

# Design and Development of a Web-Based Application for Managing Incoming and Outgoing Letters Using the Agile Methodology

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## ARTICLE INFO

### Article History

Received: 26 May 2025

Revised: 18 July 2025

Published: 29 August 2025

### Keywords

Agile

Mail Archiving

Mail Information System

SAKERA

Web-Base Application

## ABSTRACT

The management of incoming and outgoing correspondence in government institutions such as the Palesanggar Village Office is still carried out manually, leading to various problems such as delayed recording, difficulty in retrieving archived letters, and potential data loss. This study aims to develop a web-based Incoming and Outgoing Mail Information System to improve administrative efficiency and facilitate the archiving and reporting processes. Data were collected through direct observation, interviews with village officials, and literature review. The system development method used in this research is the Agile model, which consists of requirement analysis, system design, implementation, and testing phases. The result of this study is a web-based information system capable of recording, storing, and displaying data on incoming and outgoing letters in a structured manner and accessible to village staff. System testing shows that the application functions properly and is well received by users. The conclusion of this research is that the developed information system successfully addresses the issues of manual mail management and provides convenience and speed in archiving letter data at the Palesanggar Village Office.

## INTRODUCTION

Mail archives are documented records of correspondence, created and received by state institutions, local governments, educational institutions, companies, political parties, and community organizations, in various forms and media, in line with advancements in technology, information, and communication [1]. Archives not only serve as administrative evidence, but also function as tools for control and strategic support in decision-making. Therefore, systematic and efficient archive management is a fundamental necessity for both governmental and private institutions. Letters are a form of written communication used by senders to deliver messages or information to recipients [2]. With the advancement of information technology, digital archive management has become a modern solution that offers storage efficiency, ease of retrieval, and broader accessibility. The use of information systems in archiving reduces reliance on manual processes, minimizes the risk of physical damage, and increases the speed of archive distribution to relevant units. This system is particularly relevant for managing incoming and outgoing mail, which serves as the main official communication medium between departments within an institution.

The Sumenep Forestry Agency Branch, under the East Java Provincial Forestry Service, has an organizational structure that includes a unit dedicated to administrative affairs and correspondence services. Currently, the management of incoming and outgoing mail is still conducted manually. This manual process has resulted in delays in the distribution of documents, difficulties in locating and retrieving correspondence, and the buildup of

physical archives. These challenges pose a significant problem, especially considering that an efficient flow of information is essential for supporting effective bureaucratic performance and timely decision-making.

To address this need, this study aims to design and implement a web-based mail management information system capable of digitizing the archiving process. The Agile Development method is employed as the development approach because it offers the flexibility needed to address the dynamic and evolving requirements of the Sumenep Forestry Agency Branch. Given that the agency's administrative processes are still manual and subject to ongoing procedural changes, Agile allows for iterative development, continuous user feedback, and quick adaptation throughout the system's lifecycle. Unlike traditional methods such as the Waterfall model, which require fixed requirements from the start, Agile is better suited for environments where user needs and organizational workflows are still being refined during development. In addition, the system is equipped with an intelligent search feature based on the Tabu Search algorithm to optimize the speed and accuracy of document retrieval.

With the implementation of this system, it is expected that the administrative management of correspondence at the Sumenep Forestry Agency Branch will become more efficient, accurate, and digitally documented, thereby enhancing the quality of services and internal decision-making processes.

## METHOD

The research workflow begins with data collection and analysis to identify the needs of the Sumenep Forestry Agency Branch as the institution to fulfill the requirements for the development of SAKERA (*Surat Keluar Masuk Information System*). The next stage involves the development of the website, followed by a trial or testing phase. If the Sumenep Forestry Agency Branch provides feedback or revision requests, the website design and functionality must be updated accordingly. Once revisions are completed and the institution approves the developed website, the subsequent step is the preparation of the research documentation. This is followed by guidance from the academic supervisor, during which further revisions may be made if necessary.

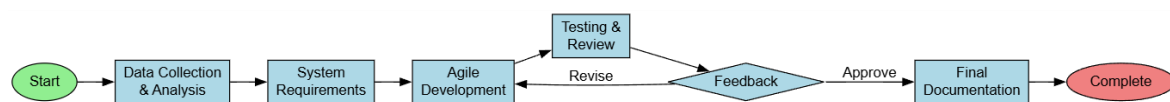


Figure 1. Research Flowchart

## Interview

This method is carried out through a one-way question-and-answer process conducted systematically and based on the research objectives. The interview was conducted directly with the authorized personnel at the Sumenep Forestry Branch Office to obtain information regarding the institution. Below is the interview with the administrative staff of the Sumenep Forestry Branch Office.

Table 1. Interview Questions

No	Category	Question	Answer
1	System Needs	What are the main challenges you often face in managing incoming and outgoing letters?	The process is tedious because we have to input letters one by one into Excel. Also, it's hard to find letters when archives are unorganized.

		What features do you consider most important for simplifying digital letter management?	Easy search for incoming/outgoing letters and sorting from the newest to the oldest.
2	Ease of Use	What should be done to make the system easy to use for all staff?	It should be simple and smooth. The interface should not be too complicated so that all staff can operate it.
		Do the staff have any experience using similar systems before?	No, we are still using a manual system with Excel.
		Do you need any special training to operate the new system?	No special training is needed, just a basic explanation will do.
3	Storage & Search Efficiency	Do you feel the current storage system is too large or difficult to manage?	Storage is fine, but using Excel is tiring and inefficient.
		How important is the quick document search feature for staff?	Very important to quickly find important documents when needed.
		Do you need document grouping based on certain categories?	Yes, for easier searching and neater organization by category or time.
4	AI Features (TabooSearch)	What is your opinion on using AI-based smart search features?	Very helpful. It simplifies document searching.
		In document search scenarios, what type of information is most frequently sought by staff?	Cooperation letters and staff assignment letters.
		Should the system provide automatic suggestions when searching documents?	Yes, so users are not confused during search.
5	Evaluation & Expectations	What are your expectations of this system in supporting letter management?	I hope it improves efficiency and speed. I expect quicker distribution, no missed letters, and full traceability.
		How can this system help improve staff work efficiency in your office?	It reduces manual work like document logging. Automating routine tasks helps minimize errors and ensures nothing is overlooked.

### Observation

This method is conducted by directly observing the document archiving process at the Sumenep Forestry Branch Office. Through observation, a clear understanding of the existing problems is obtained, which helps in finding solutions to resolve those issues.

### Documentation

This method involves collecting data at the Sumenep Forestry Branch Office regarding the problems encountered. The data collected includes records of incoming and outgoing mail.

## Literature Study

This step involves gathering supporting information or literature for the development of the incoming and outgoing mail information system using the agile development method. Therefore, the literature used consists of journals on similar topics, namely incoming and outgoing mail information systems and agile development methods. Thus, the obtained information can be directly utilized in building the mail information system.

## Agile Scrum

Agile is a software development approach characterized by rapid changes within a short period, providing flexibility to developers. Its core concepts are application development, team collaboration, and communication while minimizing documentation. It is suitable for small projects with small teams. The methods include Extreme Programming, Adaptive Software Development, DSDM, and Scrum. Its principles cover customer satisfaction, accepting changes even late in development, delivering results within weeks or months, having a trusted team, intensive communication, and focusing on software functionality[16]. The Agile method was chosen because it fits the needs of iterative projects that require quick adjustments based on user feedback and allows gradual and measurable system development within a limited institutional scope.

In developing the web-based incoming and outgoing mail information system at the Sumenep Forestry Branch Office, the system is developed using the Agile method. Agile itself is a type of short-term system development that also requires developers to quickly adapt to any changes. Agile software development involves several stages in building software. The following are the stages:

### 1. Product Backlog

At this stage, an interview is conducted between the Product Owner (researcher) and the stakeholder (administrative staff) to gather system requirements. The results of the interview are used to compile the Product Backlog, which is a list of system feature requirements. The product backlog can be seen in Table 2.

Table 2. User Stories and Product Backlog

No	User Story	Priority	Estimated Time (hours)	Description
1	As an admin, I want to create user accounts so that administrative staff can log into the system	High	6	User CRUD, registration form
2	As an admin, I want to manage user roles and permissions to ensure system security	High	8	CRUD roles and role permissions, access validation
3	As administrative staff, I want to input incoming mail data to archive it digitally	High	6	Input form, save to incoming_mail table, file upload
4	As administrative staff, I want to input outgoing mail data to record and store it properly	High	6	CRUD outgoing_mail, file upload
5	As administrative staff, I want to view the list of incoming and outgoing mail to manage them well	High	5	Table display, filter by mail type
6	As administrative staff, I want to search mail by number or date to quickly find documents	High	4	Simple search and grouping
7	As administrative staff, I want to edit or delete mail data in case of input errors	Medium	4	Edit and delete functions

8	As an admin, I want to view and manage page access rights so users have appropriate roles	Medium	5	Access middleware, permission management UI
9	As administrative staff, I want the system to be lightweight and not require large storage to be efficient	Medium	3	File size validation, database indexing
10	As a user, I want to log in using a username and password to access the system	High	5	Login authentication, session validation

## 2. Planning

The initial stage in the Scrum cycle begins with Sprint Planning, where the development team and stakeholders (in this case, the administrative staff) set the sprint goals and prioritize the features to be developed. The sprint duration is set to two work weeks, with a total estimated development time of approximately 50 hours. The main focus of the sprint is to build the system's core features, including user authentication, management of incoming and outgoing mail data, and user access control.

## 3. Sprint Execution

During the sprint execution, development activities are carried out based on the prepared product backlog. The implementation stages start with setting up login and user management, followed by building the incoming and outgoing mail modules, and then refining the list display and document search features. These functions are implemented using PHP programming language and a MySQL database. Daily Scrum meetings are held informally every morning to discuss daily progress, technical obstacles, and adjustments to the work plan.

## 4. Sprint Review dan Pengujian

After implementation is complete, a Sprint Review is conducted to demo the system to representatives of the administrative staff as end users. During this session, the main features are tested directly to ensure the system meets user needs, such as ease of searching letters, grouping, and uploading digital documents.

Following the review, system testing (software testing) is carried out, including functional testing of login features, CRUD for letters, and role-based access control. Non-functional testing is also performed to ensure system performance remains optimal despite limited storage usage.

## 5. Sprint Retrospective

The retrospective stage is conducted to evaluate the work process during the sprint. Successfully identified aspects include smooth integration between modules and the ease with which the administrative staff adapted to the system interface. Meanwhile, the challenge encountered was the file size limitation during document uploads, which was promptly addressed by setting upload size limits and implementing file compression. Lessons learned from this sprint are used to improve efficiency and quality in the subsequent sprint.

## 6. Documentation

As part of the final process, comprehensive documentation is created for the developed system. The technical documentation includes the database structure, program flow, user access rights, and the application directory structure. Additionally, user documentation is prepared to assist the administrative staff in operating the system, including guides for login, inputting mail data, and using the search feature. The program flow will be illustrated with an activity diagram.

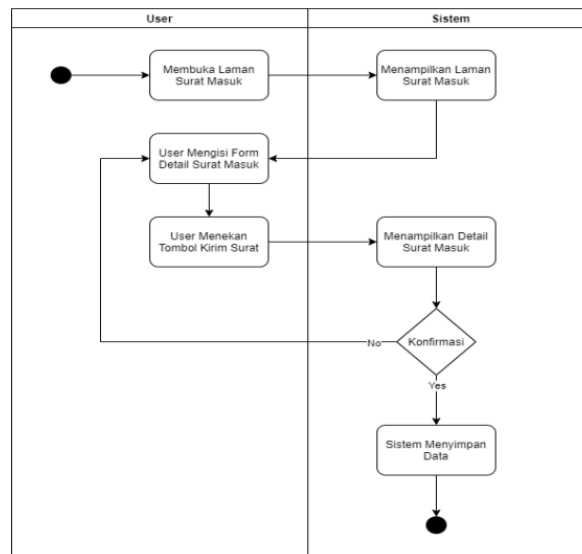


Figure 2. Activity Diagram of Incoming Mail Archiving

This describes the steps to perform the incoming mail activity after the user successfully logs in. After logging in, the user will see several menu options on the homepage, one of which is the option to record incoming mail. After selecting the incoming mail menu, the user will be directed by the system to the incoming mail data entry page, where the user can directly input the data within the website. After entering the data, the system will display the details of the incoming mail information entered by the user and ask for confirmation whether the information is correct. Once the user confirms, the system will save the incoming mail data recorded by the user. The outgoing mail activity is performed for archiving outgoing mail with the aim that the incoming mail to the institution can be well managed and a systematic archiving system is established. Below is the activity diagram for outgoing mail.

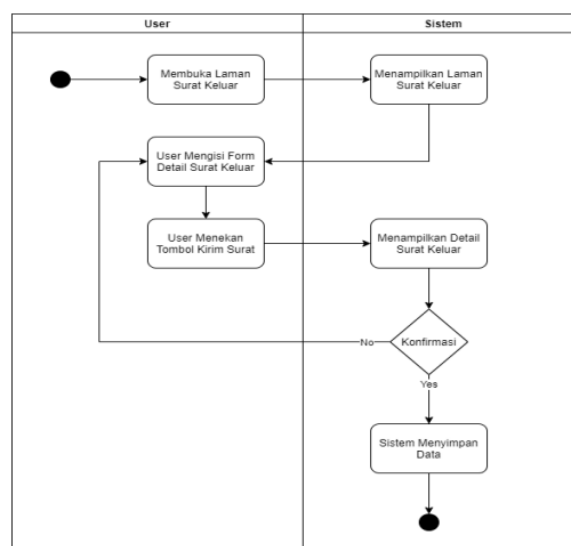


Figure 3. Activity Diagram of Outgoing Mail Archiving

This describes the steps to perform the outgoing mail activity, which is largely similar to the incoming mail process, starting after the user successfully logs in. After logging in, the user will see several menu options on the homepage, one of which is the choice to record outgoing mail. After selecting the outgoing mail menu, the user will be directed by the

system to the outgoing mail data entry page, where the user can directly input the data within the website. After entering the data, the system will display the details of the outgoing mail information entered by the user and request confirmation whether the information is correct. Once the user confirms, the system will save the outgoing mail data recorded by the user.

### Use Case Diagram

The mail archiving system has many features, some of which can be seen in the following diagram.

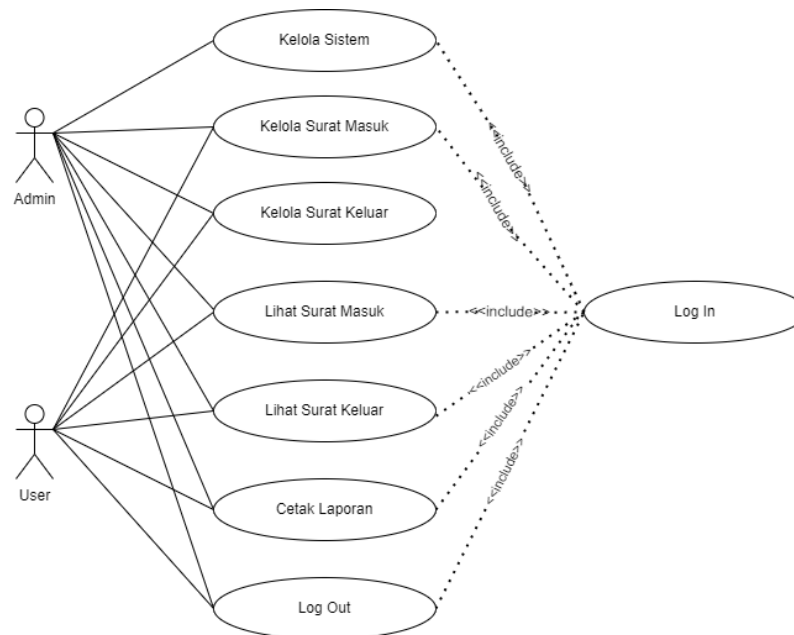


Figure 4. Use Case Diagram of Incoming and Outgoing Mail Information System

As shown in the image, the incoming and outgoing mail processes involve uploading the incoming mail to the website and entering related information such as the mail number, date, sender, and others. This activity involves actors consisting of the admin and users who are the website users at the Forestry Branch Office of Sumenep Regency.

### Conceptual Data Model

Figure 5 shows the use of a Conceptual Data Model (CDM) to describe in detail the database structure in a logical form. This structure is independent of any specific software or data storage used within the website. The CDM consists of objects that are not directly implemented in the actual database.

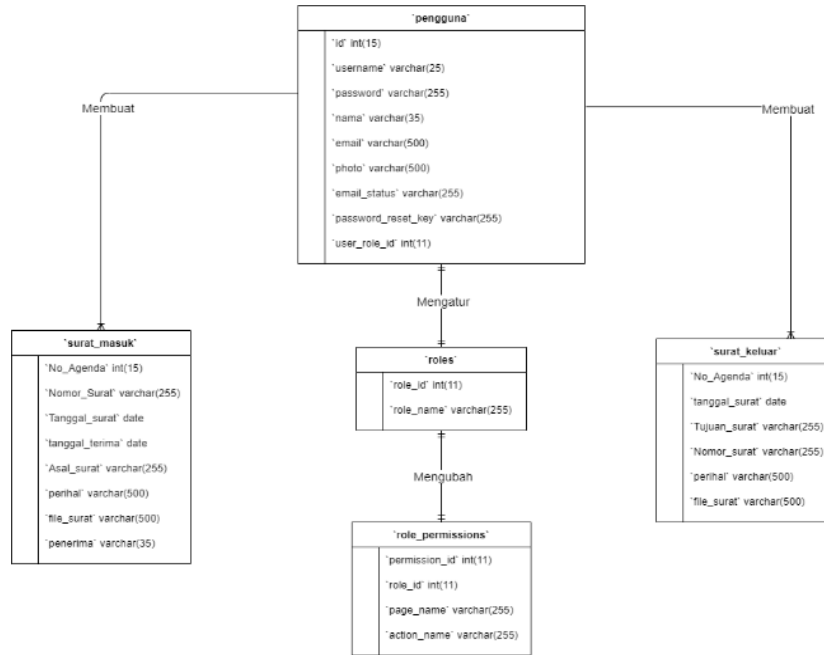


Figure 5. Conceptual Data Model

## RESULTS AND DISCUSSION

After understanding the procedures used in the research, the next step is to apply the research methods and present data supporting the research findings. The results are divided into the implementation of the wireframe design, the implementation of the wireframe into the UI, and the implementation of the Tabu Search feature. UI is the visual part of UX, including elements such as buttons, icons, typography, themes, and layouts to facilitate user interaction. Meanwhile, UX focuses on designing a pleasant experience that meets user needs. High fidelity design refers to a design with a high level of similarity to the final product, making it suitable for evaluation due to its complete visual details. In this project, the design process proceeds from wireframe to high fidelity design for the front-end portion.

### 1. High Fidelity Login

The login form includes the following elements:

- Search icon and title: "User Login"
- Input field: "Username Or Email" with a user icon
- Input field: "Password" with a search icon
- Form controls: "Remember Me" checkbox and "Reset Password?" link
- Action button: "Login" with a search icon

Figure 6. High Fidelity User Login

### 2. High Fidelity Registrasi

The registration form includes the following elements:

- Title: "Add New Pengguna"
- Form fields: "Username" (with asterisk), "Password" (with asterisk and strength indicator), "Nama" (with asterisk), "Email" (with asterisk), "Photo" (with upload instructions), and "User Role Id" (with asterisk and dropdown menu)
- Action button: "Submit" with a search icon

Figure 7. High Fidelity Registration

### 3. High Fidelity Home Dashboard

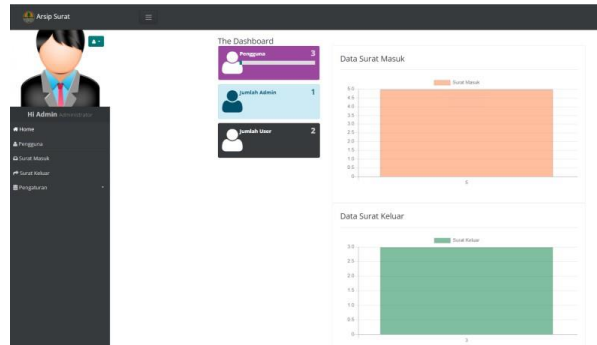


Figure 8. High Fidelity Home Dashboard

### 4. High Fidelity Surat Masuk

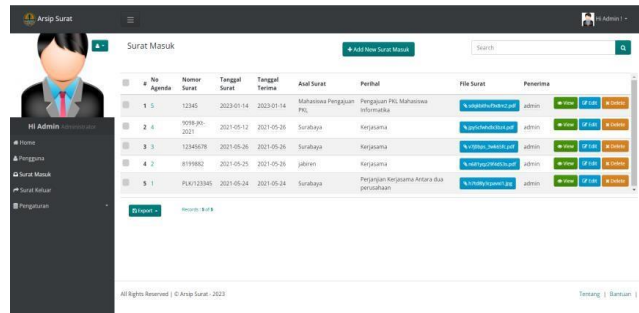


Figure 9. High Fidelity Incoming Mail

### 5. High Fidelity Surat Keluar

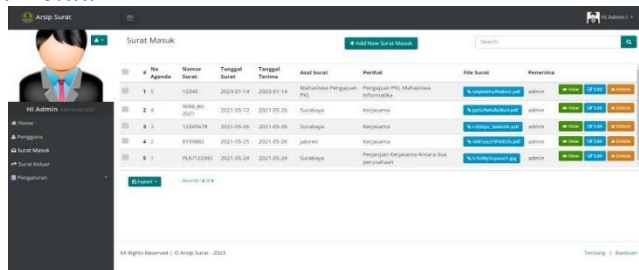


Figure 10. High Fidelity Outgoing Mail

### 6. High Fidelity Detail Pengguna

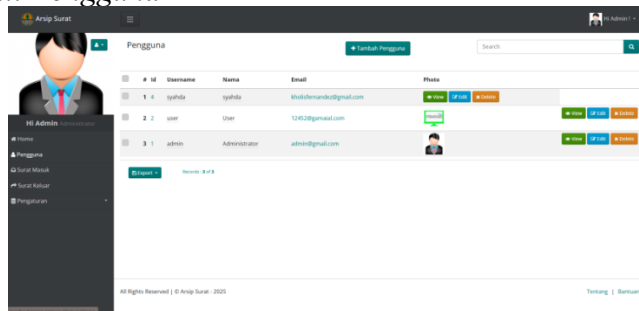


Figure 11. High Fidelity User Details

### 7. High Fidelity Pengaturan (Wewenang)

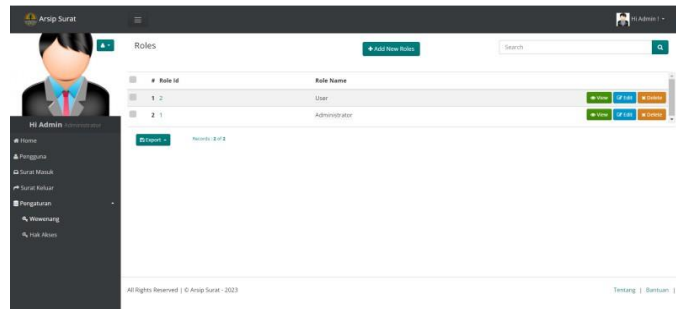


Figure 12. High Fidelity Settings (Permissions)

8. High Fidelity Pengaturan (*Hak Akses*)

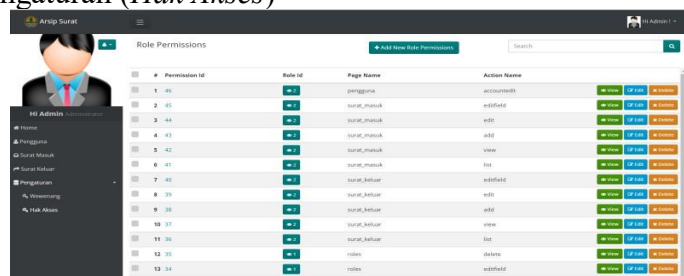


Figure 13. High Fidelity Settings (Access Rights)

**System Testing and Evaluation**

The incoming and outgoing mail information system is tested incrementally using an iterative approach within the Agile methodology. Testing is conducted at the end of each sprint to ensure that the functionality meets user requirements. Each developed feature is tested using various testing types, such as black-box, functional, integration, usability, and regression testing.

Table 2. Blackbox Testing Results

No	Tested Feature	Test Scenario	Input	Expected Output	Status
1	User Login	Login with valid username & password	admin / 123456	Successfully logged into dashboard	Passed
2	User Login	Login with invalid credentials	admin / wrongpassword	Error message "Login failed"	Passed
3	Registration	Register a new account with complete data	Complete registration form	Account successfully created	Passed
4	Incoming Mail Input	Add a new incoming mail record	Incoming mail data	Mail saved in database	Passed
5	Outgoing Mail Input	Add a new outgoing mail record	Outgoing mail data	Mail saved in database	Passed
6	Mail Search (Tabu Search)	Search mail with keyword	"Cooperation Agreement"	Relevant mail results displayed	Passed
7	Admin/User Access Rights	Admin can edit mail, user can only view	Login as Admin/User	Access rights according to roles	Passed
8	Logout	Click logout button	-	User redirected to login page	Passed

**Evaluation Based on Feedback**

The evaluation was conducted together with the administrative staff through demo sessions and brief interviews at the end of the sprint. Users gave special appreciation for the Tabu Search-based search feature because it speeds up archive searching compared to the

manual method. Some development suggestions, such as document preview and search history features, were noted and added to the backlog for the next sprint.

Success Indicators — The system is considered successful if:

1. The main features (login, incoming/outgoing letters, search) function properly.
2. No major bugs are found.
3. The search using Tabu Search proves to be faster.
4.  $\geq 80\%$  of users express satisfaction through an internal survey.

### Testing Documentation

Each test is documented in a spreadsheet log. Bugs are classified by severity level and addressed in the following sprint to ensure accountable development.

### Results of Using the Agile Approach

The Agile development methodology was chosen for this study due to its adaptability to dynamic environments such as the Sumenep Forestry Branch Office. Traditional approaches like the Waterfall model, which require fixed requirements from the beginning, are less effective in institutions where administrative workflows and user needs frequently change. Agile allows for incremental development, regular feedback, and continuous collaboration between developers and end-users, making it a suitable choice for developing an information system tailored to actual field conditions.

The system development was carried out in iterative sprints, each consisting of planning, development, testing, and review phases. At the end of each sprint, the prototype was evaluated with the administrative staff to gather feedback. One of the key outcomes of adopting Agile was the flexibility to adjust system features based on real-time input, such as the request for an intelligent document search using the Tabu Search algorithm and improvements in the user interface to enhance usability.

The use of Agile had several positive impacts, including faster bug fixing, higher user satisfaction, and a more responsive system that met actual administrative needs. It also encouraged active user participation throughout the development cycle. However, challenges included the need for constant communication between developers and users, the time constraints of each sprint, and technical issues such as large file uploads, which were resolved through compression and validation mechanisms. Overall, Agile proved to be an effective and responsive approach for this project.

## CONCLUSION

The results of Black Box testing cover twenty-four main features of the Incoming and Outgoing Letter Information System, including user login and registration, management of incoming and outgoing letters, user management, and access rights and authority settings. The test results show that all these features work well and meet expectations. During testing, no significant errors or failures were found, indicating a high level of system stability and reliability. Every test scenario produced results of “Successful” and “Compliant,” demonstrating that the system meets the specified functional requirements. Therefore, the system is considered suitable for use in the workplace, especially at the Forestry Branch Office of Sumenep Regency.

## REFERENCES

- [1] L. Gustina dan A. T. Hidayat, “Manajemen Kearsipan Tenaga Kependidikan Dalam Meningkatkan Layanan Administrasi Di Sma Majalaya Putra Kabupaten Bandung,” *Jurnal Pendidikan Indonesia : Teori, Penelitian, dan Inovasi*, vol. 1, no. 1, 2021, doi: 10.59818/jpi.v1i1.18.
- [2] S. Addin, "Jurnal Mitra Manajemen (JMM Online)," *Jurnal Mitra Manajemen*, vol. 5, no. 10, pp. 718–735, 2022.

- [3] A. G. Pradini dan A. Sudradjat, "Sistem Informasi Pengarsipan Surat Kantor Desa Berbasis Web," *Information Management for Educators and Professionals*, vol. 5, no. 2, hlm. 1–10, 2021.
- [4] L. N. Aini dan F. I. Pratama, "Sistem Informasi Pengarsipan Surat Berbasis Web pada Perumda Air Minum Tirta Moedal Kota Semarang," vol. 4, no. 2, hlm. 152–157, 2022.
- [5] D. D. Arizal, "REKOMENDASI PENENTUAN HARGA BAHAN DAN JASA PEMBANGUNAN RUMAH MENGGUNAKAN ALGORITMA TABU SEARCH," 2021.
- [6] M. Surahmanto, R. Soekarta, dan Arpandi, "Rancang Bangun Sistem Laporan Kedatangan Dan Keberangkatan Kapal Nelayan Berbasis Website (Studi Kasus Kantor Syahbandar Pelabuhan Perikanan Kota Sorong)," 2024.
- [7] D. Febrian Wabula, D. Febrian Wabula, dan M. I. Mustaqim, "Perancangan Pelayanan Surat Berbasis Android," 2022.
- [8] M. Aswiputri dan K. Penulis, "LITERATURE REVIEW DETERMINASI SISTEM INFORMASI MANAJEMEN: DATABASE, CCTV DAN BRAINWARE," vol. 3, no. 3, 2022, doi: 10.31933/jemsi.v3i3.
- [9] I. P. Sari, F. Qathrunada, N. Lubis, dan T. Anggraini, "Attribution-ShareAlike 4.0 International Some rights reserved Sistem Informasi Perancangan Sistem Absensi Pegawai Kantoran Secara Online pada Website Berbasis HTML dan CSS."
- [10] A. I. Disusun *dkk.*, "ARTIKEL Penerapan Sistem Manajemen Basis Data."
- [11] P. F. Laravel *dkk.*, "PEMANFAATAN FRAMEWORK LARAVEL DAN FRAMEWORK BOOTSTRAP PADA PEMBANGUNAN APLIKASI PENJUALAN HIJAB BERBASIS WEB," *Jurnal Media Infotama*, vol. 18, no. 1, hlm. 2022.
- [12] A. Dendi Rachmatsyah, B. Isnanto, S. Hadi Saputro, E. Helmud, dan A. Amir AlKodri, "Pelatihan Pembuatan Web Dengan PHP Dan WordPress Pada SMA Negeri 4 Pangkalpinang."
- [13] M. S. Ariantini dan A. M. Dirgayusari, "Implementasi Metode Tabu Search Dalam Penjadwalan Menggunakan Analisa Pieces," *INFORMAL: Informatics Journal*, vol. 6, no. 2, hlm. 62, 2021, doi: 10.19184/isj.v6i2.23811.
- [14] T. Arianti, A. Fa'izi, S. Adam, M. Wulandari, dan P. ' Aisyiyah Pontianak, "PERANCANGAN SISTEM INFORMASI PERPUSTAKAAN MENGGUNAKAN DIAGRAM UML (UNIFIED MODELLING LANGUAGE)," 2022.
- [15] K. ' Afifah, Z. Fira Azzahra, A. D. Anggoro, D. Redaksi, R. Akhir, dan D. Online, "Universitas Negeri Jakarta; Jl. Rawamangun Muka Raya No.11 RW.14 Rawamangun," *JURNAL INTECH*, vol. 3, no. 1, hlm. 8–11.
- [16] D. J. K. Putra dan P. F. Tanaem, "Perancangan Aplikasi Pembukuan Menggunakan Metode Agile Scrum," *Jurnal Teknik Informatika dan Sistem Informasi*, vol. 8, no. 3, Des 2022, doi: 10.28932/jutisi.v8i3.5060.