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# Development of a Web-Based Liturgical Presentation System with Quick Switch and QR Code Using R&D Method

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**Abstract:** Church worship services require a system that can assist in organizing and presenting worship materials in a structured manner so that congregants can follow the service effectively. However, the conventional presentation of liturgy, Bible verses, and songs creates challenges in material management, slide transition flexibility, and limited access for congregants. This study aims to design and implement a web-based liturgical presentation system to improve efficiency and flexibility in managing and delivering worship materials in a single church, namely GMIM Kanaan Likupang Dua. The research employs the Research and Development (R&D) method, which includes requirement analysis, system design using Unified Modeling Language (UML), development, testing, and evaluation. The system is developed using PHP with the Yii Framework 2 and MySQL database, implementing the Model-View-Controller (MVC) architecture. The main features include liturgy management, web-based presentation, a Quick Switch feature for rapid content changes, and QR Code integration that enables congregants to access presentation content through personal devices. Black Box Testing results indicate that all system functions operate properly. Furthermore, User Acceptance Testing (UAT) shows a high level of user acceptance, with 98.75% from multimedia staff and 88.86% from congregants. Therefore, the developed system is considered feasible and effective in supporting more structured, responsive, and inclusive worship services.
**Keywords:** Liturgy Presentation, Quick Switch, QR Code, Framework, Web-Based System.

## 1. INTRODUCTION

The utilization of digital media has become an integral part of church ministry in the modern era. Digital transformation provides opportunities for churches to expand the reach of ministry, deliver messages more effectively, and present worship services in a more interactive manner through visual technology [1], [2]. Multimedia is no longer merely a supporting tool but has evolved into an interactive medium that enhances communication and increases congregational participation during worship services [3]. In addition, web-based systems enable flexibility and accessibility in delivering information, as they can be accessed through various devices without requiring additional installation [4].

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However, the implementation of multimedia presentations in churches still faces several challenges. In many cases, including at GMIM Kanaan Likupang Dua, multimedia staff rely on multiple separate applications such as PowerPoint and other tools to present liturgy, Bible verses, and songs. This lack of system integration results in inefficiencies, delays in slide transitions, and increased potential for operational errors. Furthermore, sudden requests during worship, such as displaying Bible verses, still require manual processes that reduce system responsiveness and disrupt the flow of worship [5]. These conditions indicate that the current system is not yet able to support real-time changes that often occur during worship activities.

Another issue is the limited accessibility of worship materials for congregants. Most congregants depend solely on projector screens, making it difficult for those seated far from the screen or with visual limitations, particularly elderly individuals, to follow the worship content clearly. This condition reduces inclusivity and limits active participation in worship services [3]. In addition, the absence of alternative access media indicates that the current system has not been able to provide flexible and equitable access for all congregants. Digital Bible technology also supports more flexible and accessible access to scripture content in modern worship practices [6].

Previous studies indicate that multimedia technology can improve congregational engagement, especially among digitally oriented users [3]. In addition, web-based presentation systems have been developed to support structured and dynamic content delivery [7], [8]. Furthermore, QR Code technology has been proven to provide fast, efficient, and practical access to information, as it allows users to access digital content instantly through scanning without manual input [9], [10]. This technology can improve accessibility and reduce dependence on a single display medium.

However, previous studies have not explicitly addressed the integration of a web-based liturgical presentation system that combines real-time slide control through a Quick Switch feature with QR Code technology for simultaneous congregational access within a single platform. Most existing systems tend to focus only on presentation delivery or multimedia usage without providing a unified solution that supports real-time responsiveness and accessibility. This limitation indicates a clear research gap in developing an integrated system that can effectively handle dynamic worship conditions.

Therefore, this study proposes a web-based liturgical presentation system that integrates Quick Switch and QR Code features as a solution to overcome these limitations. The Quick Switch feature enables rapid and real-time slide transitions, while QR Code technology allows congregants to access worship content directly through their personal devices. This approach provides a more efficient, flexible, and inclusive solution compared to existing systems.

Based on these problems, this study aims to develop a web-based liturgical presentation system with Quick Switch and QR Code features using the Research and Development (R&D) method [11]. The proposed system is expected to improve efficiency, flexibility, and accessibility, as well as support more structured, responsive, and inclusive worship services.

# 2. RESEARCH METHODOLOGY

This study employs the Research and Development (R&D) method to develop a web-based liturgical presentation system. The R&D approach is selected because it focuses on producing a functional system and evaluating its effectiveness through systematic stages [11]. The research was conducted at GMIM Kanaan Likupang Dua as the main location for data collection and system implementation.

### Research Design

The research design follows a structured R&D process consisting of several stages,

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including problem identification, data collection, system design, implementation, testing, and evaluation. This approach ensures that the developed system is aligned with user needs and can effectively address existing problems [11], as shown in Figure 1.

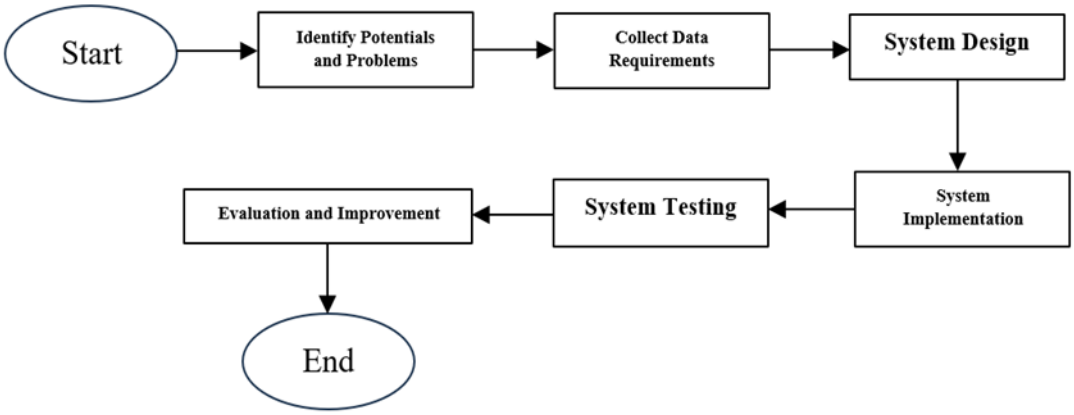


**Figure 1.** Research Design

Gambar 1 menunjukkan desain penelitian yang menggunakan metode Research and Development (R&D). Proses ini terdiri dari beberapa tahapan, mulai dari identifikasi masalah dan pengumpulan data hingga perancangan sistem, implementasi, pengujian, dan evaluasi. Setiap tahapan dilakukan secara sistematis untuk memastikan bahwa sistem yang dikembangkan sesuai dengan kebutuhan pengguna dan mampu menyelesaikan permasalahan yang telah diidentifikasi.

**Identify Potentials and Problems**

This stage aims to identify existing problems in the current worship presentation process. Based on observations and interviews, several key issues were identified, including inefficient slide transitions, lack of system integration, and limited access for congregants who rely solely on projector displays. These findings highlight the need for a more integrated and flexible system.

**Collect Data Requirements**

Data collection is conducted to obtain comprehensive information regarding system requirements. The data are classified into two types:

1. Primary Data
   Primary data are obtained through direct observation of worship activities and interviews with multimedia staff. These methods provide insights into real-world problems and user expectations.
2. Secondary Data
   Secondary data include liturgy documents, Bible verses, song data, and relevant literature. These data support the development of system features and content.

The collected data are then analyzed to define both functional and non-functional requirements of the system.

**System Design**

The system design is carried out using Unified Modeling Language (UML) to provide a

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structured representation of the system [12]. The diagrams used include:

1. Use Case Diagram to describe user interactions with the system
2. Activity Diagram to illustrate system workflows
3. Class Diagram to represent system structure and relationships

**System Implementation**

The system is implemented using PHP with the Yii Framework 2 and MySQL database [13]. The development adopts the Model-View-Controller (MVC) architecture, which separates system components into model, view, and controller [14]. In this architecture, the model is responsible for managing data such as liturgy, songs, and QR code information stored in the database. The view handles the user interface, including presentation displays and system pages accessed by multimedia staff and congregants. Meanwhile, the controller manages system logic and user interactions, such as controlling slide transitions, executing the Quick Switch feature, and processing QR code generation. This approach enhances system organization, scalability, and maintainability.

In addition, the system is developed using web technologies such as HTML, CSS, and JavaScript to support interactive and responsive user interfaces [15].

**System Testing**

System testing is conducted to ensure that the system functions properly and meets user requirements. Two testing methods are applied:

1. Black Box Testing
   This testing method is used to verify system functionality without considering internal code structure. Each feature is tested based on expected input and output.
2. User Acceptance Testing (UAT)
   UAT is conducted by involving multimedia staff and congregants to evaluate system usability, performance, and acceptance [16]. The results are measured using a questionnaire to determine the level of user satisfaction.

**Evaluation and Improvement**

The final stage involves evaluating the system based on testing results. Any identified issues are analyzed and improved to enhance system performance. This stage ensures that the developed system is reliable, effective, and suitable for use in worship activities.

# 3. RESULT AND DISCUSSIONS

This section presents the results of system development based on the Research and Development (R&D) method, which consists of several stages, including identification of problems, data requirement collection, system design, implementation, testing, and evaluation. Each stage is carried out systematically to ensure that the developed system aligns with user needs and effectively addresses existing problems.

**Identify Potentials and Problems**

The initial stage involves identifying problems and potentials in the worship presentation process through observation and interviews with multimedia staff and church representatives. The findings indicate that the existing system is not yet integrated, as multimedia staff rely on multiple applications such as PowerPoint and Canva to manage liturgy, Bible verses, and songs. This condition leads to several issues, including delays in slide transitions, difficulties in handling sudden changes during worship, and increased risk of operational errors. In addition, the process of displaying Bible verses and songs is still performed manually, which reduces system responsiveness.

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From the congregational perspective, access to worship materials is limited to projector displays, creating challenges for those seated far from the screen or with visual limitations, particularly elderly individuals. As a result, not all congregants can follow the worship process effectively. Based on these findings, an integrated system is needed to improve efficiency, flexibility, and accessibility in worship presentations.

**Collect Data Requirements**

Following the identification stage, data collection is conducted to define system requirements based on real conditions and user needs. The data are obtained through observation and interviews, as well as supporting documents used in worship activities.

The collected data are categorized into functional and non-functional requirements. Functional requirements include the ability to manage liturgy, display Bible verses and songs, provide a Quick Switch feature for fast slide transitions, and integrate QR Code for congregational access. These features are designed to address inefficiencies and improve system responsiveness.

Non-functional requirements include usability, performance, accessibility, and reliability. The system must be easy to use for multimedia staff, provide fast response times during presentation, and be accessible across various devices, including smartphones used by congregants. In addition, the system must ensure stable performance to support real-time worship activities. The results of this stage serve as the foundation for system design and development.

**System Design Results**

Based on the defined requirements, the system is designed using Unified Modeling Language (UML) to represent system functionality, workflow, and structure [13]. The design includes use case diagrams, activity diagrams, and class diagrams to provide a comprehensive overview of the system. The use case diagram describes the interaction between multimedia staff and congregants as system users, the activity diagram illustrates the workflow of the presentation process including slide transitions using the Quick Switch feature, and the class diagram defines the system structure by representing the main components and their relationships. These diagrams can be seen in Figures 2, 3, and 4.

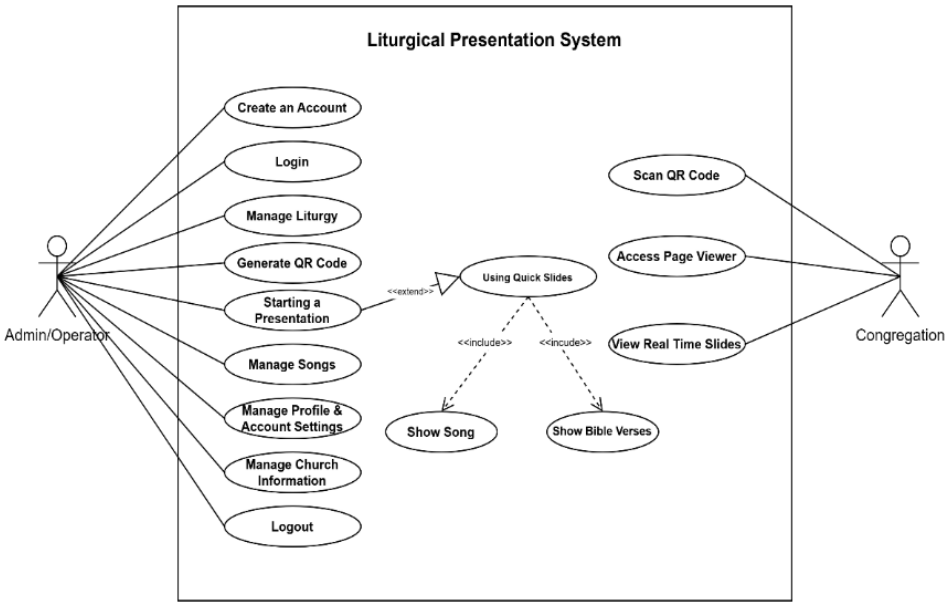


**Figure 2.** Use Case Diagram

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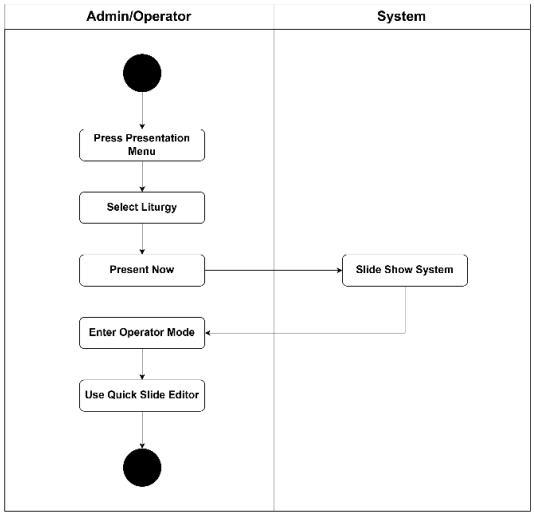


**Figure 3.** Activity Diagram

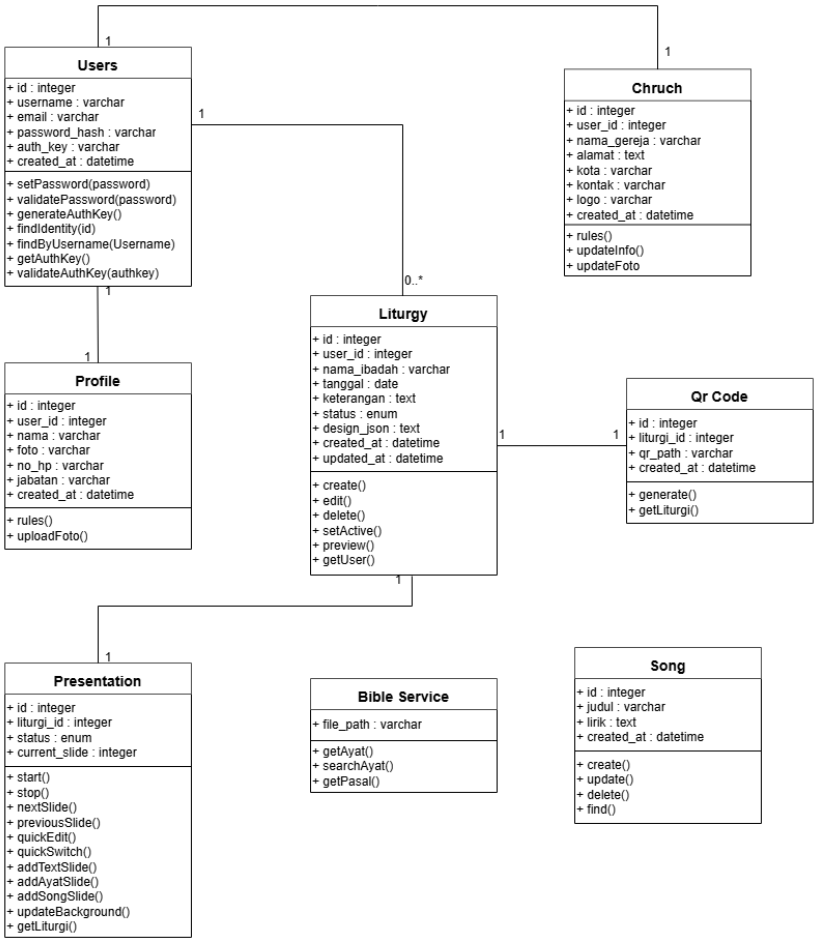


**Figure 4.** Class Diagram

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Figures 2, 3, and 4 present the system design using UML diagrams. The use case diagram illustrates the interaction between multimedia staff and congregants, where multimedia staff manage liturgy, control presentations, and generate QR codes, while congregants access presentation content through their personal devices. The activity diagram describes the workflow of the presentation process, including selecting liturgy, displaying slides, and performing rapid transitions using the Quick Switch feature. Meanwhile, the class diagram represents the system structure by showing key components such as users, liturgy, presentation, and QR code, along with their relationships. These diagrams provide a comprehensive understanding of the system functionality, workflow, and structure.

**System Implementation Results**

The system is successfully implemented as a web-based application using PHP with the Yii Framework 2 and MySQL database. The system adopts the Model-View-Controller (MVC) architecture to ensure a structured and maintainable development process.

The implementation results show that the system provides several main features, including liturgy management, web-based presentation, Quick Switch for fast content transitions, and QR Code generation for congregational access. These features are designed to improve efficiency, flexibility, and accessibility in worship presentations by reducing manual operations, enabling real-time content updates, and supporting dynamic changes during worship activities.

The system interface consists of several main pages, including the dashboard, liturgy management page, presentation page, and QR Code feature. The dashboard interface can be seen in Figure 5, the presentation interface is shown in Figure 6, and the QR Code feature is presented in Figure 7. Each interface is designed to support user interaction effectively, with a focus on simplicity, ease of use, and quick access to essential functions, allowing multimedia staff to operate the system more efficiently and congregants to access content more conveniently.

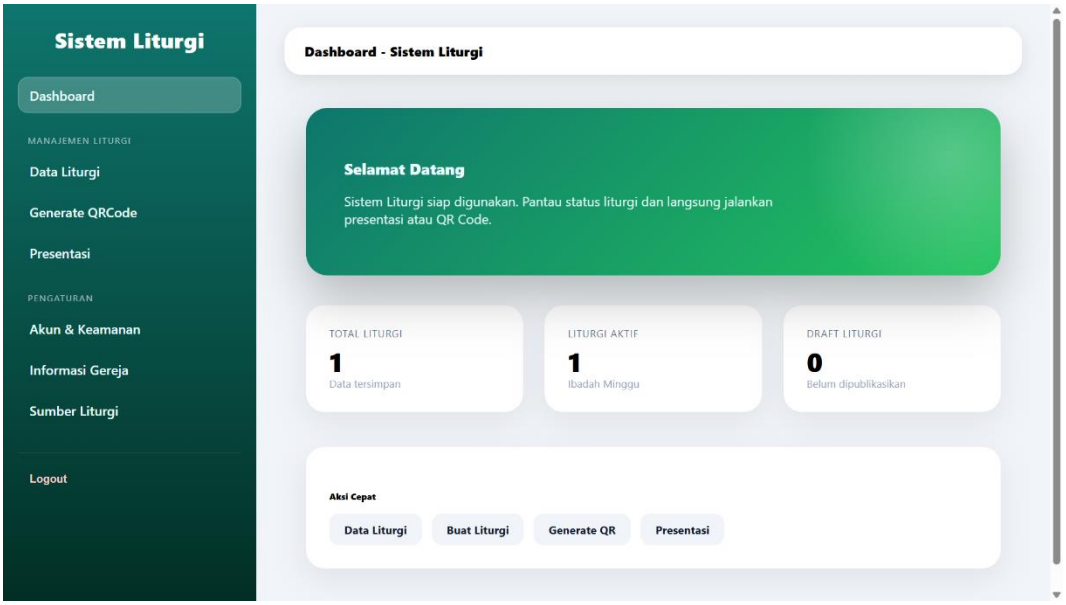


**Figure 5.** Dashboard Interface

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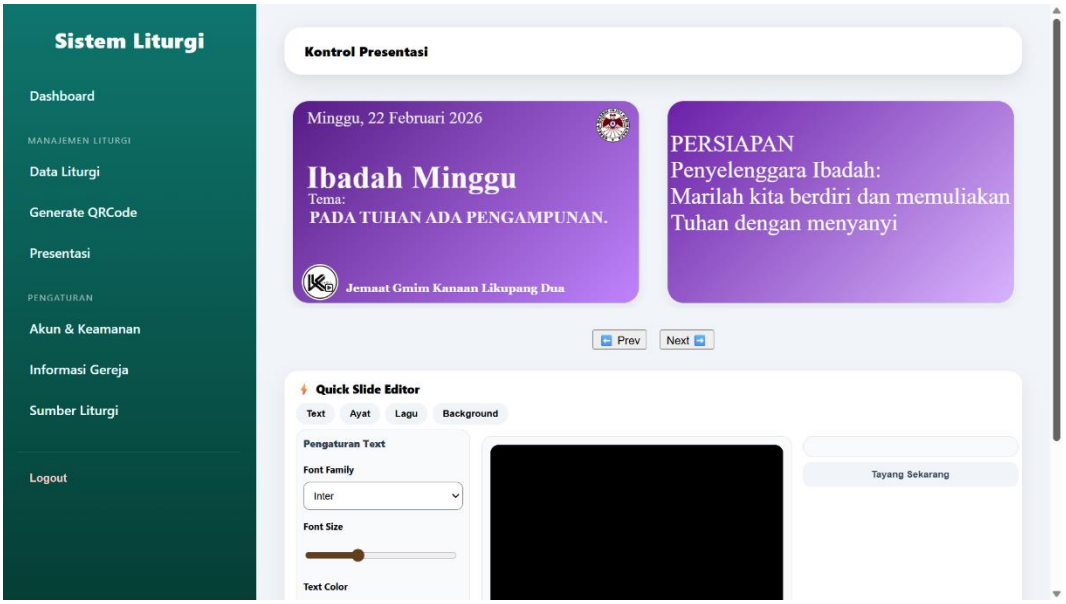


**Figure 6.** Presentation Interface

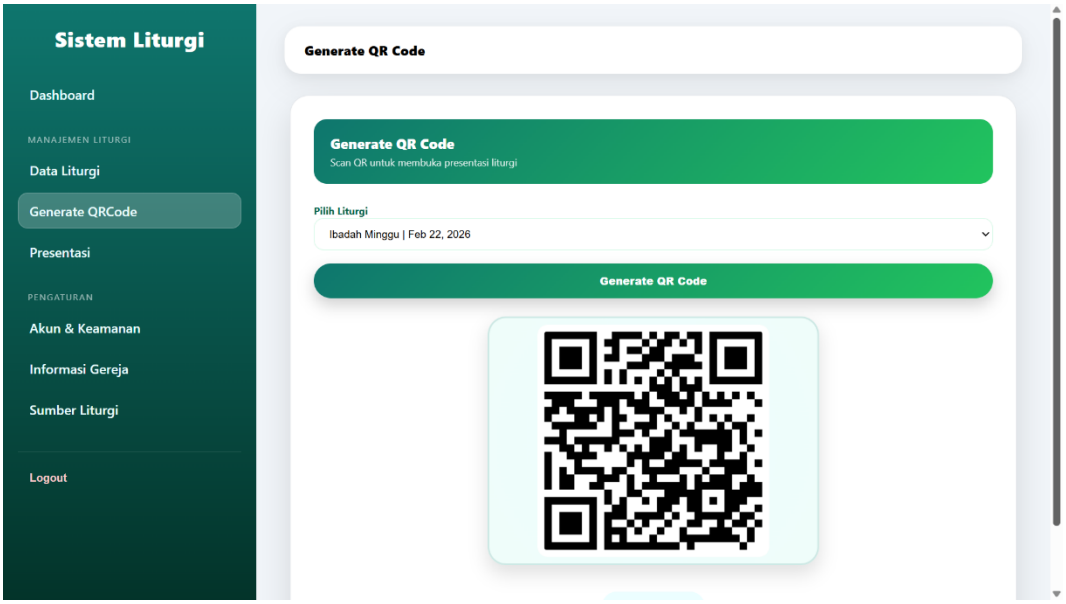


**Figure 7.** QR Code Feature

Figures 5, 6, and 7 present the main interfaces of the developed system, which are designed to support both multimedia staff and congregants in the worship process. The dashboard interface serves as the central control panel that allows multimedia staff to access and manage system features efficiently, including navigating menus, organizing liturgy data, and preparing presentation content before the service begins. This centralized design reduces operational complexity and minimizes the risk of errors during system usage.

The presentation interface is used during worship to display liturgy, songs, and other content in real time. This interface is equipped with the Quick Switch feature, which enables

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operators to perform rapid and seamless slide transitions without interrupting the flow of worship. As a result, the system is able to respond to dynamic changes effectively, improving both responsiveness and presentation continuity.

Meanwhile, the QR Code feature provides an alternative access mechanism for congregants by allowing them to view presentation content directly on their personal devices through scanning. This feature reduces dependence on projector displays and improves accessibility, particularly for congregants who are seated far from the screen or have visual limitations. Overall, these interfaces demonstrate that the system successfully enhances efficiency, flexibility, and inclusivity in the delivery of worship presentations.

**System Testing Results**

System testing is conducted to evaluate the functionality and usability of the developed system through Black Box Testing and User Acceptance Testing (UAT). This testing process aims to ensure that all system features operate according to the specified requirements and that the system can be effectively used by its intended users. Black Box Testing is used to validate system functionality, while User Acceptance Testing is performed to assess user satisfaction, usability, and overall system performance in real-world conditions.

**Black Box Testing**

Black Box Testing is performed to verify that all system functions operate according to the specified requirements without considering the internal code structure. The testing focuses on key features such as login, liturgy management, presentation display, Quick Switch functionality, and QR code generation and access, as shown in Table 1.

**Table 1.** Black Box Testing Results

| No | Feature | Test Scenario | Input | Expected Output | Status |
|---|---|---|---|---|---|
| 1 | Login & Registration | User creates a new account then logs in | New account data | Account successfully created and enters dashboard | **Success** |
| 2 | Dashboard | User opens the Liturgical Data menu | Click menu | Liturgical Data page appears | **Success** |
| 3 | Add Liturgy | Add new liturgical data | Worship name and other data | Data saved and enters edit mode | **Success** |
| 4 | Edit Liturgy Slide | Edit liturgy slide content | Slide content | Changes saved | **Success** |
| 5 | Save Liturgy | Save liturgy after editing | Click save | Data enters table with draft status | **Success** |
| 6 | Ready to Use Status | Change status to active | Click ready to use | Status changes to active | **Success** |

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| | | | | | |
|---|---|---|---|---|---|
| 7 | Generate QR Code | Create liturgy QR Code | Select liturgy | QR Code successfully generated | **Success** |
| 8 | Presentation | Select liturgy to be displayed | Select liturgy | Liturgy ready to be presented | **Success** |
| 9 | Present Now | Enter operator mode | Click present | Operator mode active | **Success** |
| 10 | Quick Switch Editor | Change slide quickly | Slide navigation | Slide changes in realtime | **Success** |
| 11 | Verse & Song | Display verse or song | Select content | Content appears on screen | **Success** |
| 12 | Account Settings | Edit profile and change password | New data | Changes saved | **Success** |
| 13 | Church Information | Edit church information | Information data | Data successfully updated | **Success** |
| 14 | Manage Songs | Add/edit song | Song data | Song saved | **Success** |
| 15 | Logout | Exit the system | Click logout | Returns to login page | **Success** |

Based on the testing results presented in Table 1, all system features function as expected without errors. Each tested feature, including login, liturgy management, presentation display, Quick Switch, and QR Code access, operates correctly according to the defined requirements. These results indicate that the system meets the functional requirements and can operate reliably to support worship activities.

**User Acceptance Testing (UAT)**

User Acceptance Testing (UAT) is conducted to evaluate the usability, performance, and acceptance of the system from the user perspective. The testing involves multimedia staff as system operators and congregants as end users. The evaluation is carried out using a questionnaire that includes several indicators such as usability, performance, and functionality, as shown in Table 2.

**Table 2.** User Acceptance Testing Results

| User Group | Number of Respondents | Acceptance Percentage |
|---|---|---|
| Multimedia Staff | 2 | 98.75% |
| Congregation | 20 | 88.86% |

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Based on the results presented in Table 2, the multimedia staff achieved an acceptance rate of 98.75%, while the congregants achieved 88.86%. These results indicate that the system is highly acceptable from both operator and user perspectives. The higher acceptance rate among multimedia staff shows that the system effectively supports operational tasks, while the positive response from congregants reflects improved accessibility and usability. Overall, the system is considered suitable for implementation in real-world worship activities.

**Discussion**

The results of this study demonstrate that the developed system successfully addresses the problems identified in the initial stage. The integration of all worship presentation components into a single platform significantly improves operational efficiency for multimedia staff.

The Quick Switch feature provides flexibility in managing dynamic worship conditions by enabling rapid slide transitions without delays. This reduces the risk of errors and ensures a smoother worship flow.

Furthermore, the QR Code feature enhances accessibility by allowing congregants to access worship materials through their personal devices. This overcomes the limitations of projector-based displays and supports a more inclusive worship experience.

Overall, the system contributes to improving efficiency, flexibility, and accessibility in worship presentations. The high UAT results further confirm that the system is feasible and effective for real-world implementation.

# 4. CONCLUSION

This study successfully developed a web-based liturgical presentation system using the Research and Development (R&D) method to improve the efficiency, flexibility, and accessibility of worship services at GMIM Kanaan Likupang Dua. The system integrates various worship components, including liturgy, songs, and presentation management, into a single platform, thereby reducing dependence on multiple applications and minimizing operational inefficiencies. The implementation of the Quick Switch feature enables rapid and flexible slide transitions, allowing multimedia staff to adapt to dynamic changes during worship. In addition, the integration of QR Code technology provides an alternative access medium for congregants, enabling them to access worship materials through personal devices and improving inclusivity.

Based on system testing, Black Box Testing results indicate that all system functions operate properly, while User Acceptance Testing (UAT) shows a high level of user acceptance, with 98.75% from multimedia staff and 88.86% from congregants. These results confirm that the developed system is feasible, effective, and suitable for real-world implementation. For future research, it is recommended to enhance system features by adding more structured user management, improving interface responsiveness across various devices, and integrating additional multimedia elements such as video and running text to further enrich the worship experience.

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