ISSN 2278-3091
Volume 15, No.1, January – February 2026
International Journal of Advanced Trends in Computer Science and Engineering
Available Online at http://www.warse.org/IJATCSE/static/pdf/file/ijatcse011512026.pdf
https://doi.org/10.30534/ijatcse/2026/011512026

Hybrid Web-Based Letter and Document Management System for Saint Columban College

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Received Date: December 10, 2025 Accepted Date: January 18, 2026 Published Date: February 06, 2026

ABSTRACT

The Hybrid Web-Based Letter and Document Management System for Saint Columban College (Web-LDMS) was developed to address the inefficiencies in the manual processing of institutional correspondence at Saint Columban College in Pagadian City, Philippines. The Traditional paper-based routing of documents results in delays and document misplacement. The lack of visibility in tracking document progress. The Web-LDMS presents a digital process through organized templates, an approval hierarchy, secure document archiving, validation of the QR codes, and real-time tracking. Office heads, secretaries, faculty, and administrators will be able to efficiently create, revise, and approve letters, as well as monitor them, through a centralized digital platform. The system was tested in accordance with the recommendations of the Waterfall Model and IEEE software engineering standards, and it performed very well in terms of various attributes as outlined in the ISO/IEC 25010 Software Quality Model. The analysis shows that this system can enhance accountability, reduce paper usage, and assist the institution in achieving its digital transformation objectives.

Key words: Document Management, Workflow Automation, Approval System, QR Code Verification, Web-based System, Institutional Communication.

1. INTRODUCTION

Academic institutions must rely on effective communication processes that can facilitate effective decision-making, transparency, and documentation. However, even today, a number of organizations continue to use manual and paper-based systems for document routing, which results in misplaced documents, sluggish approvals, and insufficient visibility of document status as they travel between offices [1], [6]. The same is true at Saint Columban College (SCC), where letters must be physically transported from the originating unit to office heads, then to vice presidents, and finally to the Office of the President. The paper-based workflow outdoors results in long processing times, high paper usage, and low accountability [8], [14].

The lack of digital tracking also makes operations problematic, since employees will not be able to monitor the status of the documentation they provided effortlessly. Paper sorting by secretaries and office staff makes work more difficult, adds to the reasons for a bottleneck, and increases the possibility of human error [11], [13]. As academic institutions worldwide adopt the process of automation and sustainability, the implementation of a Web-Based Letter and Document Management System is required in SCC [10], [2].

In this study, the researcher proposes the Hybrid Web-Based Letter and Document Management System for Saint Columban College (Web-LDMS), which aims to simplify the process of letter creation, multi-level approval routing, centralized archiving, and verification of authenticity by using QR codes. Traditional document systems have been demonstrated to be considerably less efficient in operation, more prone to error, and lack traceability and institutional communication-friendly in comparison with digitized workflow [7], [3], [12].

The Waterfall Model was used to develop the system, enabling a well-structured and disciplined development and implementation process. The quality of the system was measured based on ISO/IEC 25010, which prioritizes usability, functionality, reliability, and security criteria commonly used in the assessment of modern software solutions [5], [9], [4]. A similar investigation also demonstrates that E-Systems are far more efficient than paper-based processes in academic settings, which confirms that SCC must be converted into digital document management [8], [15].

The subsequent sections of this paper present the system design, methodology, implementation results, and evaluation findings based on expert and end-user assessments.

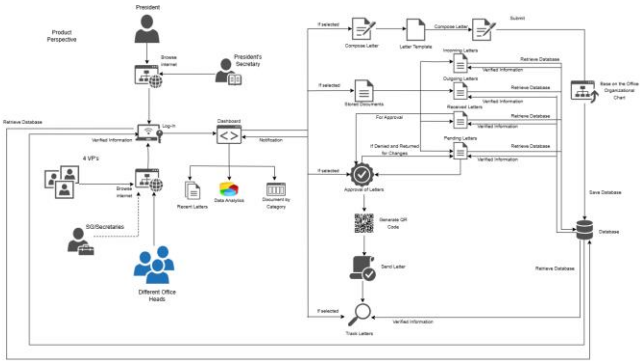

Figure 1: Product Perspective Diagram showing how employees and system components.

Figure 1 illustrates The Product Perspective Diagram of the Web-Based Letter and Document Management System for Saint Columban College shows how users (employees at Saint Columban College) and system components interact to manage and track letters. The Employees log in through their dashboards to view recent letters, analytics, and notifications. The system enables users to write, send, and follow letters according to the organization's hierarchical structure. The system is designed to change the status of pending, approved, or revised. After approval, a QR code is generated for verification, and all the information is stored in a central database. This structure will provide an efficient, semi-paperless, and organized document management and communication within the offices.

2. METHODOLOGY

2.1 Research Design

Web-LDMS was developed based on the Waterfall Model. The model was chosen because it is structured and systematic in software development. The waterfall model as a research design entails successive and consecutive advancement of specific phases, like a falling waterfall. Moreover, the software engineering standards of IEEE (Institute of Electrical and Electronics Engineers) were used in the development process. These are requirements analysis, design, coding, testing, and documentation standards. The adherence to IEEE recommendations guaranteed the high quality of the developed system, reliability, and maintainability. The Waterfall process model used in this paper is based on a sequential software process model, which entails requirements gathering, planning, design, implementation, testing, deployment, and finally, maintenance as depicted in Figure 2.

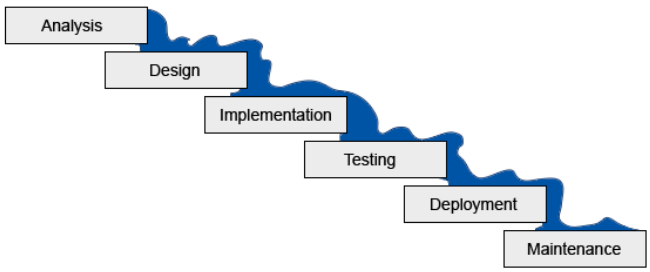

Figure 2: Process Model

Furthermore, to assess the quality of the developed system, the researchers utilized the ISO/IEC 25010 Software Product Quality Model. The system was evaluated by both IT experts and institutional end-users, focusing on these key attributes:

2.1 Functional Suitability: How well the system performs letter management functions;
2.2 Performance Efficiency: System responsiveness and resource usage;
2.3 Compatibility: Interoperability across browsers and institutional networks;
2.4 Usability: User-friendliness for administrative staff and office heads;
2.5 Reliability: Stability and error-handling during usage;
2.6 Security: Protection of institutional documents and access control;
2.7 Maintainability: Ease of updating and enhancing the system;

2.2 Technical Specifications

A. The system was built using modern web technologies to ensure scalability, security, and user-friendliness:

- Frontend: HTML5, CSS3, JavaScript, Tailwind CSS
- Backend: PHP
- Database: MySQL
- Additional Features: QR code generation, role-based access control, automated notifications
- Hosting: Local institutional server
- Users: Administrators, Office Heads, Secretaries, Faculty Staff, President's Office

2.3 Other Recommendations

This can be improved in the future with the addition of a digital signature feature to facilitate official approval, such as the clearance and accomplishment report, and automatic recognition of irregular systems to easily identify the documents.

These upgrades will also make the system more user-friendly, enabling the college to reach the objective of having an entirely digital administrative workflow.

3. RESULTS

The Web-Based Letter and Document Management System was developed using the waterfall software development model and adhered to the IEEE software engineering standards. The stages of development are as follows:

3.1 Review

This phase involved a thorough analysis of the manual letter processing system currently in use at Saint Columban College. The team conducted interviews and observation of administrative personnel, faculty, and office heads, and found out several of the essential needs, such as: hierarchical processes of approval, templates used to create the letter, real-time monitoring, QR code verification, and safe archiving of documents. It was documented in terms of both functional requirements (user authentication, document routing, status tracking) and non-functional requirements (security, performance, usability).

3.2 Planning

The planning stage set the project goals and resource distributions as well as risk management approaches. Software Project Management Plan (SPMP) was created, presenting task schedules, team roles (Project Manager, System Developer, Quality Assurance), and contingency plans. The plan served as a guideline during the project's lifecycle, and it was reviewed on a regular basis to suit new needs.

3.3 Design

The design stage was crucial in developing the overall structure and functionality of the **Web-Based Letter and Document Management System of Saint Columban College**. In a place-based system development, the emphasis was on converting project requirements into a concise and well-structured system blueprint.

3.3.1 Technical Specification

The Web-Based Letter and Document Management System, in the case of Saint Columban College, comprises major components. The first one is a secure web-based portal to which all users have access to the system. The required hardware includes institutional equipment, such as office desktop computers, laptops, and network-connected printers and scanners.

The Faculty and Staff are the main end-users because they are the ones who write and submit official letters and documents via the system. The review, approval, or rejection of these documents is conducted by approvers who are the heads of departments, Deans, Vice Presidents and the College President through a hierarchical workflow. The Secretary of the Office of the President performs the functions of a central router and notary, controlling the final steps, such as verifying the QR code and number code. Lastly, the System Administrator (typically the College IT or MIS unit) is the primary supervisor of the system, responsible for user account management, system settings, and the institutional reports created.

The following components also act as the fundamental building blocks of the system.

- Presentation Layer: Responsive web interface using HTML5, Tailwind CSS, JavaScript
- Application Layer: PHP-based business logic handling workflow management
- Data Layer: MySQL database for secure data storage
- Security: Role-based access control, session management, input validation

3.3.2 Use Case Diagram

A use case diagram illustrates the functional requirements and user interactions with a system from the perspective of its end users. Its primary aim is to provide a straightforward, high-level summary of how users interact with the system.

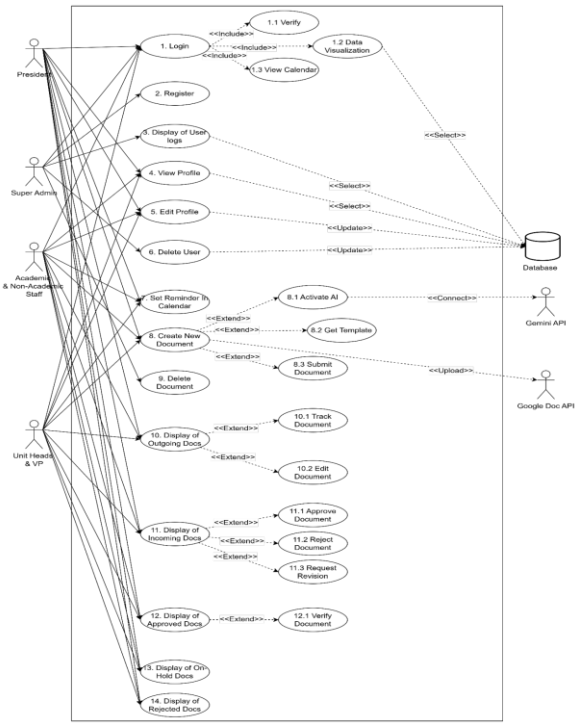

Figure 3: Use Case Diagram showing the interactions between employees, administrators, and office recipients.

Figure 3: The Use Case Diagram of the Web-Based Letter and Document Management System for Saint Columban College shows how the system interacts with its main users: Employees, Administrators, and Office Recipients. Employees can create, send, and track letters, view their outgoing submissions, and receive reviews. Administrators and office recipients can view incoming letters, acknowledge or respond to them, and archive documents for record-keeping.

The system also handles automatic functions such as sending notifications and updating the status of each letter. Overall, the diagram illustrates how the system streamlines communication by providing a centralized and paperless way to manage institutional letters and documents.

3.3.3 Interface Design

The interface design is an important aspect of the system development. It has the visual components arranged in a way that gives the best user interaction, like buttons, input fields, and a navigation menu to enhance the overall user experience. The primary goal of the interface design is to offer an easy and friendly experience, where the layout is readable and visually pleasing. The design is a graphical user interface (GUI) that users interact with to carry out activities or access system features.

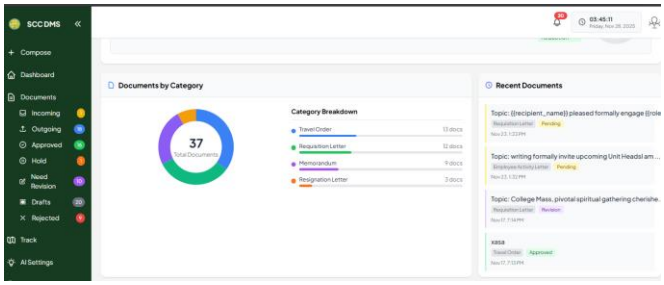

Figure 4: Document Composer and Tracker Dashboard showing the main interface used for creating, monitoring, and managing institutional documents

Figure 4 illustrates the "Document Composer & Tracker" Dashboard serves as the primary hub for creating, managing, and tracking all official correspondence. The interface is normally split into two key sections: a navigation sidebar where users can view various document states (e.g., Incoming, Outgoing, Approved, Drafts) and a main content area where one can see a real-time view of document statistics and the latest activity. It allows users to easily write new letters, view the status of existing documents, and distribute documents by type, thereby simplifying the entire document life cycle, from creation to archival.

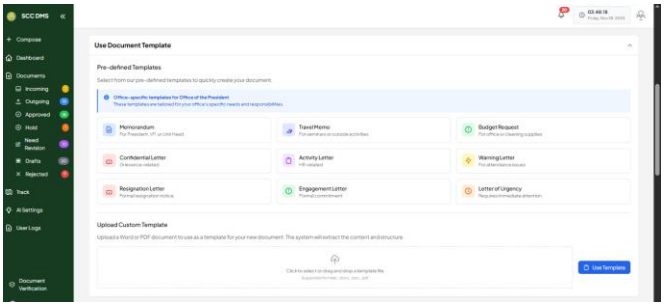

Figure 5: Template Selection and Management Interface showing how users choose or upload standardized document templates for creating official correspondence

Figure 5 illustrates the "Template Selection & Management" Interface, where users can customize document creation, having a simplified repository of standard formats. This interface typically offers two primary methods for document creation: either by selecting a document template (such as Memoranda, Travel Orders, Budget Requests) specific to a particular office and use scenario, or by uploading an original template file. This interface creates uniformity, time-saving, and maintains the institution's branding in all records by using standardized formats and simplifying the process of initiating official correspondence.

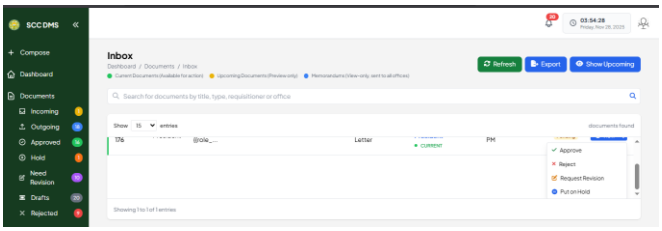

Figure 6. Document Inbox and Action Panel showing how approvers review, track, and act on incoming documents

Figure 6 illustrates the "Document Inbox and Action panel" is the main workspace where document approvers can work on the incoming requests. This interface is typically structured to display a queue of documents that require action, with their status indicated either pending or in a specific state based on the situation, and is supported by appropriate metadata. It offers approvers a set of instant actions, including Approve, Reject, Request Revision, and Put on Hold, as well as search, filtering, and export capabilities. This design enables the efficient handling of documents, facilitates prompt decision-making, and has a clear audit trail of all administrative operations in the approval process.

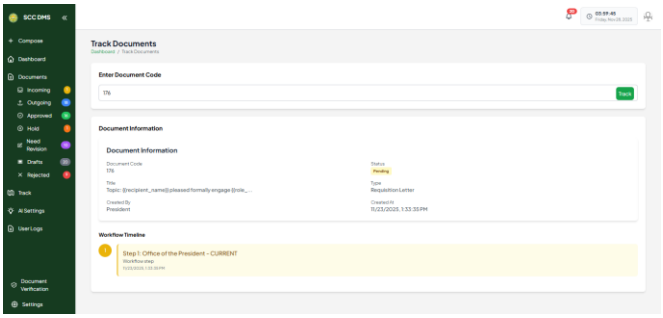

Figure 7. Document Tracking and Status Portal showing real-time monitoring of a document's progress through the hierarchical approval workflow

Figure 7 illustrates the Document Tracking and Status Portal offers exhaustive visibility of any official document lifecycle. This interface allows users to locate a specific document by its unique tracking code and see its status, content, and position within the hierarchical approval process. The system will generally provide a visual record of the document's life cycle, including the steps that have been completed, the work being done with the office in charge, as well as the outstanding steps. It allows other interested parties to track progress in real-time and predict the time it will take to process the document, ensuring accountability throughout the document approval processes.

3.3.4 Testing

Comprehensive testing ensured system reliability and functionality:

- Unit Testing: Individual component validation
- Integration Testing: Module interaction verification
- System Testing: End-to-end workflow validation
- User Acceptance Testing: Real-world scenario testing with actual users

3.3.5 Deployment

The system was deployed on the college's institutional server, integrated with existing IT infrastructure. User training sessions were conducted for administrative staff, office heads, and secretaries. The deployment included data migration strategies and system configuration aligned with institutional hierarchy.

3.3.6 Maintenance

Ongoing maintenance is handled by the college's IT Department, including:

- Regular system updates and security patches
- User support and troubleshooting
- Performance monitoring and optimization
- Feature enhancements based on user feedback

4. CONCLUSION

Web-Based Letter and Document Management System (Web-LDMS) was able to overcome the inefficiencies of manual document handling at Saint Columban College. The system also helped to reduce delays, cut down on paper usage, and increase transparency by digitizing the processes of creating, routing, approving, and tracking letters. QR code check and role-based workflow enabled the integrity and accountability of documents.

The evaluation results confirmed that the system meets high standards of software quality, particularly in security, usability, and functional suitability. The system has been successfully implemented and adopted by the college to handle all official correspondence, supporting its goal of digital transformation and environmental sustainability.

ACKNOWLEDGEMENT

We could not have completed this project successfully without the guidance and support that we got. The project adviser, Leomar F. Nuevo, LPT, has provided invaluable ideas, unwavering support, and professional guidance in the development of this system.

It is in his honorable service that we wish to express our sincere gratitude. Our most heartfelt appreciation goes to the Dean of the College of Computer Studies, Philipcris C. Encarnacion, DIT, who granted us the opportunity to pursue this project and provided us with solid support.

We would also like to express our personal appreciation to our team members, Marie Justin M. Merida, Mark Nelson L. Gemina, and Duchess Jane R. Bahay, for their tireless efforts, teamwork, and the hours spent in bringing the Archivist project to fruition.

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