

DESIGN AND IMPLEMENTATION *FRONT-END* WEB-BASED MANAGEMENT INFORMATION SYSTEM FOR STUDENT ISLAMIC BOARDING SCHOOL SERVICES BINA TAUHID (PP MABIT) USING THE METHOD *WATERFALL*

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ABSTRACT

The Bina Tauhid Student Islamic Boarding School (PP Mabit) still faces challenges in service management and information delivery, due to the administration system still being carried out manually. This situation results in delays in service, there are many potential errors in data recording, and less than optimal user experience. This study aims to design and implement a web-based service management information system interface, as part of the development of an information system that supports the digitalization of services at PP Mabit. The system development process is carried out using the Waterfall approach, which includes the steps of user needs analysis, display design, user interface implementation, and system testing. This study focuses on the creation and development of a front-end interface that pays attention to aspects of user experience, such as ease of navigation, display alignment, and information delivery. The realization of the web-based system is carried out by utilizing technologies such as HTML, CSS, and JavaScript, and emphasizes the login page, main page, and news and announcement pages. System testing was conducted using the blackbox testing method to assess the suitability of system functions to user needs without looking at the internal code structure. The test results showed that all the main functions of the system operated as expected, the user interface was easy to access, and service information could be obtained more efficiently. This finding indicates that the application of the Waterfall method in developing web-based information systems can improve the quality of user experience and effectiveness in services. This research is expected to be a reference source for the development of

service information systems in the web-based student Islamic boarding school environment.

Keywords: front-end, user experience, Waterfall, web, Information Systems

CHAPTER I INTRODUCTION

The development of information technology has encouraged various educational institutions to digitize their services and operational activities (Harini et al., 2024). The Bina Tauhid Student Islamic Boarding School (PP Mabit), an Islamic-based educational institution under the auspices of Djuanda University, requires an information system that can support effective, structured, and rapid service management. However, in the field, many administrative processes and student services are still carried out manually, such as managing boarding school activities, recording student data, and conveying information to students. This situation causes various problems, such as the risk of errors in data recording, slow information dissemination, and difficulties in accessing data effectively. *real-time*.

The increasing need for services in Islamic boarding schools requires a web-based management information system to support more efficient PP Mabit operations. The system built has a responsive display, can convey information clearly and accurately to users including students and administrators. In developing a systematic and well-structured system, the right solution is to use the waterfall method which starts with needs analysis, system design, implementation, system testing, and initial system maintenance. The waterfall method was chosen because it is appropriate for developing a system that has been determined from the start, so that each step can be implemented systematically and in a controlled manner.

Currently, PP Mabit does not have an integrated web-based service management information system that focuses on the front-end interface. Manual methods are still used for the administration and delivery of information, which can result in performance delays and create a gap between service needs and the existing management system.

Research Questions

Based on the identification of research gaps and problems that have been described in the introduction, they are formulated in several points as follows:

1. RQ1: How to identify user needs for development *front-end* web-based management information system at the Bina Tauhid Student Islamic Boarding School, Djuanda University?
2. RQ2: How can the design and implementation of the front-end web-based management information system of the Bina Tauhid Student Islamic Boarding School adapt to user needs and be easy to use?
3. RQ3: Why was the Waterfall method chosen in the front-end development of the management information system for the Bina Tauhid Student Islamic Boarding School, Djuanda University?
4. RQ4: How to develop a web-based front-end management information system at the Bina Tauhid Student Islamic Boarding School, Djuanda University in accordance with functionality and user convenience?

Research purposes

This research has the following specific objectives:

1. Design and develop a web-based PP Mabit service management information system interface.
2. Implementing system views using HTML, CSS, and JavaScript.
3. Implementing the waterfall method in the system development process systematically.
4. Evaluate the functionality and usability of the system being developed.

Author's Argument

Based on these objectives, this study emphasizes the implementation of front-end development of a web-based service management information system using the waterfall method as a development method that supports the digitalization process of Islamic boarding school student services to be more efficient (Muhammad et al., 2024). The

waterfall method not only increases accuracy and consistency in data recording but also improves the user experience through a responsive, organized, and user-friendly interface, thereby increasing the effectiveness of overall service management (Rahayu et al., 2024).

Research Focus

This research focuses on the design and implementation of the interface (front-end) of a web-based service management information system for the Bina Tauhid Student Islamic Boarding School (PP Mabit). This research focuses on developing a responsive, organized, and user-friendly system display, taking into account elements of user experience, ease of navigation, and how to deliver service information, especially to students.

Study Limitations

This research is limited to the front-end development of a web-based service management information system. It does not address back-end development, full database integration, or detailed system security aspects. This limitation was established to allow the research to focus more on interface design and evaluating the usability of the system.

Novelty Plan

The novelty of this research lies in the complete application of the waterfall method in the front-end development of the student Islamic boarding school service information system, with the main focus on responsive and user-friendly interface design as a solution for digitizing Islamic boarding school services. In contrast to previous research which generally focuses on the development of the system as a whole including the back-end, this research specifically discusses the quality of front-end design as the main reason in supporting the implementation of service digitalization in Islamic boarding schools.

Chapter Contents Map

This research consists of four main parts, the first part is the introduction which contains the research topic, identification of research gaps, problem formulation, research questions, research objectives, author's position or argument, problem focus, study

limitations, novelty plan, and research content map. The second part is the literature review, which discusses the mapping of theories and key concepts, synthesis, and comparison of previous research, identification of knowledge gaps, and presentation of the theoretical framework used in the research.

The third section is the research methods section, which explains the type and design of the study, data sources and selection criteria, data collection techniques, and data analysis techniques. The fourth section is the findings section, which presents the research data systematically, objectively, and factually, supplemented with tables, graphs, or quotations, and provides initial answers to the research questions formulated in the introduction.

CHAPTER II LITERATURE STUDY

Mapping Theory and Key Concepts

An information system is a collection consisting of hardware (*Hardware*), software (*Software*) as well as human device (*brainware*) which will use the software and hardware to manage, process, store, analyze, distribute and collect information (data) for a purpose (Sunshine 2023).

A management information system (MIS) is a planning and internal control system for a business that involves the roles of people, documents, and technology. A management information system aims to collect, store, and process data to support decision-making within an organization. (Hariyanto 2018).

Web-based applications are applications developed using programming languages. *HTML, CSS, JavaScript, dan PHP*. This application is highly browser dependent and *web server* to execute the program code that has been created such as *Chrome, Firefox, Microsoft Edge* and many other browsers. Web applications will be more popular if their data is centralized and provides good access, making them easier to use in various aspects of life (Novria Rahma, Budi Kurniawan, and Suryanto 2022).

Front-end is a part of a website or application that can be seen directly by users. *Front-End* has the task of shaping the use of applications or websites well and ensuring that all elements contained in an application or website function properly. *HTML, CSS, dan*

JavaScript is part of *front-end* which functions to provide uniqueness to the website being developed (MuftiPrasetyo et al. 2022).

Method *Waterfall* is a model used for the earliest software development and is the most widely used method and software that has a linear sequential nature, namely a process that is carried out systematically (Setiawan, Sulaksono, and Wulanningrum 2019). Web-based information systems are one of those that really require the use of this method. *waterfall* the method *waterfall* can provide an overview of the web-based software development process by providing a series of requirements or instructions for a series of stages that must be carried out systematically or sequentially, starting from analyzing needs as the initial step and system maintenance as the final step in using the method. *waterfall*.

Digitalization in education refers to the application of digital technology that transforms the delivery of educational services, making them more efficient and accessible to all users. This digital transformation includes the implementation of web-based systems, digital applications, and various media. *electronic* Other aspects that regulate administration, information delivery, and interactions between educational institutions and stakeholders. This digitalization process is very beneficial because it can speed up services, increase data transparency, and give better experience for users when accessing educational services when compared to conventional manual methods (Madrasah & Ulasan, 2025).

Synthesis and Comparison of Previous Research

Extensive research has been conducted on the development of web-based information systems in the field of education. Muhammad et al. (2024) stated that the system they developed was capable of recording student violations and achievements more systematically, accurately, and efficiently. This information system also facilitated digital communication between Islamic boarding school administrators and students' parents, enabling more sophisticated and effective communication. (Muhammad et al. 2024).

Another study conducted by Uus Firdaus et al (2023) stated that a well-designed Islamic boarding school management information system has a positive impact on the ease of accessing and managing student data and activities at the Islamic boarding school. The

main objective of this study is to provide a web-based information system with integration to improve the quality of information management at Islamic boarding schools, as well as a medium that serves as a platform for promotion and wider information dissemination to the public (Gani 2023).

Apart from that, Aisah Rini Susanti and Rangga AshRaffy January(2024) discussed the use of the waterfall method in developing web-based information systems. Using the waterfall system method has been proven to increase data management efficiency by up to 80% and provide easy access to information for students and administrators, as well as increasing the effectiveness of digital services within the PP Mabit environment (Anon n.d.).

Based on the analysis of previous studies, it was found that many studies have been conducted on management information systems using the waterfall approach and user interface design. However, research specifically directed at the design and implementation of front-end service management information systems, especially in the context of student Islamic boarding schools, is still limited. Therefore, this study is designed to complement previous studies that emphasize front-end development as a key aspect in supporting the transformation of services at the Bina Tauhid Student Islamic Boarding School towards a digitalized Islamic boarding school.

Identifying Knowledge Gaps

Based on analysis and comparison of previous research, a lack of knowledge is found in the study of web-based information system development in educational settings. Previous research has generally explored the application of management information systems to improve efficiency.serviceadministration and the use of the waterfall method in information system development. However, the majority of this research still focuses on overall system development, with a primary focus on functional aspects and back-end data processing.

While some studies have emphasized the importance of user interface design and user experience, these analyses typically treat front-end development as a supporting element, rather than the focus of the research. This study specifically explores the design and

implementation of front-end service management information systems, specifically using the waterfall method as a systematic approach that is still limited.

Furthermore, research on digital transformation in services within Islamic boarding schools for students is relatively limited compared to other formal educational institutions. This situation indicates the need for research that encompasses the development of a service management information system interface with Islamic boarding schools as the primary focus of discussion. Therefore, this study was conducted to address this gap by emphasizing the development of a web-based interface using the waterfall method as a step to support the digitalization of services in Islamic boarding schools for students.

Presentation of Theoretical Framework

Based on the analysis of important theories and concepts that have been explained previously, this research is based on the idea of a management information system as a tool for managing services in an organized, digital manner. Service as a strategy to transform conventional services into technology-based services, as well as the development of a web-based user interface as the primary objective of system-user interaction. In the educational realm, particularly in Islamic boarding schools with students, web-based management information systems are considered effective in improving administrative services and information delivery.

Furthermore, the combined results and comparisons of previous research indicate that while web-based information system development and the application of the waterfall method have been widely implemented, front-end development is generally considered a supporting element and has not yet become a primary focus of research. Furthermore, research specifically linking front-end development to the digitalization of services in Islamic boarding schools (pesantren) is still very limited. These findings indicate the need to formulate a theoretical framework that positions the front-end as a key aspect supporting service digitalization.

BAB III METODE

Type of Research and Study Design

This research is a type of software engineering research using a descriptive qualitative approach to explain the design and implementation process of the user interface of a web-based service management information system. This research design uses the waterfall method which begins with user needs analysis, system design, front-end implementation, system testing and system maintenance which are carried out in stages and in accordance with system development rules.

Data Sources and Selection Criteria

This research has data sources that include primary initial data and secondary data. Primary data were obtained through direct observation of services and interviews with managers and service users at the Bina Tauhid Student Islamic Boarding School (PP Mabit), which were used to find information on system needs and existing problems in the existing services, namely using manual methods. Meanwhile, secondary data were obtained from administrative documents at PP Mabit and scientific literature related to information systems, service digitization, and website-based user interface development. Data selection focused on information related to service needs and user interface design as a basis for developing the system's front-end interface.

Data Collection Techniques

Data collection techniques in this study included observation, interviews, and a literature review. Direct observations were conducted to understand the service process at PP Mabit and identify any problems encountered. Interviews were conducted with service managers and users to determine system requirements and expectations regarding user interface development. The literature review served as a theoretical foundation and a continuous reference in designing and developing a web-based service management information system at PP Mabit.

Data Analysis Techniques

Data analysis was conducted using descriptive qualitative methods obtained through the study and interpretation of observations, interviews, and literature reviews. The analyzed

data served as a basis for identifying system requirements and designing the front-end interface for the service management information system at PP Mabit. The information analysis process was conducted according to the steps in the waterfall method to ensure the results of the front-end design and implementation were in accordance with user needs and were consistent with the research objectives.

CHAPTER IV FINDINGS

System Requirements Analysis Results

The findings revealed issues with manual service data recording, limitations in information delivery to users, and a lack of integration between services. Furthermore, users urgently need a web-based service management information system that is easily accessible, has a clear website layout, and can improve the effectiveness of centralized service management at PP Mabit.

Front-End System Design Results

The results of the user interface implementation for the web-based service management information system at PP Mabit consist of three important parts: the login page, the main page, and the announcement and news page. There are two types of designs, namely using wireframes as follows.



Figure 4.1 Login wireframe

Figure 4.1 above is a wireframe of the login page, which functions as a user access point for a user and password, with input verification to ensure security and ease of access.

This page contains a table for an email address and password if registered, and a register button if not. Additionally, you can log in via Google, Facebook, or your mobile phone number or WhatsApp.



Figure 4.2 Home Page Wireframe

Figure 4.2 is a wireframe of the main page of the Web-Based Service Management Information System of the Bina Tauhid Student Islamic Boarding School, which contains six menus: homepage, registration, achievements, student dashboard, news and announcements, and about PKD. This page aims to display the initial appearance of the entire website or is called the homepage.

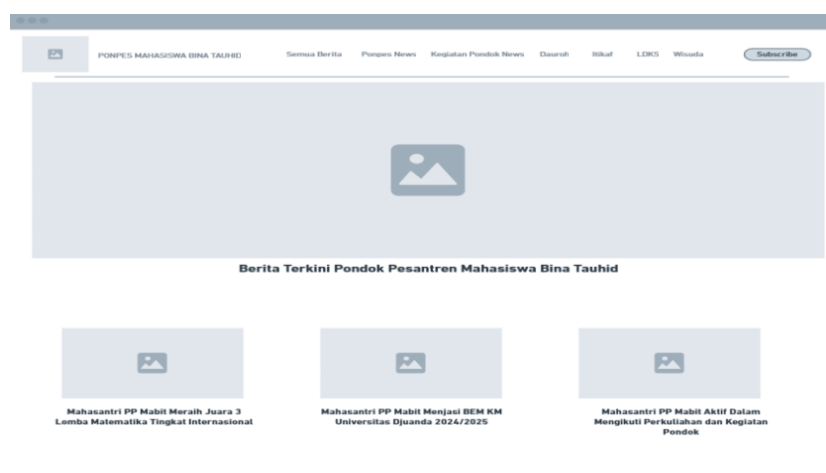


Figure 4.3 News Page Wireframe

Figure 4.3 shows the news and announcements page on the Web-Based Service Management Information System of the Bina Tauhid Student Islamic Boarding School (PP Mabit), which aims to display daily, weekly, and monthly news, Islamic boarding

school activities, and announcements to students. Furthermore, this page has an information menu related to the written works of PP Mabit students.

Web-Based Front-End Implementation Results

The results of the implementation of the user interface for the web-based service management information system at PP Mabit include three important parts, namely the login page, the main page, and the announcement and news page.

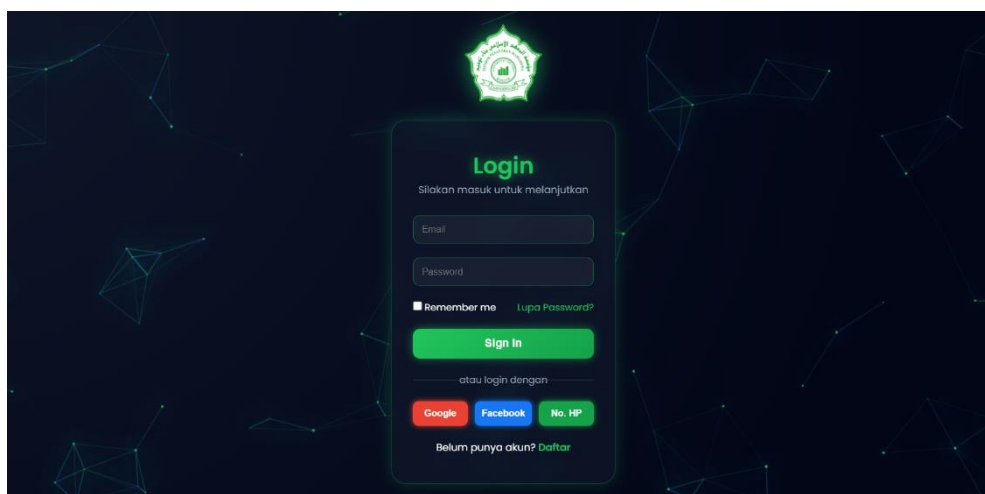


Figure 4.4 Login Page

Figure 4.4 above shows the login page, which serves as user access and password verification for security and ease of access. This page contains an email and password table if you're registered, and a register button if you're not. Additionally, you can log in via Google, Facebook, or your mobile phone number or WhatsApp.



Figure 4.5 Main Page

Figure 4.5 is the main page of the Web-Based Service Management Information System of the Bina Tauhid Student Islamic Boarding School, which contains six menus: homepage, registration, achievements, student dashboard, news and announcements, and about PKD. This page aims to display the initial appearance of the entire website or is called the homepage.

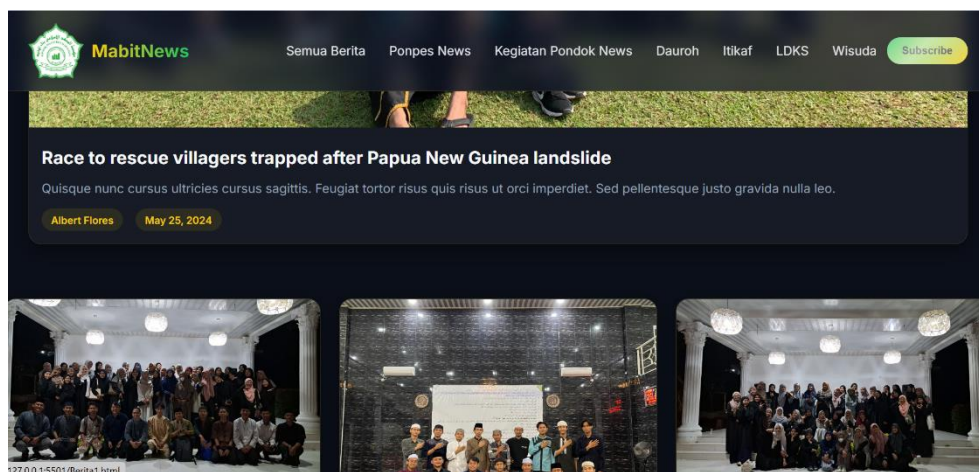


Figure 4. 6 News and Announcement Pages

Figure 4.6 shows the news and announcements page on the Web-Based Service Management Information System of the Bina Tauhid Student Islamic Boarding School (PP Mabit), which aims to display daily, weekly, and monthly news, Islamic boarding school activities, and announcements to students. Furthermore, this page has an information menu related to the written works of PP Mabit students.

System Test Results

User interface testing on PP Mabit's web-based service management information system was conducted to evaluate functional suitability, ease of use, and user interface appearance. This testing used blackbox testing without viewing the internal code.

No	Page	User actions	Output	Status
1	Login	Enter valid username and password	Log in main page	Passed
2	Login	Enter the wrong username and password	The message "Incorrect	Passed

			username or password" appears	
3	Home Page	Click the navigation menu to the news page	News page open	Passed
4	Home Page	Click on the video	Video appears	Passed
5	News Page	Click on the news title	News details are displayed	Passed
6	News Page	Use the news search feature	Search results according to keywords	Passed

Table 4.1 Testing Table

Table 4.1 above, the test results, shows that all key features, such as the login page, home page, and news page, work well, are easily accessible, and have a diverse display. This system has proven to be effective in helping users access and manage service information efficiently.

Initial Answers to Research Questions

Based on design analysis, observation, and testing, the development of the user interface for the PP Mabit web-based service management information system using the waterfall method proved successful. This success can be seen from the results of blackbox testing, where all main functions work according to user expectations, and there is alignment between the design and implementation of the system. Therefore, the waterfall method allows system development to be carried out systematically and in line with the research objectives.

CHAPTER V DISCUSSION

Interpretation and Meaning of Findings

The research results show that the front-end design for a web-based service management information system can meet user needs in terms of both functionality and visual design. The design applied to the login page, main page, and news page is proven to be easy to access and use, navigation is easy for users to understand, and supports the

process of accessing service information efficiently. These findings inform us that the planned interface design arrangement has a significant role in increasing the effectiveness of system use.

Relation to Literary Studies and Theory

The findings of this study align with the view in software engineering that the waterfall approach is particularly useful for developing systems with clearly identified and stated requirements from the initial stages. Each phase, from requirements analysis and design, implementation, testing, and maintenance, significantly impacts the quality of the final system. Furthermore, the interface design principle of prioritizing user-friendliness aligns with human-computer interaction theory, which emphasizes the importance of user experience in information systems.

Comprehensive Answers to Research Questions

Based on the design and implementation analysis, as well as black-box testing, it can be concluded that the front-end development of the Web-Based Service Management Information System using the waterfall method was successful in meeting user expectations. All key system functions worked as expected, thus successfully answering the research question regarding the effectiveness of the development method.

Theoretical Implications

Conceptually, this research supports the belief that the waterfall method has a place in web-based information systems development, particularly in front-end development with stable requirements. This research emphasizes the critical importance of detailed interface design prior to implementation to develop an effective and user-friendly system.

Research Limitations

This research has several limitations: the system testing only used blackbox testing methods without quantitative user satisfaction measurements. Furthermore, the system developed focused on front-end features, thus not comprehensive back-end testing.

CHAPTER VI CONCLUSION

The front-end development of a Web-Based Service Management Information System using the waterfall method has proven effective in meeting user needs. This provides an overview of the design, implementation, and testing results using blackbox testing, which demonstrates that all of the system's main functions are operating as expected.

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