

## WEB-BASED CHURCH WORSHIP SERVICE INFORMATION SYSTEM USING THE SPIRAL MODEL: A CASE STUDY OF GKPI AIR BERSIH

Wijaya Sipahutar<sup>\*1</sup>, Fahrul Rozi Lubis<sup>2</sup>

<sup>1,2</sup>Sistem Informasi, Fakultas Teknik dan Komputer, Universitas Harapan Medan, Medan, Indonesia

Email: [1haya13sipahutar@gmail.com](mailto:1haya13sipahutar@gmail.com), [2fachrul\\_rozi.unhar@harapan.ac.id](mailto:2fachrul_rozi.unhar@harapan.ac.id)

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### Abstract

The church as a religious institution requires effective management to support worship activities, congregation administration, and financial accountability in complex organizational and technological environments today. At GKPI Air Bersih Church, manual recording practices cause data inaccuracies, reporting delays, limited information access, and difficulties in monitoring congregation finances across sectors effectively. This study aims to design and implement a web-based church worship service management information system using the Spiral development model for integrated digital administration. The research employs a system development methodology involving requirement analysis, iterative design, implementation, evaluation, and continuous user feedback throughout multiple development cycles within the church environment. Data were collected through observation, interviews, and document analysis to identify operational needs, workflow limitations, and technical risks within the church context during system planning. The developed system integrates congregation management, worship scheduling, church bulletins, financial transactions, reporting, user management, and website configuration modules into a single centralized web platform. System evaluation using user acceptance testing indicates improved administrative efficiency, higher data accuracy, and increased transparency compared to manual processes previously used by church administrators. Real-time dashboards, automated calculations, and reporting features support informed decision-making, strengthen accountability, and enhance service quality for administrators and congregation stakeholders effectively overall. The application of the Spiral model enables adaptive development, risk mitigation, usability improvement, and alignment between system functionality and user requirements through iterative evaluation cycles. This research demonstrates the effectiveness of web-based information systems in supporting digital transformation within religious institutions and community organizations with limited technical resources available.

**Keywords:** information system; church management; spiral model; web-based system; congregation management.

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### 1. INTRODUCTION

The church is a religious institution that plays an important role in nurturing faith, teaching religious values, and shaping the character of its congregation. GKPI Air Bersih Church, as part of the Protestant Christian community in Indonesia, carries out these functions through various worship activities, social services, and spiritual development programs involving all members of the congregation, including children, youth, adults, and the elderly. These activities not only strengthen faith but also foster closer relationships among congregants and build social solidarity in daily life [1].

In fulfilling its role, the church requires effective service management to ensure that all activities are carried out efficiently and effectively. Church service management includes planning, organizing, implementing, and evaluating activities, as well as managing human resources, finances, and facilities. Proper management enables the church to improve the quality of its services to the congregation and achieve its mission optimally [2].

However, at GKPI Air Bersih Church, the process of recording member contributions from 13 congregation sectors, along with the recording of income and expenditure information, is still conducted manually [3]. This condition often leads to various problems, such as delays in data recording, the risk of data loss, calculation errors, and difficulties in preparing accurate financial reports. In addition, church administrators experience challenges in monitoring and controlling financial flows from each sector in real time. As a solution to these issues, the development of a web-based church worship service management information system is considered an appropriate alternative for implementation. This system is expected to simplify the data recording process, improve data accuracy, accelerate access to information, and assist administrators in preparing financial reports in a transparent and accountable manner. Consequently, church services can be enhanced, and congregational trust in church management can be better maintained [4]. In developing this web-based church worship service management

information system, the Spiral model is applied as an adaptive and iterative development approach. The Spiral model combines the systematic nature of the waterfall model with the flexibility of prototyping. The development stages begin with requirement identification and planning, during which system requirements from the church are collected and analyzed [5]–[7]. This is followed by risk analysis and the evaluation of alternative solutions to mitigate potential issues during development. Subsequently, system prototypes are developed and tested incrementally and then evaluated collaboratively with users, including church administrators and congregation representatives. User feedback is utilized to refine the system in subsequent iterations.

Previous studies have also addressed similar topics. Research conducted by [8] successfully developed and implemented a web-based information system to support administrative services at GKE Sion Church in Palangkaraya. The implementation of the system significantly improved the speed, efficiency, and accuracy of congregation data management, financial recording, and activity report preparation. Furthermore, another study by [9] identified that congregation data management at GITJ Pati Church was still performed manually using books, which posed risks of data loss, difficulty in data retrieval, and inefficiencies in information dissemination. The results of that study indicated that a website-based information system could enhance the effectiveness of congregation data management, accelerate access to information, and facilitate online registration for church services such as catechism, baptism, and marriage.

The purpose of this study is to design and develop a web-based church worship service management information system for GKPI Air Bersih Church using the Spiral development model. This research aims to improve the effectiveness and efficiency of managing congregation data, worship activities, and financial administration by transforming manual processes into an integrated digital system. In addition, the study seeks to evaluate the application of the Spiral model in accommodating user requirements through iterative development, risk analysis, and continuous feedback from church administrators. The implementation of this system is expected to enhance data accuracy, transparency, and accessibility, thereby supporting better decision-making and improving the overall quality of church service management [2], [9], [10].

## 2. RESEARCH METHOD

### 2.1. Research Design

This study employs a system development research approach aimed at designing and implementing a web-based church worship service management information system. The research focuses on analyzing existing problems in church service management and proposing a technological solution through systematic system development. The Spiral model is adopted as the primary development framework due to its iterative nature, which allows continuous refinement of system requirements based on user feedback and risk evaluation throughout the development process [11], [12].

### 2.2. Data Collection Methods

Data collection was conducted to identify system requirements and understand existing workflows at GKPI Air Bersih Church. Several techniques were applied, including direct observation of administrative and financial management processes, interviews with church administrators and finance officers, and document analysis of existing records such as congregation data, financial reports, and service schedules. These methods ensured that the developed system accurately reflects real operational needs and constraints within the church environment [8].

### 2.3. System Development Method (Spiral Model)

The system was developed using the Spiral model, which integrates structured development stages with iterative evaluation and risk management. Each development cycle consists of requirement analysis and planning, risk analysis, system design and implementation, and user evaluation. During the planning phase, system requirements were defined based on collected data. Risk analysis was conducted to identify potential technical and operational issues, such as data security and user adaptation. Subsequently, system prototypes were developed and tested incrementally. Each prototype was evaluated by church administrators, and feedback was incorporated into subsequent iterations to enhance system functionality and usability [13].

### 2.4. System Implementation

The implementation phase involved deploying the finalized web-based system in the operational environment of GKPI Air Bersih Church. The system includes core modules such as congregation management, worship activity scheduling, financial management, reporting, and user management. Access control mechanisms were implemented to ensure data security based on user roles. The system was tested using real data to validate functionality, data accuracy, and system reliability before full deployment [14].

### 2.5. System Evaluation

System evaluation was conducted to assess usability, functionality, and performance. User acceptance testing was performed by church administrators to verify whether the system met operational requirements. Evaluation criteria included ease of use, data processing accuracy, reporting efficiency, and system responsiveness. The results indicate that the system effectively supports church service management activities and improves administrative efficiency compared to the previous manual approach [15].

## 2.6. Research Flow

The research flow consists of problem identification, data collection, system requirement analysis, system development using the Spiral model, system implementation, and system evaluation. This structured workflow ensures that the research objectives are achieved systematically and that the developed system aligns with both technical standards and user expectations [16].

## 3. RESULTS AND DISCUSSION

### 3.1. System Implementation Results

This subsection presents the implementation results of the developed web-based church worship service management information system. The system was designed to support administrative, financial, and service-related activities at GKPI Air Bersih Church. The following interfaces demonstrate the main functionalities of the system.

#### 1. Login Page

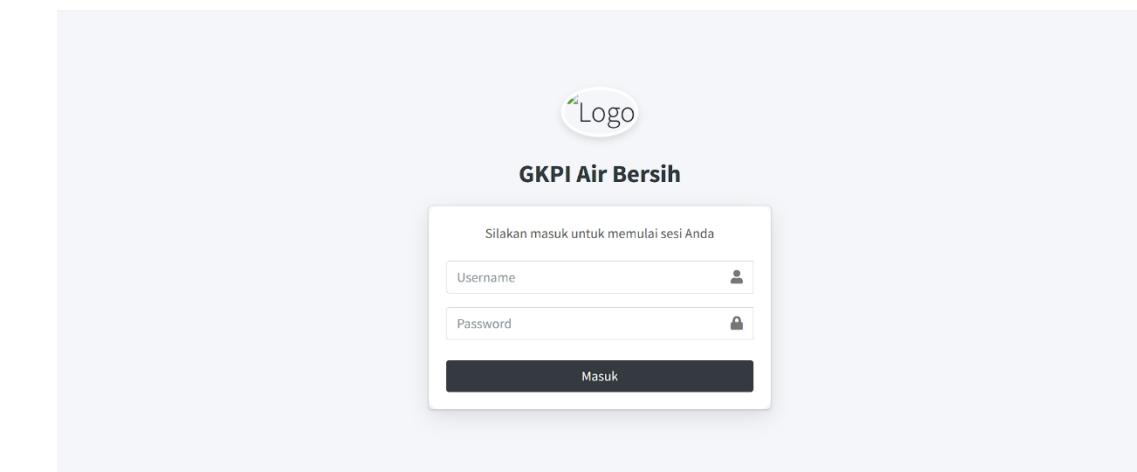


Figure 1. Login Page

#### 2. Dashboard Page

The dashboard page functions as the central information hub that presents a summary of key data within the system. On this page, users can view the total number of congregation members, total income, total expenditure, and the final balance in real time. In addition, the dashboard is equipped with monthly financial graphs that display a comparison between income and expenditure, making it easier to monitor the church's financial condition. Congregation data composition is also provided as an additional visualization for internal analysis.



Figure 2. Dashboard Page

### 3. Congregation Management Page

The Congregation Management page is designed to manage data for all members of GKPI Air Bersih Church. On this page, users can add new congregation data and view or manage information such as full name, gender, address, phone number, and membership status. Search and sorting features are also available to facilitate easier data retrieval. All displayed data can be edited or deleted as needed, allowing administrators to maintain accurate and up-to-date congregation records.

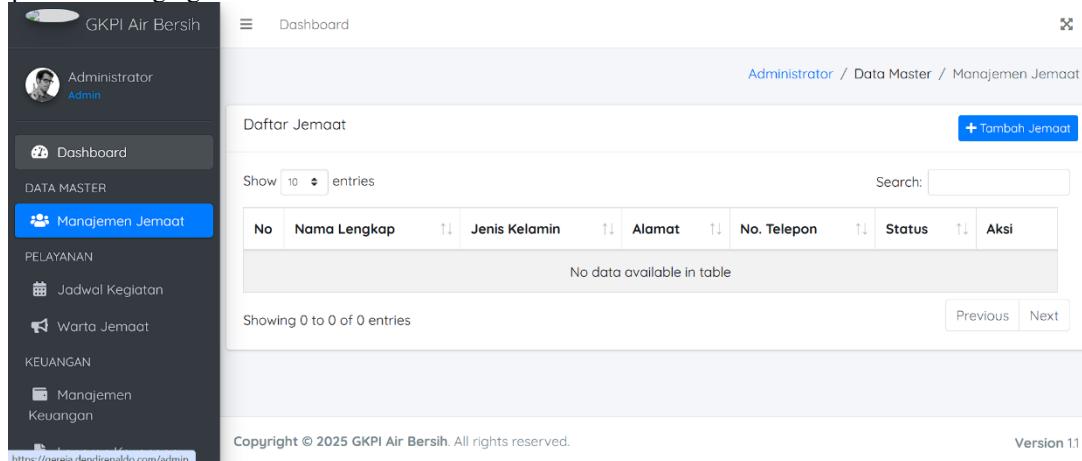


Figure 3. Congregation Management Page

### 4. Activity Schedule Page

The Activity Schedule page is used to record and display a list of church service activities that have been planned. Each activity entry includes information such as activity name, activity type (e.g., Sunday Worship), date and time of implementation, and location. Administrators can add new activities using the “Add Activity” button and can edit or delete existing entries as required.

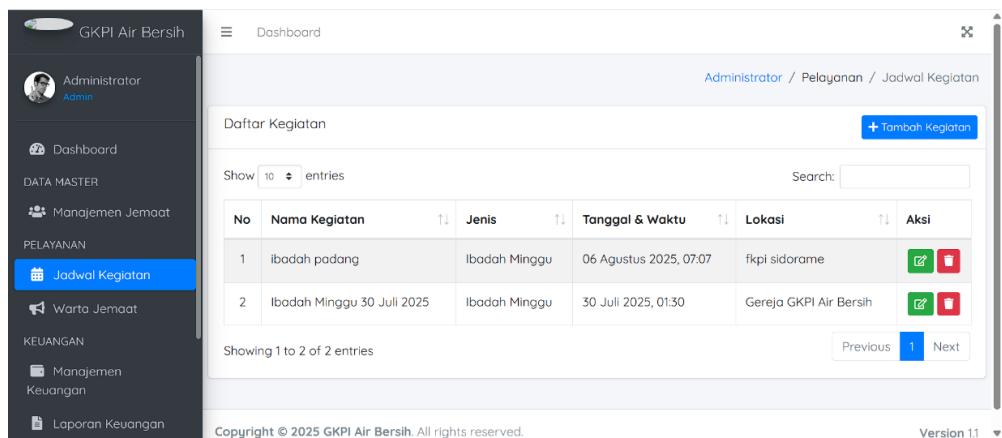


Figure 4. Activity Schedule Page

##### 5. Church Bulletin Page

The Church Bulletin page functions to manage information or announcements that will be shared with the congregation, such as devotionals, worship schedules, or other important notices. Each bulletin entry displays the title, publication date, and the name of the user who created it. Administrators can add new bulletins using the “Create New Bulletin” button and can edit or delete existing entries through the action menu.

No	Judul	Tanggal Publikasi	Dibuat Oleh	Aksi
1	Mengapa kita Harus Taat Beribadah	30 Juli 2025	Administrator	

Showing 1 to 1 of 1 entries

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Figure 5. Church Bulletin Page

##### 6. Financial Management Page

The Financial Management page is used to record and manage all financial transactions occurring within the church environment. Each transaction record is displayed systematically, including the transaction date, category, transaction type (income or expenditure), transaction amount, and the user who recorded the transaction. Administrators can add new transactions by selecting the “Add Transaction” button and can edit or delete transaction data through the action menu.

No	Tanggal	Kategori	Jenis	Jumlah	Dibuat Oleh	Aksi
1	30 Juli 2025	Iuran	Pemasukan	+ Rp 1.500.000	Administrator	
2	30 Juli 2025	Perbaiki AC	Pengeluaran	- Rp 750.000	Administrator	

Showing 1 to 2 of 2 entries

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Figure 6. Financial Management Page

##### 7. Financial Report Page

The Financial Report page presents a recap of financial transactions based on a user-defined date range. A date filter feature is provided to display income and expenditure data within a specific period. The data are presented in two main columns: Income Categories and Expenditure Categories, each accompanied by total amounts. At the bottom of the page, the system automatically calculates and displays the final balance as the difference between total income and total expenditure. In addition, a “Print PDF” button is available to generate reports in a downloadable or printable document format.

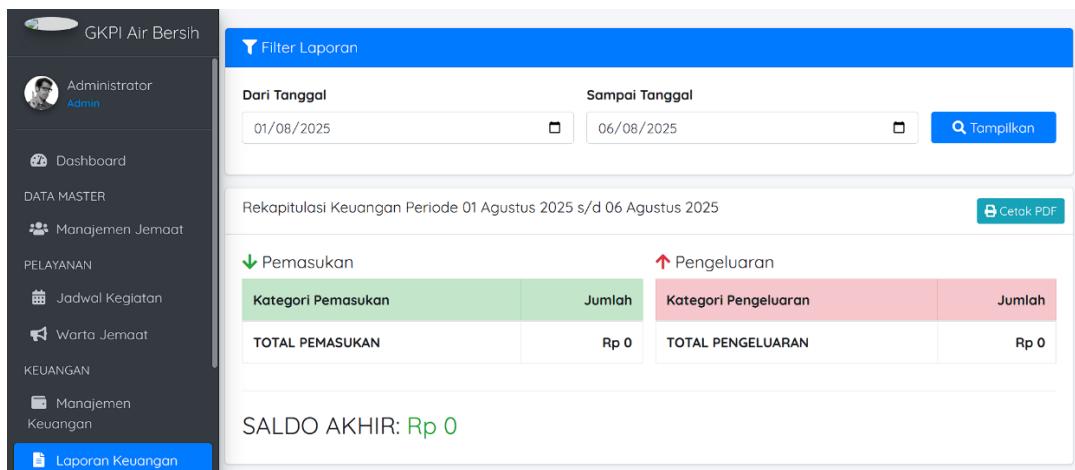


Figure 7. Financial Report Page

#### 8. User Management Page

The User Management page is designed to manage system user accounts. It displays a list of users along with information such as full name, username, and assigned role (e.g., Administrator or Staff). Administrators have the authority to add new users using the “Add User” button and can perform edit or delete actions on registered users.

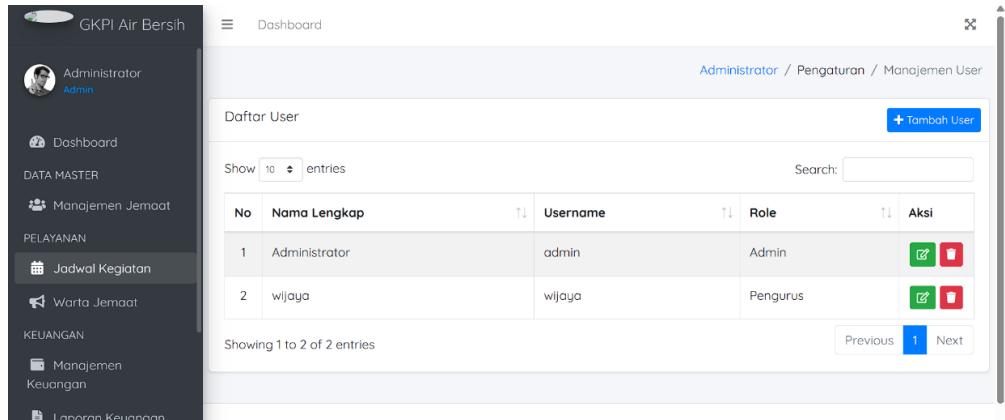


Figure 9. User Management Page

#### 9. Website Settings Page

The Website Settings page is used to manage basic system display information, such as the website name, logo, and icon. Administrators can modify the system name as required and upload new logo and icon files in supported formats such as JPG or PNG (for logos) and ICO or PNG (for icons). If no changes are needed, the file fields may be left empty. After configuring the settings, administrators can save the changes by selecting the “Save Changes” button.

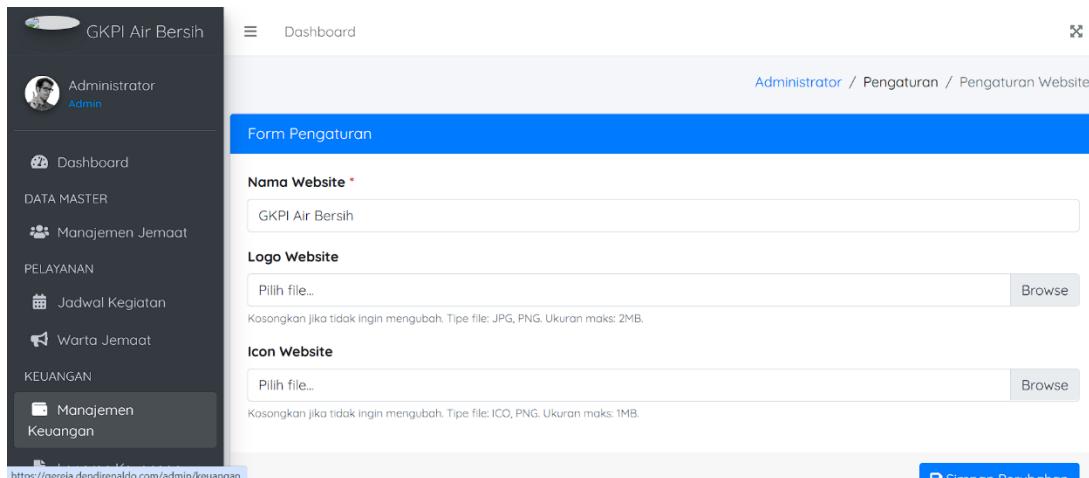


Figure 10. Website Settings Page

### **3.2. Discussion**

The implementation of the web-based church worship service management information system at GKPI Air Bersih Church demonstrates a significant improvement in the effectiveness and efficiency of church administrative and service management processes. Prior to system implementation, most administrative activities, particularly congregation data recording and financial management, were conducted manually. This manual approach was prone to data redundancy, recording delays, calculation errors, and limited accessibility of information. The developed system addresses these challenges by integrating all core service components into a centralized and digital platform.

From an administrative perspective, the congregation management module enables systematic data storage and retrieval, ensuring data accuracy and consistency. The availability of search and sorting features allows administrators to access congregation information more efficiently compared to manual record-keeping. This improvement supports better planning of worship services and pastoral activities, as accurate and up-to-date congregation data can be accessed in real time. Compared with previous manual methods, the system reduces the risk of data loss and minimizes administrative workload.

In terms of financial management, the system provides structured recording of income and expenditure transactions, categorized according to church financial needs. The real-time financial dashboard and automated balance calculation improve transparency and accountability in church financial administration. Church administrators can monitor financial conditions more effectively and identify financial trends through graphical visualizations. This aligns with prior studies that emphasize the role of information systems in improving financial accuracy and reporting efficiency within religious organizations.

The activity scheduling and church bulletin modules enhance internal communication and coordination among church administrators. By centralizing activity schedules and announcements within the system, information dissemination becomes more organized and consistent. This reduces miscommunication and ensures that all administrators have access to the same updated information. Furthermore, the digital bulletin feature supports timely publication of announcements and worship-related information, contributing to improved engagement between church management and the congregation.

The application of the Spiral development model plays a critical role in the successful implementation of the system. The iterative nature of the Spiral model allows continuous refinement of system features based on user feedback and risk analysis. Involving church administrators in each development cycle ensures that the system aligns closely with actual operational needs. This approach also mitigates development risks, such as user resistance and usability issues, which are common challenges in information system adoption.

Usability evaluation indicates that the system interface is intuitive and user-friendly, even for users with limited technical backgrounds. The simple navigation structure and clear feature segmentation support efficient system use and reduce the learning curve for church staff. This finding confirms that user-centered design is essential for the successful adoption of information systems in non-technical organizational environments.

Overall, the developed system not only enhances administrative efficiency but also supports better decision-making through accurate and timely information. Compared to previous studies on church information systems, this research contributes by demonstrating the effectiveness of the Spiral model in developing adaptable and user-oriented systems for religious institutions. The system provides a practical digital transformation solution that promotes transparency, accountability, and service quality in church worship management.

## **4. CONCLUSION**

This study successfully designed and implemented a web-based church worship service management information system at GKPI Air Bersih Church using the Spiral development model. The developed system effectively addresses the limitations of manual administrative and financial management by providing an integrated digital platform for congregation data management, worship activity scheduling, financial transactions, reporting, and user management.

The application of the Spiral model proved to be suitable for this research, as its iterative and risk-driven approach enabled continuous system refinement based on user feedback and operational needs. This development method contributed to improved system usability, reduced development risks, and better alignment between system functionality and real-world church management processes.

The implementation results demonstrate that the system enhances administrative efficiency, improves data accuracy, and increases transparency in financial management. Real-time access to information and automated reporting features support informed decision-making by church administrators and strengthen accountability to the congregation. Overall, the system provides a practical solution for modernizing church service management and supports the digital transformation of religious institutions.

Future research may focus on expanding system functionality, such as integrating mobile access, data analytics, or congregation-facing features, to further enhance service delivery and user engagement.

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