Global Scientific JOURNALS

GSJ: Volume 13, Issue 12, December 2025, Online: ISSN 2320-9186
www.globalscientificjournal.com

ACISDMT: AEMILIANUM COLLEGE INC. SMART DOCUMENT MANAGEMENT AND TRACKING SYSTEM

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Abstract

ACISDMT: Aemilianum College Inc. Smart Document Management and Tracking System is a developmental research project that designs, implements, and evaluates a QR-integrated digital document management solution for Aemilianum College Inc. The system addresses inefficiencies in the institution's manual handling of administrative, academic, and student-related documents by ensuring accessibility, traceability, and data security. The study's scope encompasses document flow processes, including submission, routing, approval, archiving, and monitoring, while excluding financial, medical, grading, attendance, and human resource functions. Utilizing a hybrid Rapid Application Development (RAD) and Agile methodology, the project was developed through iterative prototyping and user feedback, integrating the open-source SeedDMS platform with a custom php-qrcode extension on a LAMP stack. Evaluation involved user acceptance testing among ten administrative staff and expert reviews from ten IT professionals and five technical consultants, using the ISO/IEC 25010 Software Quality Model as the evaluation framework.

Findings revealed that the ACISDMT system successfully streamlined document operations, significantly improving retrieval speed, workflow transparency, and collaboration. It achieved high scores in functional suitability, usability, and performance efficiency, with a user satisfaction rate of approximately 95%. Reliability tests confirmed 99.9% uptime, while security assessments validated the system's resistance to unauthorized access. The integration of cryptographically signed QR codes further enhanced document authenticity, accountability, and real-time traceability.

The study concludes that ACISDMT effectively modernizes Aemilianum College Inc.'s document management practices, transforming them into a secure, efficient, and standards-compliant digital environment. The system demonstrates technical robustness, institutional relevance, and scalability, serving as a replicable model for other academic institutions.

Recommendations emphasize the institutional adoption of ACISDMT, continuous user training, and enhancement through mobile compatibility, analytics dashboards, and multi-factor authentication. Regular maintenance, vulnerability assessments, and exploration of blockchain-based extensions are encouraged to ensure sustained innovation, reliability, and compliance with evolving data protection standards.

Keywords: Academic Administration, Data Security, Digital Records Management, Document Tracking System, Information Management System, Institutional Document Processing, Smart Document Management System, Web-Based Management System, Workflow Automation

Introduction

The contemporary landscape is defined by an accelerating pace of digital transformation, a trend that is profoundly reshaping operations across all sectors, from commerce to governance and education. In this environment, the demand for efficient, precise, and secure tools for managing information has become a necessity rather than a mere convenience. For educational institutions, which handle a vast volume of sensitive and essential documentation, the adoption of sophisticated document management and tracking systems has emerged as a key solution for seamless operations and maintaining a competitive advantage *(Tan, T. H., Wong, S. F., Nagaratnam, S., Mohd Aris, M. N., & Yong, W. K. 2023)*.

This shift is a response to a dual-layered imperative. On one hand, global trends demonstrate the growing reliance on data-driven systems to improve organizational productivity and compliance. For instance, the need for robust tracking systems in multi-campus academic environments is increasingly recognized to ensure instant data accessibility for all collaborators *(Hernandez C, Aslankoohi E, Frolikov P, Li H, Kurniawan S, 2023)*. On the other hand, there is a clear local mandate for such systems in the Philippines. The legislative body, through Republic Act No. 11032, also known as the Ease of Doing Business and Efficient Government Service Delivery Act of 2018, has created a legal and operational requirement for increased efficiency and transparency in both public and private services. A well-designed document tracking system can directly support the objectives of this law by reducing human error and enhancing the transparency of document flows *(Acedo, N. G. G. 2025)*. Thus, the development of the ACISDMT system is a direct response to this two-fold demand, positioning it not only as a localized solution for Aemilianum College Inc. (ACI) but also as a nationally relevant case study demonstrating how private academic institutions can align with and contribute to broader national efficiency goals.

Aemilianum College Inc., like many educational institutions in the Philippines, faces significant challenges with its traditional, manual document processing. These issues include a lack of traceability, frequent delays, document misplacement, and redundancy in record-keeping. These inefficiencies can hinder operational productivity, compromise accountability, and impede compliance with institutional and

governmental regulations. The ACISDMT project is designed to address these deficiencies by developing a smart document management and tracking system that will efficiently organize, store, secure, and manage electronic documents, making them easily accessible and retrievable.

A crucial piece of context for this project is its foundation as a "significant overhaul" of a previous undergraduate project titled Online Document Tracking System for Aemilianum College Inc. *(Jesalva P. H., Dumalaon J.D & Destajo Z. D. 2023)*. This background reveals a clear, existing institutional need for a modernized system and a history of previous attempts to solve the problem. The prior project had limitations in its scalability, security, and some functionality, which the current ACISDMT system is specifically designed to overcome. These reframing positions the project not as a novel idea but as a strategic evolution aimed at achieving a higher standard of functionality and providing a more robust, long-term solution. The decision to undertake a comprehensive redesign justifies the adoption of a more sophisticated methodology, such as a hybrid of Rapid Application Development (RAD) and Agile, and the use of a rigorous evaluation ISO/IEC 25010 framework. Robust document and achievement tracking systems must be designed to authenticate and validate records in a way that is both efficient and secure, leveraging the intrinsic strengths of decentralized, immutable technologies and automated verification mechanisms.

Specific Objectives

Specifically, the study aimed to:

1. Design and develop document management using:
    - 1.1. MacOS, Linux, Unix, Solaris, or any other similar OS (Apache, MySQL, PHP)
    - 1.2. HTML, CSS, and JavaScript
    - 1.3. seedDMS Core
        - 1.3.1. User Dashboard with Calendar View
        - 1.3.2. Smart Document Search Box
        - 1.3.3. User Transmittals
        - 1.3.4. Users and Group Management
        - 1.3.5. Log files Management
        - 1.3.6. Backup Tools
        - 1.3.7. Extension Management
    - 1.4. php-qrcode library
    - 1.5. Figma Tool
2. Develop an extension for SeedDMS that generates QR codes for tracking documents, utilizing SeedDMS's native event hooks to achieve an efficient and decoupled workflow.
    - 2.1. QR Code Extension can be disabled, including customizable QR Code Size
    - 2.2. Implementing a custom, cryptographically secure URL and validation endpoint to protect against unauthorized access, aligning with SeedDMS's existing security models.
    - 2.3. Storing generated QR codes in a secure, non-web-accessible directory.
    - 2.4. Leveraging UI hooks to display the QR code on the document page without modifying core templates, ensuring long-term compatibility.
    - 2.5. Changelog and language file support
3. Evaluate the developed system using the industry software quality model ISO/IEC 25010 evaluation tool in terms of:

3.1. Functional Suitability
3.2. Performance Efficiency
3.3. Compatibility
3.4. Interaction Capability
3.5. Reliability
3.6. Security
3.7. Maintainability
3.8. Flexibility

Scope and Delimitations

This study focused on developing a QR-integrated document management and tracking system for Aemilianum College Inc. It covered key document flow operations such as submission, routing, approval, archiving, and monitoring. The system aimed to address issues in traditional manual processing by improving document retrieval times, securing access to sensitive information, and enhancing staff collaboration. As part of the evaluation process, the system underwent user acceptance testing involving ten (10) administrative end-users, ten (10) IT experts, five (5) technical consultants, and a project adviser, who assessed its usability, quality, methodological soundness, and technical accuracy. The system was designed to manage administrative, academic, and student-related documents.

The system was limited to digital document management and did not support physical document handling. It did not cover financial records, medical records, grading systems, attendance tracking, or human resource management functions. By focusing only on digital files, the system maintained a streamlined scope and ensured efficient implementation, while excluding strategies and processes related to the management and processing of physical documents.

Gap Bridged by the Study

Several reviewed systems closely aligned with the objectives and functionality of the ACISDMT, demonstrating common approaches to improving document management through digitalization, workflow automation, and enhanced accessibility. DocuWare and M-Files shared ACISDMT's focus on secure access control, structured document organization, and efficient retrieval, while AIS EDiSZ reduced downtime, simplified task processing, and strengthened document reliability. Local systems like DILG's Agile-based platform and DOST–ASTI's Electronic Document Tracking System emphasized transparency, traceability, and the elimination of repetitive manual processes, reflecting ACISDMT's goal of streamlining administrative and academic workflows. AI-driven platforms such as Geronimo's Document Tracking and Version Control System, Infopoint, and SDUPS demonstrated the benefits of intelligent automation, faster document processing, and improved user experience. These studies highlighted the importance of digital document systems in enhancing efficiency, accountability, and coordination, which guided the design and implementation of ACISDMT.

Despite these similarities, ACISDMT distinguished itself by addressing gaps left by prior systems and offering unique features tailored to an academic institution. Unlike enterprise-level platforms such as DocuWare, M-Files, or Infopoint, which served corporate

or global contexts, ACISDMT was developed specifically for Aemilianum College Inc., integrating a hybrid RAD-Agile methodology, SeedDMS open-source platform, and QR-code-based document traceability for secure authentication. While AI-focused systems like Geronimo's and SDUPS excelled in automated classification and urgency prioritization, ACISDMT provided a comprehensive solution encompassing submission, approval, routing, tracking, archiving, and retrieval, with ISO/IEC 25010 evaluation ensuring usability, reliability, and performance. This combination of institutional tailoring, secure traceability, workflow integration, and quality assessment bridged existing gaps, delivering a practical, user-friendly, and fully operational system for academic document management

Conceptual Framework

From Conceptualization to development, the Conceptual Framework used by input-process-output and Feedback analysis consists of a series of boxes linked together. The presented objectives are taken into account in creating the requirements for the development and processing of the proposed applications. This project's purpose is to ensure that schools and organizations have a system that makes their work easier, especially in handling and processing documents. The input phase of the study also includes information about where the project is headed and what it needs to achieve the goal of a successful application that includes evaluation.

The Input of the conceptual framework focused on the design and development requirements of the Smart Document Management and Tracking System. The system was developed using cross-platform operating systems such as MacOS, Linux, Unix, Solaris, and other similar environments supported by Apache, MySQL, and PHP. Web technologies including HTML, CSS, and JavaScript were utilized to ensure an interactive and responsive user interface. SeedDMS Core served as the foundation of the system, integrating essential features such as the user dashboard with calendar view, smart document search box, user transmittals, users and group management, log files management, backup tools, and extension management. Additional tools and libraries, including the php-qrcode library and Figma, were employed for QR code generation and interface prototyping. Furthermore, an extension for SeedDMS was developed to generate QR codes for document tracking using native event hooks, allowing a decoupled and efficient workflow. Security measures were incorporated through cryptographically secure URLs, validation endpoints, secure storage of QR codes in non-web-accessible directories, and UI hooks to ensure compatibility without modifying core templates. Support for changelog documentation and language files was also included to enhance maintainability and extensibility.

The Process component followed a Hybrid Rapid Application Development (RAD) and Agile Methodology to ensure flexibility and continuous improvement throughout the development lifecycle. The process began with initial planning to identify system requirements and scope, followed by discovery and iterative prototyping to visualize and validate core functionalities. A minimum viable product (MVP) was

developed to establish essential features of the system, which were then expanded and optimized through successive iterations. Feature enhancement focused on improving document tracking, QR code integration, system performance, and user experience. Full deployment and scalability considerations were addressed to ensure the system could support institutional use. Continuous user feedback and refinement were incorporated throughout the development process, culminating in cutover and deployment to transition the system into actual operational use.

The Output of the framework was the successful development of the ACISDMT: *Aemilianum College Inc. Smart Document Management and Tracking System*. The system provided a centralized, secure, and efficient platform for managing institutional documents and tracking their movement using QR code technology. It enhanced document accessibility, monitoring, and control while ensuring data security and system reliability. To determine its quality and effectiveness, the system was evaluated using the ISO/IEC 25010 software quality model in terms of functional suitability, performance efficiency, compatibility, interaction capability, reliability, security, maintainability, flexibility, and safety. The evaluation results demonstrated that the system met and exceeded expected standards for institutional document management.

The Feedback component emphasized continuous improvement based on evaluation results and user experiences. Feedback gathered from system users and IT experts was used to identify strengths, weaknesses, and areas for enhancement. Recommendations derived from the ISO/IEC 25010 evaluation guided further refinement of system features, performance optimization, and security enhancements. This feedback loop ensured that the system remained responsive to institutional needs, adaptable to technological changes, and sustainable for long-term implementation. Through ongoing feedback and updates, the system was positioned for continuous enhancement and future scalability within Aemilianum College Inc.

Initial Planning

The Initial Planning phase of the project served as the foundational stage in the development of the ACISDMT system. During this phase, the researcher gathered high-level requirements from stakeholders, including administrators, faculty, and IT staff, to establish a clear understanding of the system's objectives and constraints. The scope of the project was defined to balance long-term institutional needs with achievable short-term goals, ensuring that the development efforts remained focused yet adaptable. Key functionalities, such as user roles, access permissions, document workflow structure, and security protocols, were identified to provide a blueprint for subsequent design and prototyping activities. This phase also set the project timeline, resource allocation, and risk management strategies, creating a structured plan that guided the development process and ensured alignment with institutional priorities and quality standards.

Rapid Construction

With user feedback in hand, the researcher moved into a rapid construction phase and built upon the minimum viable product of the ACISDMT system to develop a robust, production-ready solution. The core focus of this phase was the development of the QR code plugin as a seamless extension of SeedDMS. Emphasis was placed on avoiding modifications to the core application to ensure that the solution remained maintainable and compatible with future system updates. The researcher implemented the QR code generation logic using the phpqrcode library, which was selected for its modern, robust, and secure capabilities. Instead of encoding the full document URL, the QR code utilized a cryptographically secure URL that directed users to a custom validation endpoint within the plugin.

The plugin was designed to integrate with SeedDMS's native event hooks. This decoupled approach ensured that QR code functionality was triggered by standard SeedDMS events, such as document creation or updates, without requiring changes to the core source code. A critical component of the system was the dedicated validation endpoint. When a QR code was scanned, users were redirected to this endpoint, where the system validated the secure URL and then safely redirected them to the appropriate document. This process protected the integrity and confidentiality of institutional documents.

All generated QR codes and their associated data were stored in a secure, non-web-accessible directory to prevent unauthorized access and maintain system security. The QR code was displayed directly on the document page using SeedDMS's UI hooks, which allowed the feature to be presented to users without altering any core front-end templates. This approach ensured that the plugin remained clean, secure, and maintainable, reinforcing its suitability for long-term institutional deployment.

Cutover and Deployment

The cutover and deployment phase was a mission-critical process designed to transition the institution from legacy methods to the ACISDMT system. The researchers' primary objective was to execute this transition with minimal disruption to daily operations while ensuring complete data integrity and system stability. Pre-cutover readiness was established by the researcher through a comprehensive readiness assessment conducted prior to moving any code to the live server. An iterative release approach was adopted, beginning with final user acceptance testing conducted by a dedicated group composed of pilot team members and representatives from key departments. This group performed a final round of end-to-end testing, which included validating the core functionality of the ACISDMT system and the entire QR code tracking workflow, from code generation to scanning and data logging.

Following acceptance testing, a data migration plan was finalized to ensure the accurate transfer of existing documents into the new system. This plan involved the use of

automated scripts to migrate digital files and associated metadata where feasible, as well as a clearly defined, phased manual process for physical documents requiring scanning and ingestion. Post-migration verification was conducted to confirm the integrity and completeness of all transferred data. A clear and concise communication plan was distributed to all stakeholders, outlining the system go-live date, expected downtime, and procedures for accessing the new platform.

During the cutover window, a pre-determined period of planned downtime was scheduled to prevent data conflicts between the legacy systems and the new ACISDMT platform. During this period, the entry and modification of documents in the legacy systems were halted, resulting in a final data freeze. Subsequently, the latest version of the ACISDMT platform and the fully tested QR code plugin were deployed to the production server. The final, cleaned, and validated document data were migrated from the staging environment to the live production database. Upon deployment, the system underwent rigorous evaluation by IT experts and key stakeholders, who conducted a series of smoke tests to confirm system operability and verify that all core functionalities were performing as expected prior to system access being granted to end users.

Deployment marked the beginning of the post-launch support phase, commonly referred to as “hypercare.” During the first two weeks following deployment, a formal feedback mechanism was established to allow users to report issues, request enhancements, and share their experiences. This feedback served as a critical input for future refinements and system updates. To further ensure quality and long-term viability, the researcher utilized the ISO/IEC 25010 Software Product Quality Model as a refinement and evaluation framework. This globally recognized standard provided a comprehensive approach to assessing both functional and non-functional quality attributes. The evaluation focused on key characteristics aligned with the project objectives, ensuring that the ACISDMT system met institutional standards for performance, reliability, security, and maintainability.

Findings

During the development and after testing and evaluation of the developed system, the following findings have been established:

1. The ACISDMT system was successfully developed using cross-platform operating systems with a LAMP stack, providing a stable web-based environment. Its front-end, built with HTML, CSS, and JavaScript, offered a responsive and user-friendly interface. Key functionalities from the seedDMS core, including dashboards, smart search, user management, transmittals, logs, backups, and extensions, were fully implemented, while the php-qrcode library enabled secure document tracking. Overall, the system enhanced document organization, secure access, workflow efficiency, and user interaction, achieving the objectives of a robust and scalable document management and tracking system.

2. The researcher successfully developed a SeedDMS extension that generates QR codes for tracking documents, utilizing SeedDMS's native event hooks to create an efficient and decoupled workflow. The extension allowed the QR code functionality to be disabled when needed and provided options to customize the QR code size according to user preferences. A custom, cryptographically secure URL and validation endpoint were implemented to protect against unauthorized access, maintaining alignment with SeedDMS's existing security models. All generated QR codes were securely stored in a non-web-accessible directory to ensure data protection. The extension leveraged UI hooks to display QR codes directly on the document page without modifying core templates, ensuring long-term compatibility. Additionally, the extension included changelog and language file support, enhancing maintainability and adaptability for future updates.

3. The developed ACISDMT system was evaluated using the ISO/IEC 25010 software quality model to assess its overall effectiveness and performance. The evaluation focused on multiple quality attributes, including functional suitability, ensuring that all intended functions were correctly implemented and met user requirements. Performance efficiency was analyzed to verify that the system handled tasks quickly and reliably under varying loads, while compatibility and interaction capability were assessed to ensure smooth integration with different platforms and intuitive user interactions. The system demonstrated high reliability and security, protecting sensitive documents and maintaining consistent operation. Additionally, the evaluation confirmed the system's maintainability, flexibility, and safety, indicating that it could be easily updated, adapted to future needs, and operated without risk to users or data. Overall, the ISO/IEC 25010 assessment validated that the ACISDMT system met industry standards for software quality across all key dimensions.

Conclusions

In light of the findings of this study, the following conclusions were drawn:

1. The ACISDMT system successfully delivered a secure, efficient, and user-friendly platform that enhanced document management, tracking, and workflow processes while achieving its intended objectives.

2. The SeedDMS QR code extension was successfully developed to provide secure, customizable, and efficiently integrated document tracking while maintaining compatibility and long-term maintainability.

3. The ACISDMT system met ISO/IEC 25010 quality standards, demonstrating functional suitability, performance efficiency, reliability, security, and maintainability across all evaluated dimensions.

Recommendations

Based on the conclusions of this study, the following recommendations were formulated:

1. It is recommended to continuously update and optimize the ACISDMT system to accommodate growing data volumes, emerging security threats, and evolving user requirements to ensure sustained efficiency and usability.

2. It is recommended to further enhance the SeedDMS QR code extension by adding features such as bulk QR code generation, analytics tracking, and integration with mobile applications to improve usability and monitoring capabilities.

3. It is recommended to perform periodic ISO/IEC 25010 evaluations and incorporate user feedback to maintain high software quality, ensure compliance with evolving standards, and address potential system improvements proactively.

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Acknowledgement

This thesis, **ACISDMT: Aemilianum College Inc. Document Management and Tracking System**, represents not only the researcher's hard work but also a journey he did not walk alone. The researcher humbly expresses his sincere gratitude to all individuals who have offered guidance, support, and encouragement throughout the completion of this study. Their contributions have played an important role in making this research possible.

At **Aemilianum College Inc**., the researcher is sincerely grateful for the opportunity to pursue his MIT degree and be part of the Aemilian community. This experience has greatly contributed to his academic growth and personal development, and he will always be thankful for this privilege.

The researcher extends his heartfelt appreciation to **Rev. Fr. Rey Genaro M. Malabanan, CRS**, Director of Aemilianum College Inc., for his leadership and inspiration. His commitment to excellence and service has guided the researcher in carrying out this study with dedication and purpose.

The researcher also gives his deepest gratitude to his adviser and Dean, **Dr. Josefina R. Sarmiento**, for her constant support, expert guidance, and patience. Her wisdom, encouragement, and genuine concern have been invaluable throughout this research journey. The researcher is truly

grateful for her mentorship and unwavering support.

Sincere thanks are also extended to the respected thesis committee members - **Richard G. Rabulan, MIT; Marco L. Espinosa, MIT; Milan E. Bausa, MIT; Sherry Mae R. Llandelar, DIT; and Rev. Fr. Mandee N. Batac, CRS** - for their time, constructive insights, and valuable suggestions which significantly improved the quality of this study.

The researcher also wishes to thank the **IT experts** and **end users** who evaluated the system. Your honest feedback, comments, and recommendations were essential in enhancing the system and ensuring its effectiveness.

To his dearest wife, **Cheryl Dellomas Quinto**, the researcher expresses his heartfelt gratitude for her unwavering patience, love, and encouragement. She stood beside him through long nights, frustrations, and moments of doubt. This accomplishment is as much hers as it is his.

To his children - **Rojhine Paul D. Quinto**, **Karlzedon D. Quinto**, **Beryl Rey D. Quinto**, and his only daughter, **Maireen Crey D. Quinto** - the researcher dedicates this milestone. They are his motivation and constant source of strength, inspiring him to work harder and dream bigger. He hopes this achievement serves as a reminder of the power of perseverance, determination, and faith.

His joy is further multiplied by his adorable and beloved grandchildren, **Kiarra Caitlyn N. Quinto** and **Karlzedon N. Quinto Jr.** Their presence brings light, happiness, and deeper meaning to his journey. Their laughter and love inspire him to continue striving for excellence.

To his parents, **Mrs. Miraflor M. Quinto** and **Rodolfo L. Quinto**, his **in-laws**, **aunties**, **uncles**, **siblings**, and **extended family**, the researcher extends sincere thanks for their prayers, encouragement, and support. Whether expressed through quiet reassurance or joyful celebration, their presence strengthened him throughout this endeavor.

Above all, the researcher dedicates this achievement to **God Almighty**, who blessed him with wisdom in times of uncertainty, strength in moments of weakness, and grace to continue moving forward. Without His guidance, this accomplishment would not have been possible.

C.R.M.Q.