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E-Letter Design Using Prototype System Development Methodology

Perancangan E-Letter Menggunakan Metodologi Pengembangan Sistem Prototype

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A B S T R A C T

This research aims to design a web-based correspondence information system using the prototype method. The research methodology involves iterative prototype development starting with gathering user requirements followed by designing system prototypes using UML diagrams. The prototypes were evaluated by users to provide feedback for refinements in subsequent iterations. Multiple iterations were conducted until a satisfactory prototype matching the user needs was obtained. The resulting prototype covers core features like incoming and outgoing mail data collection, mail disposition, and reporting. In summary, the prototype method enabled designing a good correspondence information system that fulfills the user requirements before full system implementation.

Keyword: information systems, correspondence, web based, implementation, prototype

A B S T R A K

Penelitian ini bertujuan untuk merancang sistem informasi persuratan berbasis web dengan menggunakan metode prototipe. Metodologi penelitian dilakukan melalui pengembangan prototipe secara iteratif yang dimulai dari pengumpulan kebutuhan pengguna, kemudian merancang prototipe sistem menggunakan diagram UML. Prototipe yang telah dibuat dievaluasi oleh pengguna untuk mendapatkan masukan yang digunakan dalam penyempurnaan pada iterasi berikutnya. Beberapa iterasi dilakukan hingga diperoleh prototipe yang sesuai dengan kebutuhan pengguna. Prototipe akhir mencakup fitur utama seperti pencatatan data surat masuk dan keluar, disposisi surat, serta pelaporan. Secara keseluruhan, metode prototipe memungkinkan perancangan sistem informasi persuratan yang sesuai dengan kebutuhan pengguna sebelum dilakukan implementasi sistem secara penuh.

Kata kunci: sistem informasi, persuratan, berbasis web, implementasi, prototipe

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1. INTRODUCTION

In this digital age, all systems are widespread, including the advancement of information and communication technology[1]. That's a huge push for various offices to take advantage of information system technology[2]. Compression management to improve efficiency and flexibility in processing compression[3]. This information management system represents an advance in the management of compilation with a web browser as its medium and connected to the Internet[4]. This letter is a routine operational activity carried out by any staff in an organization, office[5]. The formal letter process relates to legal aspects[6]. And generally contained in written service documents[7]. Traffic of documents, letters, note of service or memo of service between personnel or work units can grow very rapidly[8].

Information and communication systems have not yet been fully implemented in the Department of Religious Affairs of the City of Medan[9]. Computers have not been fully utilized to assist the office's performance. As in the case of staff administration and the creation of the service travel letter (SPPD) and the handling of the leave application letter is still manual[10]. The creation still uses Microsoft Word and Microsoft Excel[11]. After the letter is completed it must be signed by the head of office[12]. The signature is still using manual, not online[13]. While using manual access will take a long time[14]. With this system of letters, officers can be faster to make requests for letters or submissions of letters[15]. In the preparation of the SPPD and the filing of leave there are still many shortcomings to be filled[16]. This leads to a lot of paper being wasted due to misprinting. Besides, it makes work inefficient and efficient[17].

The development of information and communication technology has become a solution to many of today's problems[18]. In the Office of the Ministry of Religion of the City of Medan, the use of information technology is not optimal[19]. Especially for the letter to the Ministry of Religious Affairs of the City of Medan which is still being done manually by reporting to the public[20]. This is time-consuming and inefficient[21]. In order to address the problem, the author plans to create a web-based application to make letters at the Ministry of Religious Affairs of the City of Medan[22].

As for the first researchers who discussed the letter of condemnation in the Ministry of Religious Affairs of the city field still use the concept of SDLC[23]. The design of the system is still using UML, this letter information system still uses the PHP programming language and uses the MYSQL storage[24] [25]. The difference between this research and previous research lies in the methods of research such as this research using Flowchart, data flow diagram, use case diagram. The research is aimed at providing a more time-efficient solution to the staff/officers in the Office of the Ministry of Religion of the City of Medan. This is expected to improve the efficiency of accessibility of information available in the Department of Religious Affairs of the Town of Medan significantly. And can help the staff in making letters.

2. METHODOLOGY

2.1 Research Location

Location of the research conducted at our practice lectures at the office of the Ministry of Religion/Government of the City of Medan, which is adjacent to Jl. Sei Batu Gingging Market. X No. 12, Padang Bulan Selayang I, Kec. Medan Selayang, North Sumatra.

2.2 Research Stage

The stages of the research to be carried out can be seen in the picture below:

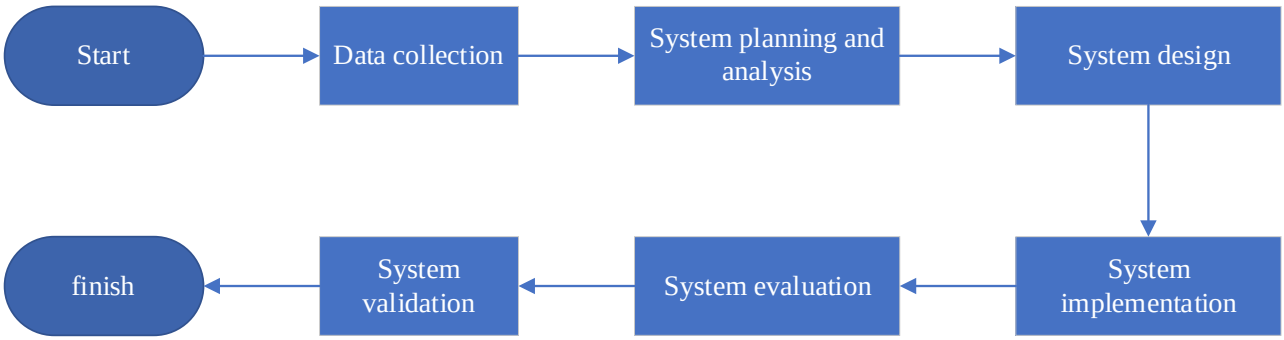

Figure 1. Research Phase

Figure 1 on the research phase describes how the phase of the research carried out starts from data collection, planning, analysis, design, implementation and evaluation. System Development Methods Prototyping methods are methods in system development that use methods to create programs quickly and gradually so that users can fix them as quickly as possible. A prototype represents a product model to be built or simulate a structure. We can implement a suitable UCD for users who are public Information Technology.

1. Data collection

Data collection carried out by means of observation. By conducting direct observations at the Ministry of Religion, when performing observations can also validate the information given at the time of the interview. Data collection by observing directly based on the sources available. Then the researcher performs the study of the Library, which is the collection of data carried out directly from other sources such as journals, scripts, guidelines related to this research and based on knowledge acquired during the lectures related to the issues undertaken.

2. System Planning and Analysis

The study of user needs, technical and technological feasibility studies and software development scheduling can also be described as the definition of system needs. Evaluation phase where we try to identify the problems that exist in the user, recognize the components of the system components, objects objects as well as the relationship between objects both in internal and external conditions.

3. System Design

System design is a multi-step process that focuses on the attributes that are data structure, software architecture.

4. System Implementation

The implementation stage is the result of the analysis and design that we have made in a form that can be read and understood by the machine or computer.

5. System Evaluation

In the System Evaluation stage, the developed correspondence information system prototype is evaluated by end-users. The goal is to obtain feedback and input from users regarding the functionality and interface of the prototype. Evaluation is done through methods like prototype demonstrations, interviews/questionnaires, and observation of user interactions. The prototype is shown to users while explaining the features; users can try using it to see if it matches requirements. Users are asked questions about their experience in using the prototype and whether it was easy to use, had complete features, etc. User interactions are observed to uncover any difficulties not revealed during interviews. Feedback from the evaluation is then used to refine and improve the prototype in subsequent iterations. The process of evaluation and refinement is repeated until the resulting prototype adequately fulfills user needs.

6. System Validation

Software must undergo changes over time after being handed over to the user the actual changes may arise due to errors found by the user where the system is no longer the same.

3. RESULTS AND DISCUSSION

3.1 Data Collection

At the data collection stage, this study uses the method of developing a prototype system. Gathering user needs is done as a preliminary step. The users involved in this iteration are staff at the Department of Religious Affairs of the City of Medan. User needs data is obtained through interviews and direct observation of the letter process that is taking place in the office. Once the user needs are gathered, a prototype of the letter information system is designed. The design involves the creation of UML diagrams, which include the use case diagram, the activity diagram and the sequence diagram. These diagrams provide a visual picture of how systems work and interact.

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Table 1. Interview and Observation Results

No	User needs	Findings
1	Entry and exit postponement	It requires a system that can record and manage inbound and outbound communications efficiently.
2	Mail layout	The mail disposal process needs to be integrated into the system to facilitate mail control and tracking.

No	User needs	Findings
3	Letter Report	The need for a letter reporting feature to facilitate monitoring and evaluation.
4	Information Accessibility	Users need quick and easy accessibility of information through the system.
5	Data security	The data of the letter must be kept secure so that it is not accessible by unauthorized parties.

Table 1 is the findings of observations and interviews with staff/officials of the Ministry of Religious Affairs of the City of Medan showing that there is an urgent need to improve the management of letters. Entry and exit arrangements, disposal of letters, reporting, rapid access to information, and data security are top priorities. It forms the basis in the design of a prototype letter information system that responds to the needs of the user. System Planning and Analysis is carried out to deepen the process of processing incoming and outgoing letters that are currently in progress to identify the problems and weaknesses of the system aimed at finding solutions through repairs with the system design in accordance with the needs to produce rapid and efficient management of arrivals and exits.

3.2 System Planning And Analysis

a) The running system

The procedures for managing the entry and exit letters that are running at the office of the Ministry of Religious Affairs of the City of Medan through several stages, among others :

1. Procedures for Entry Letters
   (a) The TURT case receives and reads the entry.
   (b) The staff investigates and sorts the entry
   (c) Then the staff records the entry in the agenda book
   (d) the staff makes a disposal sheet of the entry letter
   (e) The next staff keeps the physical file of the letter in the map.

2. Exit procedures
   a) TURT cases receive exit letters from their respective departments
   b) Staff gives an exit agenda number to the exit letter agenda book
   c) Subsequently staff records and saves the physical file out into the map

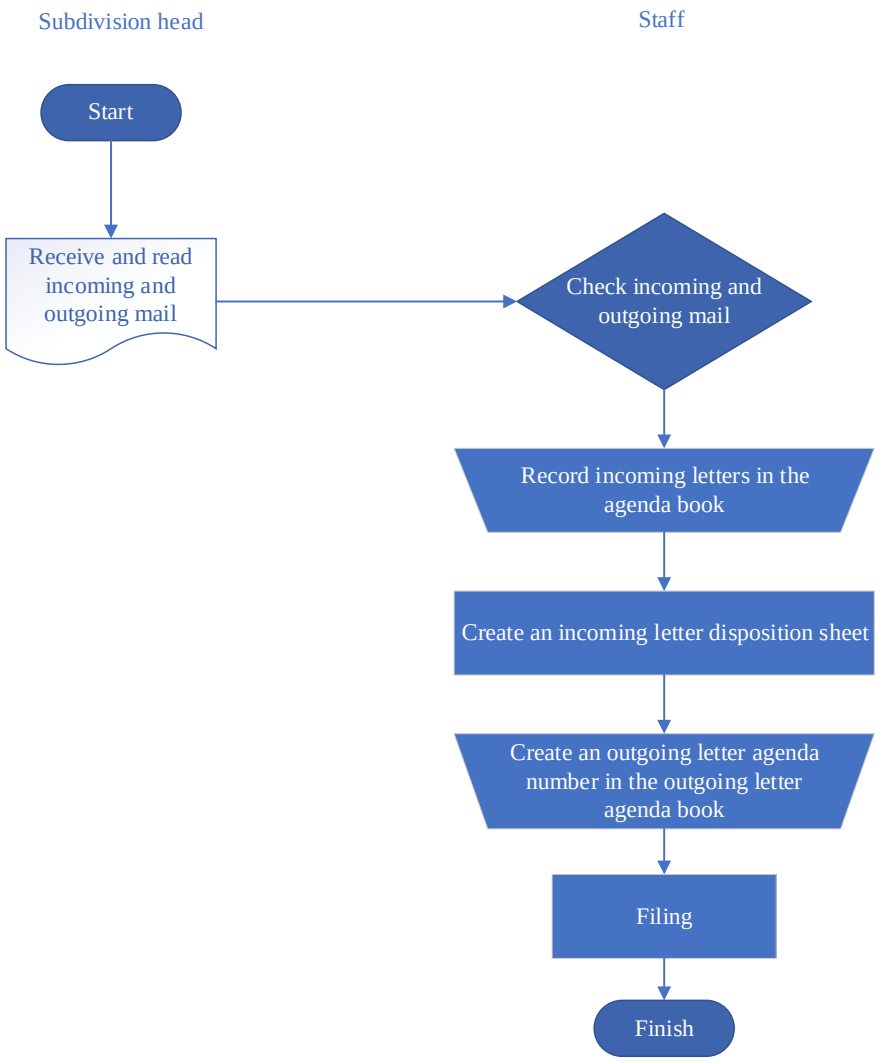

Figure 2. Flowmap of the Running System

Figure 2 is a flowmap of the running system that is still manual. Based on the results of the analysis of the system that runs the management of inbound and outbound letters that are running in the office of the Ministry of Religion of the City of Medan this running system has some weaknesses, namely:

a. Inefficient archive storage of inbound and outbound letters.
b. Difficult in searching inbox and outbox archives because you have not used an application program that supports according to your needs or you are still using a manual, as stored in a map.

b) Proposal system

Based on the results of running system analysis, it can be concluded that the analysis of archive management proposal system is dynamic, effective and efficient. The purpose of the design of an in- and out-mail archive information system is as follows:

1. Facilitating the management of incoming and outgoing letters.
2. Facilitating the archiving of incomes and outbound letters.
3. Facilitation of the search for incomes & outbounds files.
4. Facilitate the tracking of letters can be done quickly.

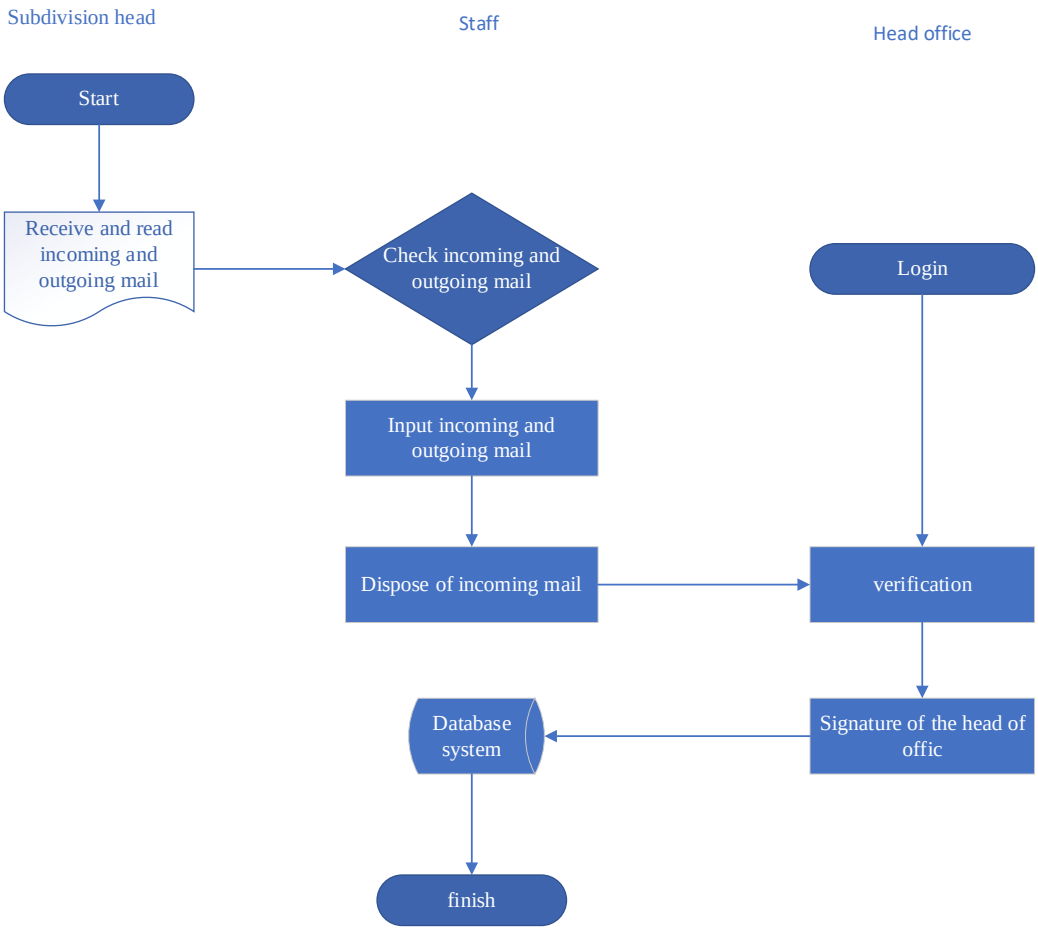

Figure 3. Proposal System Flowmap

Figure 3 is a flowmap of the system proposals that will be implemented later after the system is created and how the system itself works when implemented and implemented. As for the process flow of the proposal system, as follows:

1. The TURT staff receives and reads the inbox.
2. The staff examines the inbound/outbound letters.
3. The staff performs CRUDs on the system in addition to automatic requests on the outbound letter according to the classification of the letter.
4. The staff upload the file to the system as a backup file in order to facilitate the search for the letter or call with the disposition of the mail.
5. Then the Chief Office logs for the verification of the message.
6. After the chief office has verified the letter, then the next letter is in the TTD by the head of the office.

3.3 System Design

a) Use Case Diagram

Figure 4. Use Case Diagram

Figure 4 explains how the system is running as described in the new Use Case Digram on the information system of the government letter travel service and the filing of this leave has 2 access rights namely as an admin, and User or Officer.

b) Activity Diagram

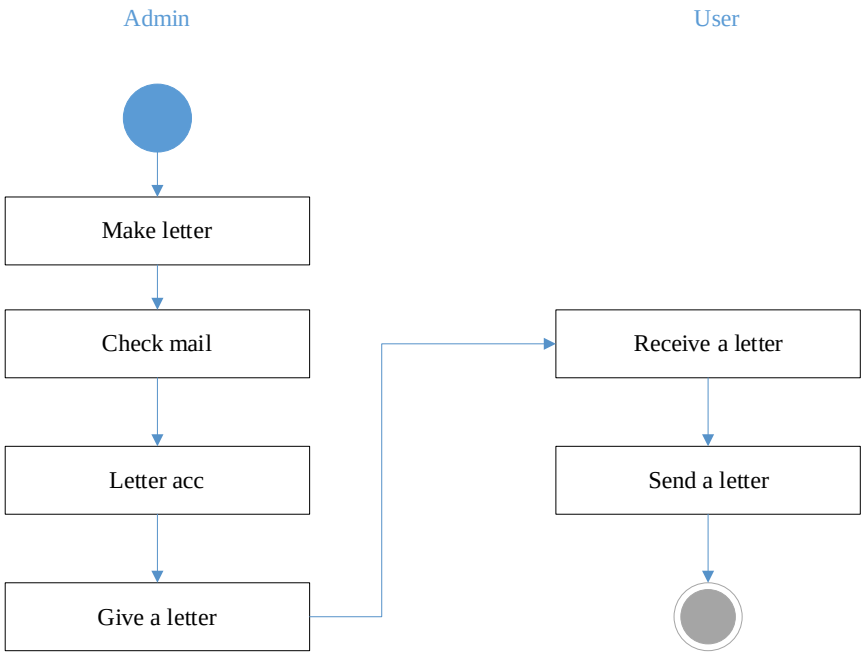

Figure 5. Activity Diagram

Figure 5 is an activity diagram of the E-Mail prototype design where between the admin and the user there are relationships to send and receive messages.

c) Sequence Diagram

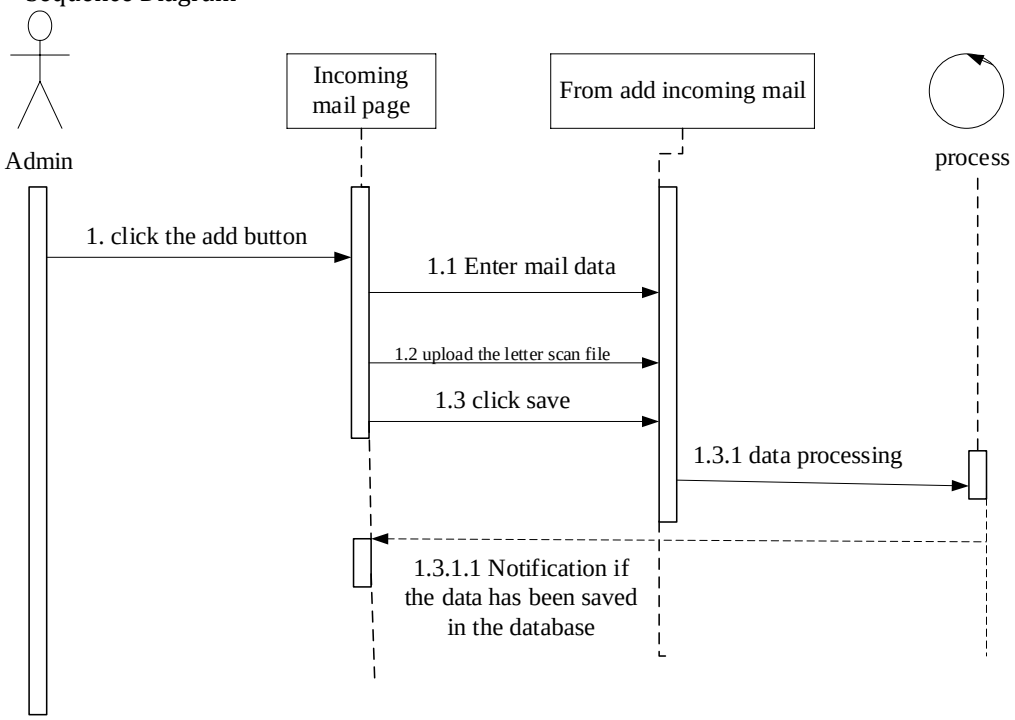

Figure 6. Sequence Diagram archives inbox

Figure 6 shows how the Sequence Diagram is in the inbox archiving. During this process, users interact with the system to ensure that the login is processed correctly and efficiently.

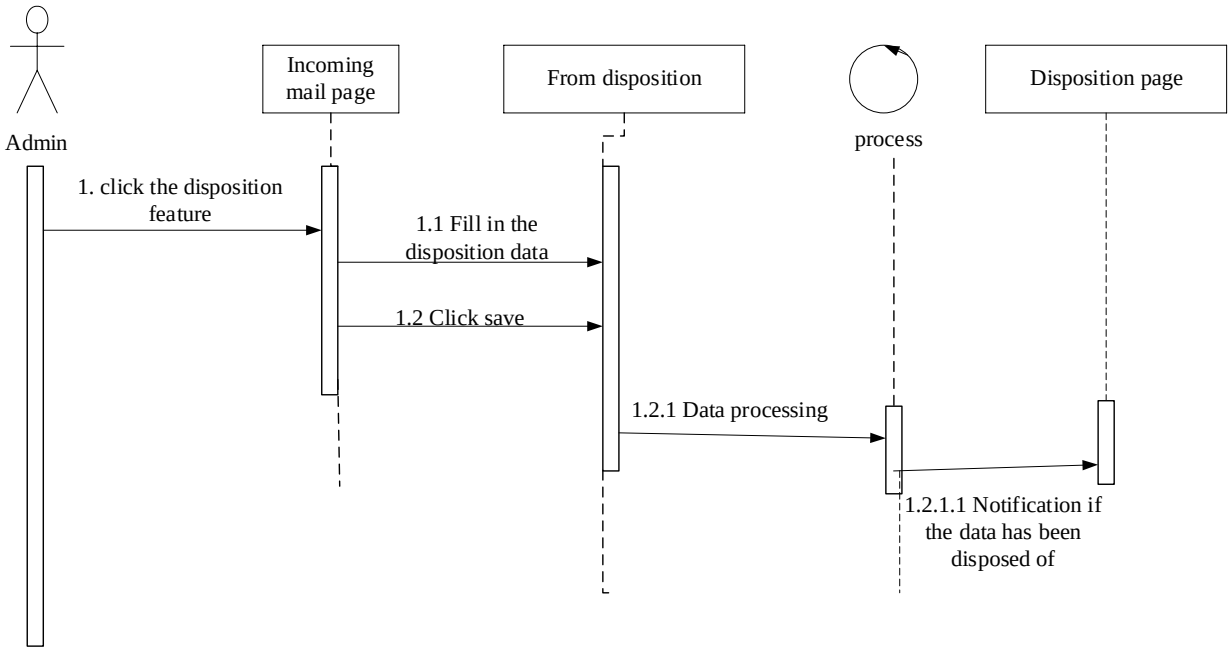

Figure 7. Sequence Diagram Makes Layouts

Figure 7 describes the process of making the disposal for the entry. The user, a superior or authorized officer, initiates the making of the disposition by selecting the corresponding letter.

3.4 System Implementation

System Implementation is the phase of translating the results of the analysis and design of this web-based letter information system into the PHP programming language. The analysis results are flowmaps of the proposed

system, flowcharts of the system, and data flow diagrams (DFDs) designed in the display of the letter information systems interface. In the implementation of the following is the design of the Interface display letter application:

1. Login Page

Figure 8. Login Page

In Figure 8 there is a login page that has been designed on the display pattern of the interface performed. Login is the initial view of the system that will be displayed to the user. Before entering the system page we must first log in by entering user name and password.

2. Dashboard Page/Initial Appearance

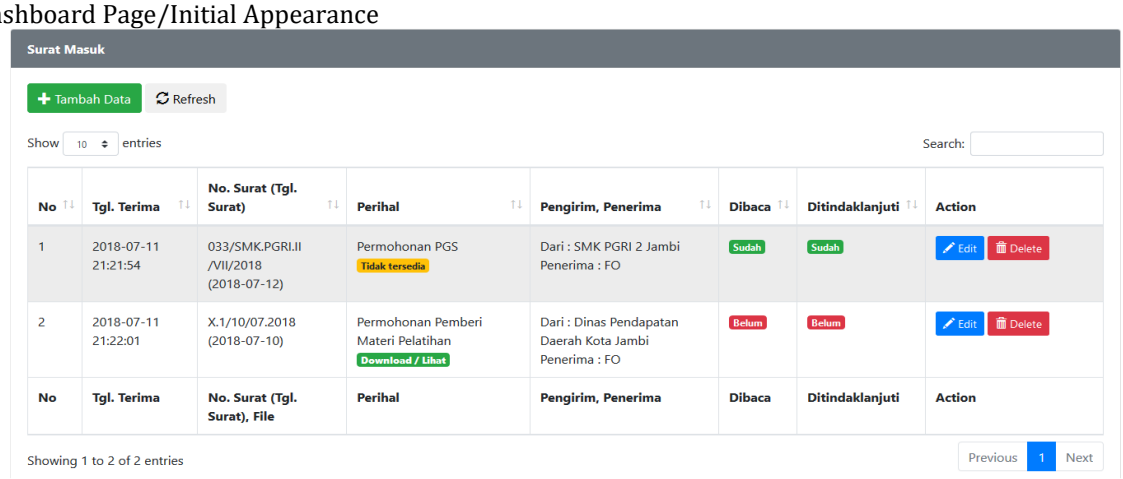

Figure 9. Home Page

Figure 9 is an overview of the start page view before entering the inbound and outbound data.

3. Viewing Inbox Forms and Arrangements

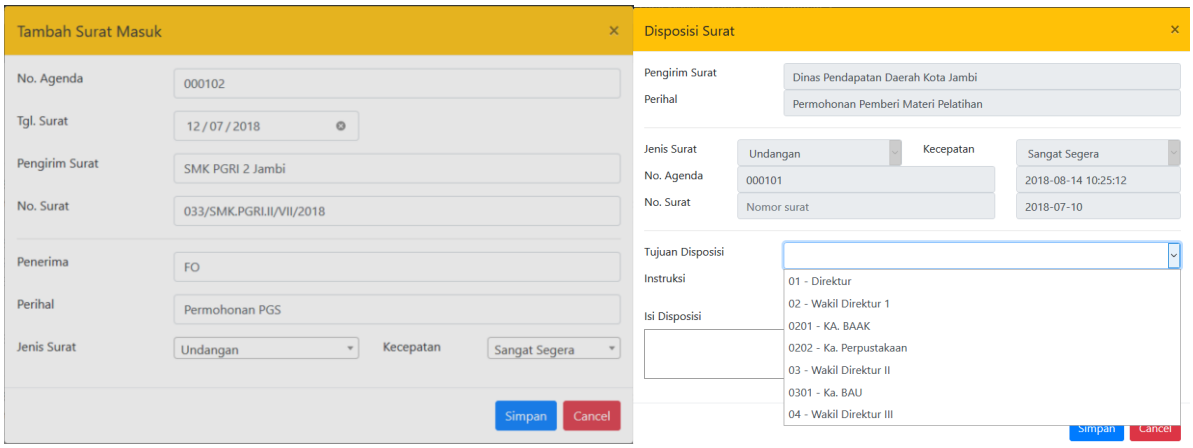

Figure 10. Input Page of Input and Arrangement

In Figure 10 is a display of the entry page of the mailing list and the disposition where this form serves to file and archive the mail, besides this display also provides the entry information of the archive at the Office of the Ministry of Religion of the City of Medan. The appearance of the inbox form is the same as in the picture.

4. Exit Letter View

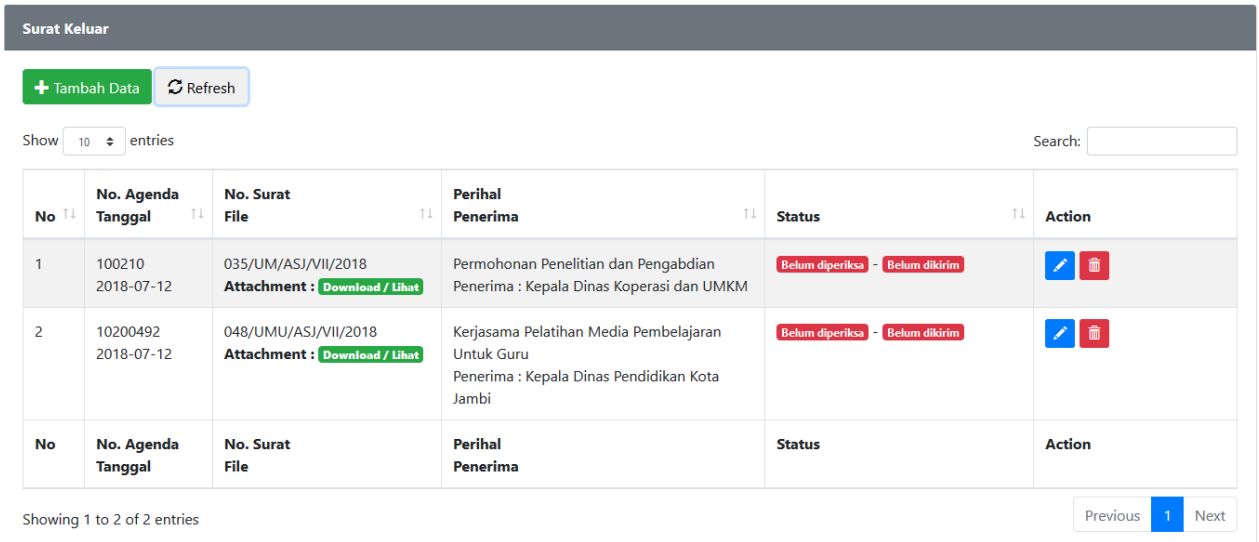

Figure 11. Exit Form Page

Figure 11 is a page of the exit form that has been created and designed.

3.5 System Evaluation and Validation

This phase is a process of testing or validating a system that is performed as planned whether or not the system will run later.

Table 2. System Testing

No	Tested Interface	Tested Interface Parts	Test Data	Expected results	Validation
1	Login	Login Form	- Username and password are correct - Username is incorrect - Password is incorrect	- Can't log in - Can't log in - Can't log in	According to expectations
2	Archive letters	Incoming/outgoing mail input form	- Complete all data - Leave one of the data blank	- Data saved - Validation error appears	According to expectations

No	Tested Interface	Tested Interface Parts	Test Data	Expected results	Validation
3	Disposition	Disposition Form	- Complete all data - Leave one of the data blank	- Saved disposition - Validation error appears	According to expectations
4	Print incoming mail report	Print report button	- Select date range - Without selecting date	- Display report - Display error message	According to expectations
5	Print outgoing mail report	Print report button	- Select date range - Without selecting date	- Display report - Display error message	According to expectations

Table 2 is a validation of the entry and exit test system above detailing the test process of some of the main features of the system including login, archiving letters, disposal of letters, and printing reports. Testing is done by entering valid and invalid test data for each feature, then the results are compared to the expected results. If the test results match the expected results then the feature is declared valid. For example, on a login test, a correctly entered username and password will result in a user being logged in, while an incorrect user name or password will not be able to log in. The same applies to testing other features to ensure that the system runs functionally as expected before the system is implemented.

Based on the validation table of the tests that have been carried out against the entry and exit system, the result is that the entire feature tested yields the expected results. (valid). It shows a web-based inbound and outbound information system designed, has been successfully implemented and works well. The system can be used by users to manage entries and exits, ranging from filing letters, disposal, to printing reports of letters, according to the needs of the Office of the Ministry of Religious Affairs of the City of Fields. With this system, mail management becomes faster, more effective and more efficient because it's already computerized online. In conclusion, the briefing information system built has been successfully implemented with results in line with expectations.

The interviews and observations revealed that staff at the Medan Religious Affairs Office require a system capable of systematically recording inbound and outbound mail, integrating disposition workflows, providing comprehensive reporting, ensuring rapid information access, and safeguarding data from unauthorized access. These requirements echo Ganiem et al.'s findings that digital-era information systems must prioritize adaptability, immediacy, and security to support organizational processes effectively [1]. Purba's study of BMKG archive management further demonstrates that replacing manual logs with a computerized system yields significant reductions in processing time and errors, particularly in government settings where data integrity is paramount [2].

Analysis of the existing manual workflow showed that physical archiving leads to inefficient searches and frequent misfiling. This mirrors the challenges documented by Damanik and Sarumaha in their case study of the Telukdalam Subdistrict Office, where manual mail handling resulted in prolonged retrieval times and organizational bottlenecks [5]. By contrast, the prototype's CRUD functionality combined with digital file uploads transforms the archive into a searchable database, enabling near-instant retrieval and streamlined mail tracking.

Adopting a prototype development methodology, as recommended by Hariyanto and Hardinata, facilitated early stakeholder engagement through UML artifacts such as use-case, activity, and sequence diagrams [6]. These visualizations clarified system interactions and helped detect design inconsistencies before implementation. The role-based access controls and encrypted credential storage incorporated into the prototype directly address the data security requirement and reflect best practices in secure web application design [4].

Validation through black-box testing confirmed that all core functions performed according to specifications under both valid and invalid input scenarios. This systematic testing approach aligns with Suminten et al.'s evaluation of a similar mail-management system at STAI Muhammadiyah, which achieved full compliance across functional test cases [17]. The positive test outcomes indicate that the prototype not only meets user requirements but also adheres to expected reliability and usability standards.

4. CONCLUSION

Based on the testing and analysis conducted on the web-based incoming and outgoing mail archiving information system at the Ministry of Religious Affairs Office in Medan, it can be concluded that a web-based system for archiving incoming and outgoing mail has been successfully designed and implemented using PHP

programming language and MySQL database. The built system is capable of managing incoming and outgoing mail data from recording, archiving, tracking, to reporting in a computerized and online manner. Through blackbox testing, all the main features of the system run properly according to the expected functionality, such as login, mail input, disposition, print reports, etc. The existence of this web-based incoming and outgoing mail information system makes the administration and management of mail more effective and efficient compared to the previous manual system. Overall, the built web-based incoming and outgoing mail information system has been successfully implemented and functions in accordance with the initial design purpose. Thus, it is proven that the application of a web-based information system can improve the effectiveness and efficiency of incoming and outgoing mail archive management at the Ministry of Religious Affairs Office in Medan.

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