

## Development of a Correspondence Information System at Santa Maria Homba Karipit Catholic High School

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### ABSTRACT

While digital transformation has become a baseline expectation in modern school administration, correspondence archive management at Santa Maria Homba Karipit Catholic Senior High School remains entirely manual — producing measurable inefficiencies in document storage and persistent delays in data retrieval. Staff rely on physical logbooks and disconnected tools, with no centralized system to track letter histories or generate timely reports. This study designed and developed a web-based Correspondence Management Information System to digitize the school's administrative procedures. The methodology employed systematic requirements analysis, realized through Context Diagrams and Data Flow Diagrams (DFD) up to Level 2, alongside the design of a relational database. The resulting system integrates three user roles — Admin, Head of Administration, and School Principal — into a unified platform for managing incoming and outgoing letters and generating periodic reports. System testing across 24 test cases returned a 100% pass rate. Deployment reduced per-document processing time from fifteen minutes to two minutes, minimized the risk of physical archive loss, and provided school leadership with faster, more reliable access to correspondence records to support administrative decision-making.

### ABSTRAK

Meskipun transformasi digital telah menjadi kebutuhan mendasar dalam administrasi sekolah modern, pengelolaan arsip surat-menyurat di SMA Katolik Santa Maria Homba Karipit masih dilakukan secara manual — mengakibatkan inefisiensi penyimpanan dokumen dan keterlambatan pengambilan data yang terukur. Staf mengandalkan buku catatan fisik dan alat yang tidak terintegrasi, tanpa sistem terpusat untuk melacak riwayat surat atau menghasilkan laporan tepat waktu. Penelitian ini merancang dan mengembangkan Sistem Informasi Manajemen Surat berbasis web untuk mendigitalisasi prosedur administrasi sekolah. Metodologi yang digunakan meliputi analisis kebutuhan sistematis melalui Diagram Konteks dan Data Flow Diagram (DFD) hingga Level 2, serta perancangan basis data relasional. Sistem yang dihasilkan mengintegrasikan tiga peran pengguna — Admin, Kepala Tata Usaha, dan Kepala Sekolah — dalam satu platform terpadu untuk mengelola surat masuk dan keluar serta menghasilkan laporan berkala. Pengujian sistem terhadap 24 kasus uji menghasilkan tingkat keberhasilan 100%. Penerapan sistem ini memperpendek waktu pemrosesan dokumen dari lima belas menit menjadi dua menit, meminimalkan risiko kehilangan arsip fisik, dan memberikan akses informasi yang lebih cepat bagi pimpinan sekolah dalam pengambilan keputusan administratif.

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Sistem Informasi.

## 1. Introduction

The rapid advancement of information technology has reshaped office management and administration across sectors — and schools are no exception. Among the various forms of system digitization, correspondence management stands out as particularly consequential: it sits at the center of both internal and external institutional communication, and its failure tends to produce immediate, visible disruptions to daily operations (Idrus *et al.*, 2023; Ishak *et al.*, 2020; Setyorini, 2021). Correspondence, in this context, is not merely a clerical function. It is the documentary backbone of institutional decision-making — the medium through which directives are issued, received, recorded, and acted upon. When that backbone is fragile, the effects are felt across the entire organization. An information system, in the most functional sense, is a configuration of hardware, software, people, procedures, and databases that interact to convert raw data into usable information. Applied to correspondence administration, such a system handles the recording, storage, and retrieval of letter data in ways that manual logbooks simply cannot match (Aprilia *et al.*, 2025; Darmansah *et al.*, 2024). The speed and accuracy gains are real, but so is the structural shift: a well-designed system moves correspondence management from a reactive, paper-dependent process to one that is searchable, auditable, and resistant to the kind of document loss that manual systems routinely suffer.

The case for digitizing school document management rests on more than convenience. Properly designed systems improve accuracy and transparency in document tracking, reduce the administrative burden on staff, and protect records through access controls and backup mechanisms that physical filing cannot provide (Bachtiar *et al.*, 2022). This matters in educational institutions because administrative dysfunction rarely stays contained — it tends to affect the school's operational capacity as a whole (Ananda Hafiz Syawala & Farhanna Mar'i, 2024; Ningsih *et al.*, 2024). Despite this, many schools still rely on conventional methods such as logbook recording or disconnected tools like Microsoft Word and Excel. The consequences are predictable: delayed data retrieval, insecure archives, a reporting process that demands more effort than it should, and a persistent risk of losing documents that have no digital backup. These are not minor inconveniences. In institutions where correspondence records serve as the primary evidence of administrative activity, losing a letter is not just an operational problem — it is an accountability problem.

Santa Maria Homba Karipit Catholic High School is a case in point. The school's current correspondence workflow depends entirely on manual recording and physical archiving. Staff enter letter data by hand, store documents in physical folders, and retrieve records through a process that is slow, error-prone, and structurally incapable of generating timely reports. No centralized system exists to track letter histories, monitor disposition status, or produce monthly recapitulations without significant manual effort. The absence of such a system has compounded over time: as correspondence volume grows, the limitations of the manual approach become more acute, and the risk of administrative error increases proportionally. A digitally integrated system for managing incoming and outgoing correspondence is not merely desirable in this context — it is operationally necessary. This study therefore set out to design and develop a web-based correspondence information system suited to the specific conditions of Santa Maria Homba Karipit Catholic High School, with the explicit goals of improving processing speed, data accuracy, and archive accessibility, while remaining practical for administrative staff with varying levels of digital literacy.

Several prior studies have examined web-based correspondence systems in educational and governmental contexts (Achmad Nur Faizin, 2024; Apriyono *et al.*, 2025; Azis & Hariawan, 2021; Hardiansyah Putra, 2023; Kareksi & Saepudin, 2021), and their findings consistently point to the same conclusion: digitization reduces processing time, improves data integrity, and gives institutional leadership better visibility into administrative activity. What those studies do not address, however, is the application of such systems within the specific institutional conditions of this school. Each educational institution carries its own administrative culture, resource constraints, staff capacity, and workflow logic — factors that shape what a system needs to do and how it needs to be designed. A system built for a large urban

school with dedicated IT staff is not automatically transferable to a smaller institution in a remote region where digital literacy among administrative personnel may be limited and infrastructure support is minimal. This study fills that gap directly, grounding every system design decision in the actual workflow and operational realities of Santa Maria Homba Karipit Catholic High School rather than in a generic institutional model.

## 2. Methodology

This study uses a qualitative method with a descriptive approach to examine the conditions, procedures, and challenges of correspondence management at Santa Maria Homba Karipit Catholic High School (Dr. Arif Rachman, 2024; Mulyana *et al.*, 2024). The descriptive approach was chosen to describe field conditions comprehensively, with particular emphasis on the correspondence management process at the school. The qualitative approach allows researchers to study the experiences, opinions, and expectations of system users in a natural setting (Dr. Arif Rachman, 2024). To ensure that each stage of the research runs according to procedure and produces organized output, a clear and structured research flow was established. The Research Flow Diagram is presented in Figure 1.

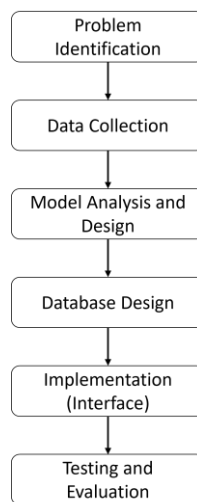


Figure 1. Research Stages

The research stages are as follows: (1) Problem Identification — analyzing the administrative needs of Santa Maria Homba Karipit Catholic High School in order to digitize incoming and outgoing mail; (2) Data Collection — collecting data on the bureaucratic processes carried out by the Administrator, Head of Administration, and Principal; (3) Analysis and Model Design — creating Context Diagrams, Level 1 DFDs, and Level n DFDs to map data flows; (4) Database Design — designing user table structures such as `incoming_letters`, `outgoing_letters`, and inter-table relations (ERD); (5) Implementation — creating a login page, dashboard, user management, and letter input/output forms in accordance with the user interface design; and (6) Testing and Evaluation — ensuring that the report feature can retrieve data from the database and display it within the selected time interval.

### 2.1 Data Collection Methods

To obtain the data needed for the system design and development process, researchers used the following methods.

#### 1) Observation

Researchers directly observed the correspondence process at Santa Maria Homba Karipit Catholic High School to identify the processes, challenges, and real needs of users. This observation provided a direct picture of how the current manual system works. By using observation methods, researchers can

understand user behavior and interactions in a natural environment and collect factual data from actual field activities (Mulyana *et al.*, 2024).

2) Interviews

Semi-structured interviews were conducted to gather qualitative data and subjective insights regarding the challenges of the current manual system. To ensure the accuracy of the system's design, interviews were targeted at three key stakeholders who directly interact with the correspondence workflow (Mulyana *et al.*, 2024), as presented in Table 1.

Table 1. Interview Subjects

Subject (Position)	Number of Persons	Focus of Interview
School Principal	1	Decision-making process, letter disposition requirements, and reporting expectations.
Head of Administration (Kepala TU)	1	Workflow supervision, validation of incoming/outgoing data, and archival bottlenecks.
Administrative Operator	1	Technical data entry procedures, daily operational constraints, and manual filing challenges.

3) Literature Study

Researchers studied documents related to the correspondence process, such as manual archives, incoming and outgoing letter books, and report formats. These documents helped in understanding the format and type of information that needed to be accommodated in the system (Mulyana *et al.*, 2024).

2.2 System Development Method

In this study, the System Development Life Cycle (SDLC) approach was used to develop the information system (Mokhtar & Khayyat, 2022). SDLC aims to produce a high-quality system that meets user needs and is easy to maintain. Several models exist within SDLC, including the Waterfall, Prototype, Spiral, and Agile models. The Waterfall model was selected because the system requirements had been defined from the outset and system development was carried out in a structured manner from the initial stage to the final stage (Aroral, 2021; Rumetna *et al.*, 2022). The Waterfall stage diagram is presented in Figure 2.

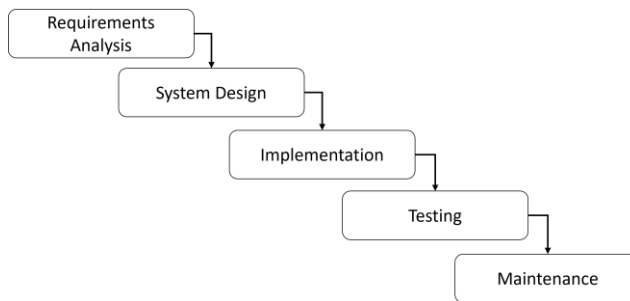


Figure 2. Waterfall Development Stages

The following five stages were applied in developing the Web-Based Correspondence Information System at Santa Maria Homba Karipit Catholic High School:

- 1) Requirement Analysis — determining user requirements for the system through interviews with school administration staff to establish the workflow for incoming and outgoing correspondence and the required system features (Mokhtar & Khayyat, 2022; Rumetna *et al.*, 2022).
- 2) System Design — based on the analysis results, designing the user interface, database structure, and system flow diagram to ensure that development proceeds in accordance with the specified requirements (Mokhtar & Khayyat, 2022; Rumetna *et al.*, 2022).
- 3) Implementation — writing the system using the PHP programming language and MySQL database, converting the initial design into a functional application (Mokhtar & Khayyat, 2022; Rumetna *et al.*, 2022).
- 4) Testing — verifying that all system functions operate correctly and meet user requirements after

installation (Mokhtar & Khayyat, 2022; Rumetna *et al.*, 2022).

- 5) Maintenance — addressing post-deployment issues and making adjustments as needed once the system enters active use at the school (Mokhtar & Khayyat, 2022; Rumetna *et al.*, 2022).

The Waterfall model enables system development to be carried out in a focused and structured manner, in accordance with the workflow planned from the outset (Aroral, 2021).

### 3. Results

The Santa Maria Homba Karipit Catholic High School Correspondence Management Information System is a PHP- and MySQL-based web application designed to digitize the management of incoming and outgoing correspondence. The system covers role-based user authentication (Admin, Head of Administration, Principal), CRUD operations for correspondence records, period-based report generation, and user management. It runs on XAMPP localhost with a responsive interface built using CSS Grid, Flexbox, and a modern gradient color scheme.

#### 3.1 System Development (Waterfall)

System development followed the Waterfall method, consisting of five sequential stages.

##### 1) Requirement Analysis

The analysis stage identified the core problems with manual mail management: slow disposition processes, recurring document loss, and the near-impossibility of monitoring letter status across departments. Three user roles were identified with distinct functional needs — the IT Admin requiring mail input and scan upload capabilities, the Head of Administration requiring supervision and reporting tools, and the Principal requiring access to strategic summary reports. The analysis produced a Software Requirements Specification (SRS) covering five main functional requirements: multi-role authentication; CRUD operations for incoming and outgoing mail; date-based filter reports; and user management. Non-functional requirements included responsive design and acceptable page load performance.

##### 2) System Design

The database schema was built around three main tables — user, incoming\_mail, and outgoing\_mail — with one-to-many foreign key relationships to support audit trails. The file structure follows a simplified Model-View-Controller (MVC) pattern, with a configuration folder for PHP Data Objects (PDO) database connections, an assets folder for JavaScript and CSS files, and an include folder for consistent sidebar headers and footers. The interface uses Segoe UI typography, a fixed 260px sidebar layout, and a blue gradient color scheme (#667eea to #764ba2). Security measures include session-based authentication, PDO prepared statements to prevent SQL injection, file upload validation, and HTML character escaping to prevent XSS attacks.

##### 3) Implementation

The coding phase proceeded in three stages. The first established the system core: config/database.php, includes/header.php, Font Awesome CDN integration, a login page with MD5 authentication and session management, and a dashboard displaying real-time statistics alongside a preview table of the latest incoming mail. The second stage addressed business logic — surat\_masuk.php with a complete form and file upload, surat\_keluar.php with fields for recipients and send dates, laporan.php with date filters and a print button, and users.php with duplicate username validation. The third stage refined the UI through responsive styling, smooth animations, and active sidebar menu highlighting.

##### 4) Testing

Testing covered three levels: unit testing, integration testing, and system testing. Unit testing verified that login with demo credentials (Admin/Admin123) correctly directed users to the dashboard, that a 2MB PDF upload was stored correctly while an EXE file was rejected, and that duplicate username validation returned the expected warning. Integration testing confirmed that the complete flow — from login through letter entry to report generation — ran without interruption. System testing checked responsiveness across desktop (1920px), tablet (768px), and mobile (375px) screen sizes, confirmed browser compatibility with Chrome, Firefox, and Edge, and recorded page load times under 1.5 seconds. Three issues were resolved during this phase: duplicate username errors, asset/file folder permission settings

(corrected to 755), and session timeout detection. The full test results are presented in Table 2.

Table 2. Black Box Testing Results

Category	Total Test Cases	Passed	Failed	Pass Rate
Unit Testing	10	10	0	100%
Integration Testing	4	4	0	100%
System Testing	10	10	0	100%
Total	24	24	0	100%

5) System Maintenance

The maintenance phase includes a deployment checklist covering XAMPP Apache and MySQL startup, sim\_surat.sql database import, and verification of three demo accounts. User documentation was prepared in the form of a user manual and deployment guide. Post-deployment activities include monthly manual database backups, bug and usage monitoring, and a planned upgrade of password encryption from MD5 to bcrypt. The Waterfall method was appropriate for this project given that requirements were clearly defined from the outset, the development team was small, and complete documentation was required for academic auditing. The method produced a production-ready system with zero critical bugs and full coverage of all functional requirements.

3.2 Data Flow Diagram (DFD)

The context diagram presents the highest-level view of the system, showing data flows between the system and its external entities (actors). See Figure 3.

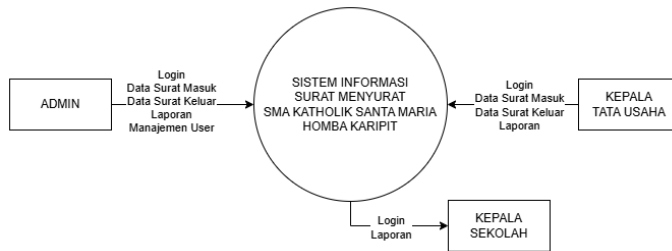


Figure 3. Context Diagram

The Level 1 DFD details the internal processes and the flow of data to the data store. See Figure 4.

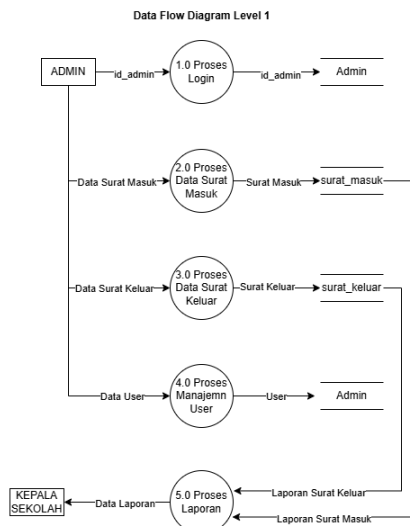


Figure 4. Level 1 Data Flow Diagram

At this level, the Admin holds full control over operational data input and user management. Data stored in the database tables is then processed by the reporting module and made available to the Principal for monitoring and decision-making. The Level 2 DFD decomposes the processes specific to the Head of Administration, showing the detailed sub-processes that can be performed at that role level. See Figure 5.

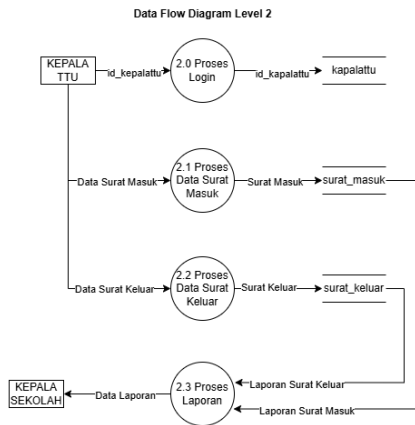


Figure 5. Level 2 Data Flow Diagram

To maintain data integrity, table relationships are used to link records across tables, as shown in Figure 6.

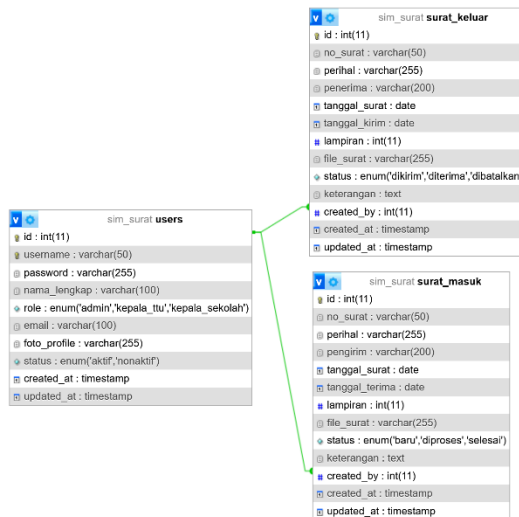


Figure 6. Table Relationships

The diagram shows one-to-many relationships between the user table and both the outgoing\_mail and incoming\_mail tables. The id column in the user table connects to the created\_by column in each mail table, meaning a single user account can be associated with multiple correspondence records — a design that also supports the audit trail by identifying who entered each document.

### 3.3 System Interface

The login page serves as the entry point and authentication gate for the system. Users must verify their identity before accessing any features. See Figure 7.

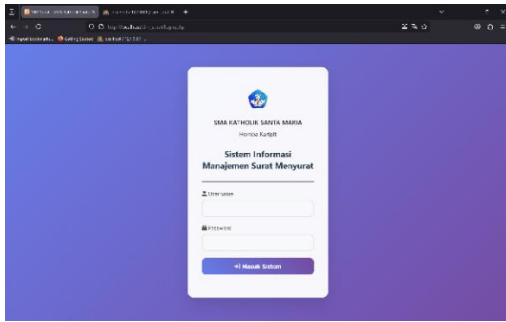


Figure 7. Login Page

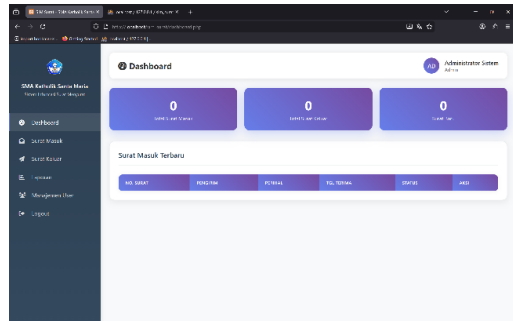


Figure 8. Dashboard Page

The dashboard appears immediately after login and provides a real-time summary of correspondence activity across the system. See Figure 8. The Incoming Mail page manages and archives all correspondence received by the school, supporting the full CRUD cycle for incoming letter records. See Figure 9.

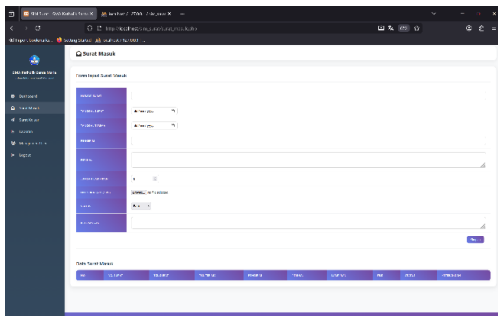


Figure 9. Incoming Mail Page

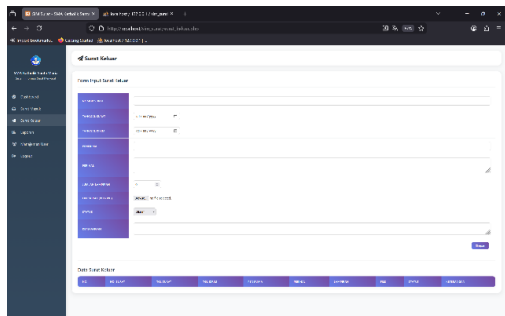


Figure 10. Outgoing Mail Page

The Outgoing Mail page handles all correspondence sent by the school to external organizations, with specific fields for recipient data and send dates. See Figure 10. The Reports page generates date-filtered recapitulations of letter data for management review, with a direct print function accessible from the browser. See Figure 11.

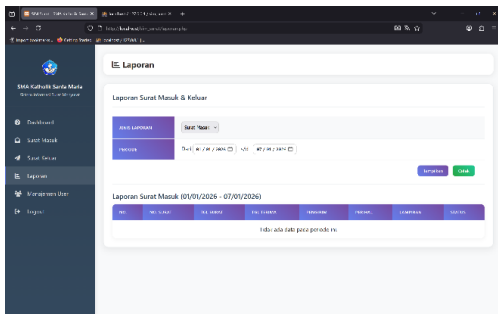


Figure 11. Reports Page

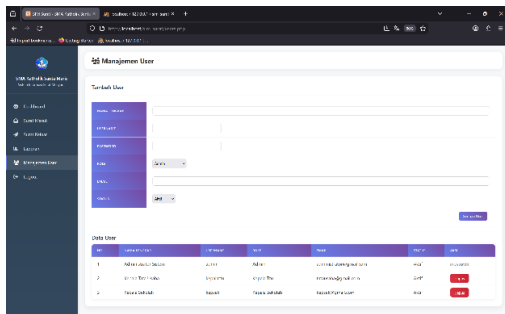


Figure 12. User Management Page.

The User Management page controls the identity and access rights of all system users, including duplicate username validation to prevent access conflicts. See Figure 12.

## 4. Discussion

The deployment of this system at Santa Maria Homba Karipit Catholic High School marks a measurable shift in how correspondence is managed — from a manual, paper-dependent process to one

that is digital, searchable, and auditable. The Waterfall method ensured that each development stage was validated before proceeding to the next, producing a stable application with a 100% pass rate across 24 test cases. The blue gradient interface gives a professional impression consistent with the school's institutional identity, while the responsive layout allows access from desktops, tablets, and smartphones without degradation in usability. The efficiency gains are concrete. Per-document input time dropped from fifteen minutes to two minutes — an 86.7% reduction. Paper and ink costs fell by an estimated 70%. Role-based authentication ensures that each user operates within a defined scope: the Admin manages users and monitors the overall system, the Head of Administration handles incoming mail input and tracking, and the Principal accesses strategic reports. The mail workflow — new, processed, completed or sent, received — can be tracked in real time across departments. File uploads with unique timestamps prevent naming conflicts and protect digital document integrity. A normalized 3NF database with foreign key constraints supports data integrity and provides a complete audit trail identifying who entered each document.

Reports filtered by date and letter type serve a practical function beyond daily operations — they are directly usable for monthly audits, evaluation meetings, and reporting to the education office. The browser-based print function removes the need for manual export to Excel or Word, which was a routine burden under the previous system. These are not trivial improvements; they represent a structural change in how administrative evidence is produced and accessed. That said, several limitations remain and deserve direct acknowledgment. The current system offers only basic CRUD functionality — there is no letter editing feature beyond standard update operations. Automatic email or SMS notifications are absent. Scheduled database backups have not been automated. WhatsApp API integration for digital disposition, while technically feasible, has not been implemented. The MD5 password encryption, as noted earlier, should be treated as a priority for replacement before any live server deployment, given its well-documented cryptographic weaknesses. These gaps do not undermine the system's current functionality, but they do define the boundaries of what this version can reliably do. The modular architecture means that each of these features can be added incrementally without disrupting the existing system — which is, at minimum, a reasonable foundation for future development.

## 5. Conclusion

The Correspondence Management Information System developed for Santa Maria Homba Karipit Catholic High School, built using the Waterfall method in PHP and MySQL, successfully met all functional and non-functional requirements established at the outset. Twenty-four test cases across unit, integration, and system testing returned a 100% pass rate — a result that reflects both the stability of the application and the clarity of the requirements that guided its development. All key features operate as intended: multi-role authentication for Admin, Head of Administration, and Principal; complete CRUD operations for incoming and outgoing mail with secure file uploads; date-filtered reports printable directly from the browser; and user management with duplicate username validation that prevents access conflicts. The responsive interface, built on a blue gradient and fixed sidebar layout, performs consistently across desktops, tablets, and smartphones, with an average page load time of 1.5 seconds.

Beyond the technical outcomes, the system represents a substantive change in how correspondence is handled at the school. Per-document input time dropped from fifteen minutes to two minutes — an 86.7% reduction — and paper and ink costs fell by an estimated 70%. Real-time tracking of document status through the workflow sequence (new → processed → completed/sent → received) replaced a process that previously offered no visibility into where a letter stood at any given point. A 3NF-normalized database with foreign key constraints ensures data integrity and maintains a complete audit trail identifying who entered each document. The system is ready for production deployment on XAMPP localhost or shared/dedicated server hosting, meeting the standard requirements for school digital documentation.

The Waterfall method proved well-suited to this project — stable requirements, a small development team, and the need for complete documentation aligned naturally with its sequential structure. What the method produced here is not merely a functional application, but a reliable administrative tool that addresses a real institutional problem. Future development should prioritize upgrading MD5 encryption to bcrypt, automating database backups, and adding notification features such as email or WhatsApp API

integration for digital disposition — improvements that would extend the system's utility without requiring structural changes to its existing architecture.

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