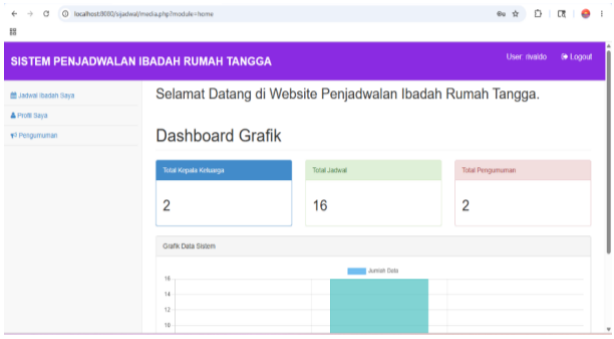

Fig. 19: Congregation Home Page

Figure 19 shows the dashboard page of the Household Worship Scheduling System, which serves as the main page after a user successfully logs in. This page displays summary information, including the number of households, the total number of worship schedules, and the number of announcements available in the system. In addition, a system data chart is provided to present information visually, making it easier for users to understand the status of the stored data. On the left side, a navigation menu is available, consisting of My Worship Schedule, My Profile, and Announcements, allowing users to access various system features conveniently. Meanwhile, the upper-right section displays the identity of the currently active user along with a logout button for exiting the system. This dashboard is designed to provide quick, easy, and organized access to important information.

9. Worship Schedule Page

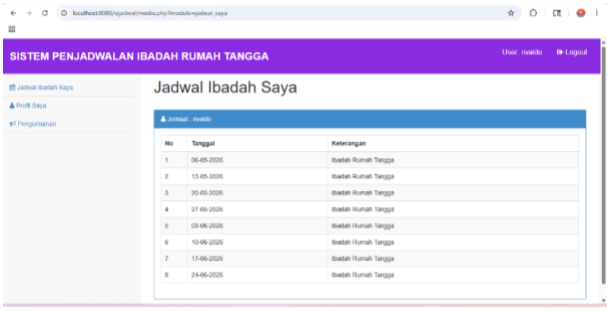

Fig. 20: Worship Schedule Page

Figure 20 shows the My Worship Schedule page, which is used to display the list of household worship schedules that have been arranged in the system. On this page, users can view schedule information in a table containing the sequence number, date of implementation, and description of the worship activity. The schedule data is presented in a structured manner, making it easier for users to identify upcoming worship activities. This page helps congregation members obtain worship schedule information quickly and accurately without the need for manual record-keeping. In addition, the navigation menu available on the left side can still be used to access the My Profile and Announcements pages according to the user's needs.

10. Congregation Profile Page

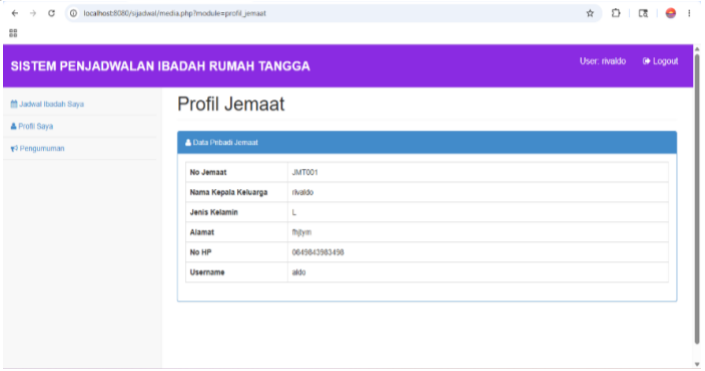

Fig. 21: Worship Schedule Page

Figure 21 shows the Congregation Profile page, which is used to display the personal information of users registered in the system. On this page, congregation data is presented in detail, including the congregation number, head of household name, gender, address, phone number, and username. This information is displayed in a table format, making it easy for users to read and understand. The profile page serves as a medium for viewing user identity information stored in the system database and ensuring that the data used in the worship scheduling process is accurate and up to date. In addition, users can still access the My Worship Schedule and Announcements pages through the navigation menu available on the left side of the page.

11. Announcement Page

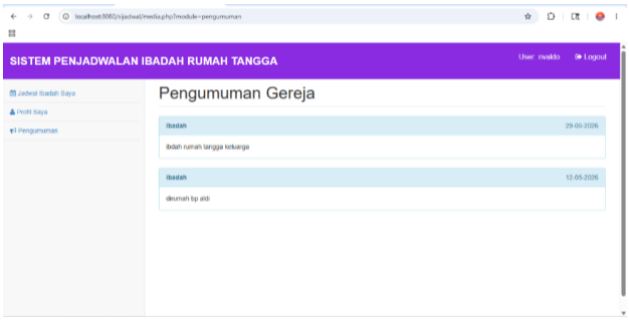

Fig. 22: Worship Schedule Page

Figure 22 shows the Church Announcements page, which is used to deliver various information and notifications to all congregation members who use the system. This page displays a list of announcements created by the system administrator, including the announcement title, content, and publication date. The information is presented in panel format, making it easier for users to read each available announcement. This feature serves as a communication medium between the church administration and congregation members for delivering information related to worship activities, worship locations, and other church agendas. With the announcement page, users can access the latest information quickly and centrally through the Household Worship Scheduling System.

3.3 Testing

1. Black Box Testing

The following are the results of Black Box testing conducted to ensure that each function in the Household Worship Scheduling System operates in accordance with the established requirements and specifications.

Table. 1: Black Box Testing

No	Test Scenario	Expected Result	Status
1	Login	The system successfully verifies the account and displays the dashboard page according to the user's access rights.	Successful
2	Church Profile	The system can display and update church profile data.	Successful
3	Congregation Data	The system can display, add, edit, and delete congregation data.	Successful
4	Schedule Data	The system can display, add, edit, and delete worship schedule data.	Successful
5	Recapitulation	The system can display and print recapitulation reports of worship schedule data.	Successful
6	Announcements (Admin)	The system can display, add, edit, and delete announcement data.	Successful
7	Congregation Profile	The system can display profile information of the currently logged-in congregation member.	Successful
8	My Worship Schedule	The system can display worship schedules assigned to congregation members.	Successful
9	Announcements (Congregation)	The system can display announcement information published by the administrator.	Successful

Based on the Black Box testing results presented in the table above, all functions within the Household Worship Scheduling System operated in accordance with the system requirements and design objectives. The testing was conducted on the main features, including login, church profile management, congregation data management, schedule data management, recapitulation reports, administrator announcements, congregation profiles, worship schedules, and congregation announcements. The test results indicate that each feature was able to accept inputs, process data, and generate outputs as expected without any functional errors. Therefore, it can be concluded that the system has successfully met user requirements and is ready to be utilized as an effective and integrated medium for managing and disseminating information related to household worship scheduling.

4. Conclusion

Based on the results of the testing that has been conducted, it can be concluded that the Household Worship Scheduling System has successfully achieved the research objectives that were established. The Black Box testing results demonstrate that all system features, including login, church profile management, congregation data management, schedule management, recapitulation reports, announcements, congregation profiles, and worship schedules, function in accordance with the specified requirements and design specifications. Furthermore, the usability testing conducted using the System Usability Scale (SUS) method obtained a score of 87.5, which falls into the Excellent, Grade A, and Acceptable categories. This indicates that the system possesses a very high level of usability and is well accepted by users. Therefore, the Household Worship Scheduling System is considered suitable for implementation as an effective, efficient, and integrated platform for managing worship schedules and disseminating church-related information. In addition, the system is capable of improving the accessibility of information for both congregation members and church administrators.

References

[1.] Abdulghani, T., & Solehudin, T. (2018). Sistem informasi pengelolaan administratif badan usaha milik desa (BUMDes) berbasis client-server studi kasus di Desa Sindangasih Kecamatan Karangtengah. *SANTIKA: Jurnal Ilmiah Sains dan Teknologi*, 8(2), 241–254.

[2.] Alex, A., Pekuwali, A. A., & Lede, P. A. R. L. (2022). Implementasi sistem informasi penjadwalan ibadah dan pengelolaan keuangan berbasis website (Studi kasus: GKS Jemaat Padadita). *Jurnal Inovatif*, 1(3), 177–186.

[3.] Alim, F. (2012). Penerapan UML dalam pengembangan sistem perangkat lunak. *Jurnal Ilmu Komputer dan Teknologi*, 8(2), 28–35.

[4.] Arianti, T., Fa'izi, A., Adam, S., & Wulandari, M. (2022). Perancangan sistem informasi perpustakaan menggunakan diagram UML (Unified Modelling Language). *Jurnal Ilmiah Komputer*, 1(1), 19–25.

[5.] Arifin, M., & HS, R. H. H. (2017). Perancangan sistem informasi pusat karir sebagai upaya meningkatkan relevansi antara lulusan dengan dunia kerja menggunakan UML. *IC-Tech*, 12(2), 42–49.

[6.] Gumolung, S. (2020). Analisa teknologi Hyper Text Markup Language (HTML) versi 5. *Jurnal Teknologi Komputer*, 7(3), 44–50.

[7.] Gunawan, E. (2020). Jurnal teknik informatika mahakarya. *Jurnal Teknik Informatika Mahakarya*, 12(1), 58–65.

[8.] Hartono, R., & Saputra, A. (2021). Sistem informasi manajemen badan usaha milik desa terintegrasi. *Jurnal Teknologi dan Manajemen Sistem Informasi*, 11(1), 22–30.