

Development and Testing of Electronic Document Archiving System (e-DAS) of Cagayan State University - Lasam Campus

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ABSTRACT:

This paper addresses the challenges of manual and paper-based document management in the Registrar Office of Cagayan State University-Lasam, which include limited storage, document loss through flooding and time-consuming retrieval processes. The primary objective was to develop the Electronic Document Archiving System (e-DAS) to securely manage, preserve, and ensure the long-term availability of the scholastic records of students and graduates. Utilizing the Waterfall Model, the researchers began with the requirements analysis and system design, followed by coding and deployment using applications such as PHP, Bootstrap, and MariaDB. The findings indicate that e-DAS is a user-friendly, secure, flexible, and effective system that stores scholastic records, increases efficiency, and improves data security through authentication and access control. Ultimately, e-DAS effectively addresses the weaknesses of the manual system. It is recommended that future studies investigate how the system integrates into the current institutional workflows and evaluate its long-term efficiency in meeting administrative requirements.

Keywords: Electronic Document Archiving System (eDAS), Digital Repository, Document Management, Digitization, Scholastic Records

1. Introduction

Today, most educational institutions handle large volumes of printed documents that remain valuable to the organization and require preservation for future access and use. Staff organize and sort these archived files properly to ensure efficient retrieval (Garfield, 2017). Traditionally, institutions have preferred paper as the medium for long-term document preservation. However, it requires substantial physical storage space and involves significant manual effort for information retrieval. Staff cannot manage paper archives quickly or effectively, and original paper documents can

wear out or be damaged over time, making them impossible to recover. To address this, modern scanning techniques and electronic archiving systems allow staff to preserve a document's contents and authenticity of documents, reducing these physical limitations (Boudrez, Dekeyser, & Dummortier, 2005).

Document archiving involves keeping important but rarely used information in a safe place for a long time. In recent years, electronic systems have been increasingly used to store and organize digital documents. They help keep the files safe and ensure they are preserved for the long term (Digitalberry, n.d). These systems help

universities and colleges organize important documents well and keep records safe (Alokuk, 2019). Also, digital archiving systems help organizations retrieved saved documents faster by using keywords, dates, and other details. This makes their work quicker and easier (Schuler, Peterson, & Vincza, 2009). It is very useful for offices that handle a lot of important data.

The Registrar's Office is the official custodian of critical academic records such as enrolment information, transcripts, and certifications. Traditionally, personnel maintained these documents on paper, resulting in inefficiencies in information access, updates, and preservation. With the increasing number of students and the demand for timely administrative services, universities encounter substantial obstacles in managing paper-based archives. A 2021 California Digital Library article presents case studies showing the life-changing potential of digital archiving systems at institutions such as the University of California. Digital archiving can solve these issues by computerizing infrastructure, automating operations, and making it available to more user access.

At Cagayan State University–Lasam, student records are still stored as paper files in the Registrar's Office rather than in digital formats. These include all documents that remain valuable to the university and its clients, like admission documents, grade sheets, issued transcripts of records, and communication letters. Records from 1980 to 2012 are kept and maintained, even if they are not used often. Although CSU-Lasam started using an information system to manage student records in 2012, keeping physical records still puts them at high risk of damage or loss.

Flooding from the adjacent creek has reached campus offices, resulting in the partial damage of documents in the Registrar's Office and other offices. Damaged pertinent documents include grade sheets, admission records, transcripts of records, and other relevant office files. To ensure the preservation of these documents throughout their lifecycle and to maintain their authenticity, as many bear signatures from teachers and school officials - scanning them while preserving their

original content is necessary. The main goal of this research addresses this need.

The main objective of this study is to develop an Electronic Document Archiving System (e-DAS) that complements the existing information system of CSU-Lasam. This system digitizes all identified office records that need to be archived, particularly the scholastic records of students, for long-term storage and efficient retrieval. The new system acted as a central digital repository for archiving and organizing documents, thus ensuring their integrity and accessibility over time. By shifting from paper-based records to a computerized system, the campus can reduce risks such as manual handling and document damage, thus improving the management of documents.

Implementing e-DAS benefits CSU-Lasam by allowing for the quick retrieval of student records, shorter wait times, and more efficient administrative operations. Second, the system contains additional document security features, such as encryption and limited access to avoid loss or unauthorized usage. Third, the requirement for physical storage is decreased, which saves office space and costs associated with paper archives. Additionally, the archiving system helps in disaster recovery. It protects all records and keeps them accessible after a calamity, contrasting with previous floods that devastated paper-based records.

Using an Electronic Document Archiving System aligns with various Sustainable Development Goals (SDGs). For example, SDG 4 (Quality Education) enables the institution to better serve students by enhancing academic record management. This also enhances educational quality and made administrative work easier. Second, in line with SDG 12 (Responsible Consumption and Production), e-DAS encourages sustainable document management practices by reducing paper consumption and promoting digital alternatives. Third, in accordance with SDG 13 (Climate Action), the system consumes less paper and requires less storage, thereby contributing to environmental protection. Furthermore, when the e-DAS is

deployed, it will allow the staff to focus on other essential work rather than tedious record-keeping. The university's reputation is also improved by its ability to be innovative and responsive to students and other clientele who value efficient and contemporary processes (UN, 2015).

2. Methodology

Research Design

The system (e-DAS) development followed a structured process called the Waterfall Model. The Web-Based Electronic Archiving System utilized this structured development methodology, emphasizing documentation,

sequential stages, and testing. It offered a solution for archival management and access by combining new technology (Pargaonkar, 2023). The system integrated web and mobile platforms to enhance device accessibility (Costa, Gomes, and Silva, 2017). Its user-centric design prioritized an appealing interface and user satisfaction, while scalability ensured long-term relevance (Bornholt and Randolph Lopez, 2016). The diagram below (Figure 1) illustrates the stages and phases of creating the Electronic Document Archiving System of Cagayan State University-Lasam. This process entailed obtaining and analyzing requirements, system design, coding and implementation, testing, and deployment and maintenance.

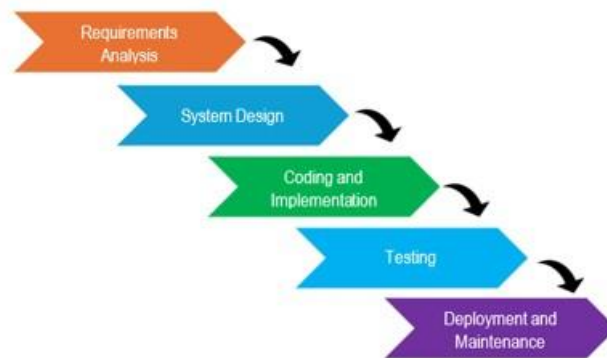


Figure 1. Waterfall Model

Requirements Analysis involved analyzing and documenting all project requirements in a specification document and conducting a feasibility analysis to ensure their validity. Any limitations and constraints, such as time and budget, that could affect the development process were considered. After thorough analysis, a Requirements Understanding Document (RUD) was created (Rezaid Global, n.d.).

The Design phase followed, during which the team used diagrams and sketches (wireframes) to develop the database structure and screen layouts for the system. The design also included the project's timeline, budget, and objectives, which served as a plan or roadmap for the whole endeavor. The team also decided which features each user would have access to, ensuring ease of use. (Welch, 2024).

During the Coding and Implementation phase, the system was built using the previous step's design. The system was developed using programming languages such as PHP, HTML, and CSS. Bootstrap was utilized to make sure that the system was responsive and compatible with multiple devices. Each element of the system was separately evaluated to verify it worked as intended.

The testing was divided into two stages. The first one was Unit Testing, where every component of the system was tested to make sure that it worked properly. The second was the Integration and System Testing during which all the parts were assembled and tested as a complete system to make sure that they operated well together under different circumstances. In case of any errors or bugs were detected in the process, they were

removed before continuing with the process. (Kirvan, Lutkevich, & Lewis, 2024)

The last stage was the Deployment and Maintenance where the system was deployed. It was made available to users under the deployment plan, which could have involved releases in phases, according to customer review. After deployment, the system entered the maintenance stage, in which continuous upkeep and changes were introduced to improve the system.

Software Development Tools

The development of the Electronic Document Archiving System (e-DAS) at the Registrar's Office involved using several tools to create a smooth and functional system. These tools include Bootstrap, JavaScript, PHP, XAMPP, MariaDB, and Visual Studio Code, each offering specific advantages. Bootstrap served as a framework for building websites that function well on any device, from desktop computers to smartphones. It used a system of grids to design flexible, mobile-friendly layouts, which was a significant advantage for e-DAS, as it quickly created a responsive design. This allowed users to access the system from any device without issues (Victor, 2024). PHP, a scripting language, was utilized to facilitate easy connections to databases for dynamic web page production, allowing for the retrieval, updating, or deletion of student and employee documents (Astari, 2024).

XAMPP was used as a local server for testing and developing the web application on a computer, allowing the team to test e-DAS locally before taking it live, thus avoiding damaging the live version (Rashmi, 2023). MariaDB is a popular, open-source database system similar to MySQL. It was used to store all the data from e-DAS in an organized manner, enabling the management of large volumes of records and their easy retrieval

when needed (Mariadb.org, 2022). Finally, Visual Studio Code (VS Code), a lightweight, open-source code editor, provided a clean and simple environment for writing PHP, HTML, and JavaScript, which helped the team work efficiently and fix issues quickly (Giza & Kahlert, 2016).

Research Instruments

Interviews were a method used for collecting information through a structured interaction. In this study, the researchers spoke with the Registrar and staff to gather relevant information for designing and developing the web application. The discussions focused on identifying specific problems in document management and determining the key features and functions the web application should provide to simplify processes and address the challenges (George, 2023).

3-4. Results and Discussion

After implementing the phases of the Waterfall model (Figure 1), the Electronic Document Archiving System (e-DAS) was successfully developed. The system was designed to store and manage archived student enrolment documents, such as Form 138, Transcripts of Records (TOR), birth certificates, and other vital records. According to Alvarado (2024), integrating the Bootstrap framework into the system was a standout feature, enabling the creation of responsive designs that adapted to various devices and screen sizes (Figure 2). Dragan (2023) highlighted that responsive web design improved accessibility and usability while contributing to better search engine rankings, as mobile-friendliness was now a ranking factor. Regardless of the device, whether a desktop, smartphone, or tablet, users experience a unified interface, promoting trust and engagement.



Figure 2. The e-DAS in Different Screen Resolutions and Orientations

In the meantime, the system serves as an archive of documents, arranging them in order and securing important student papers. As described by Roper (1999), a document archive refers to a systematic repository of valuable records which guarantees access of the same to authorized users. The issue of security is a priority in e-DAS since it is important in web application security essential in the process of adopting online systems (Huang, 2005). Authentication is imposed by the system measures based on email and password logins to protect against

unauthorized access and ensure secure information processing (Figure 3). To further enhance security, e-DAS has student, faculty and administrator (such as the Registrar and Super Admin) role-based modules, and includes additional steps such as emailing users when sending passwords resets. These measures correspond to the recommendation by Fatma Al-Maqbali (2019) to capture recovery information during the registration process to facilitate secure account management.

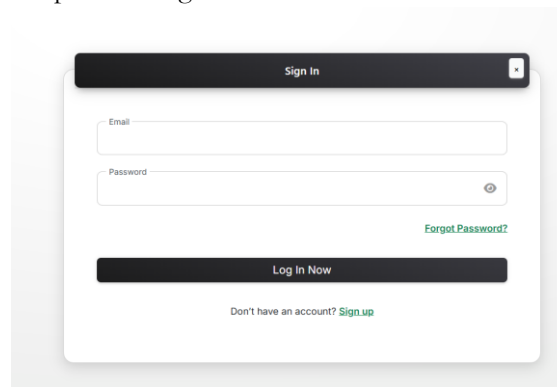


Figure 3. User Authentication

This module was implemented into the application to avoid anonymous users by default browsing the files on the repository. The repository contains records of the day-to-day dealings on the campus. Some of these are confidential files, which allows only key personnel - such as reviewers and administrators - to view, edit, or download them for further revisions and updates. User logins usually comprise of usernames and passwords which

were hashed with a customized encryption algorithm designed to prevent brute-force or password-guessing attacks. Users with specific privileges are authorized to access, read, download and delete files in the repository through the archiving software interface. Nonetheless, they were more or less privileged depending on their credentials or the authorization granted by the administrator or reviewer during the file upload process.

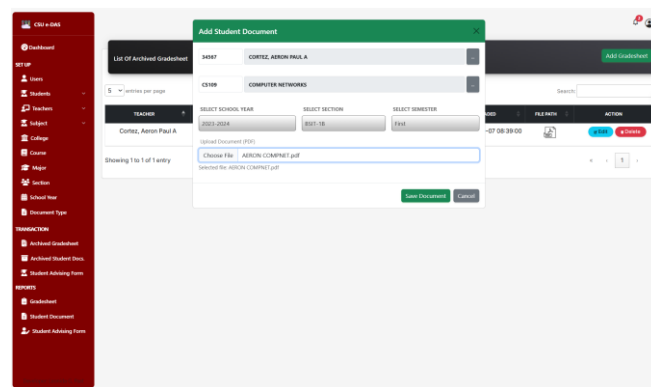


Figure 4. Module for Archiving Grade sheet

Figure 4 is a module that stores grade sheets, which are structured according to section, school year, course, and subject. This structure facilitates discovery, and minimizes the risks of losing valued files. As Smith (2016) explained, proper organization of files facilitates quick search of what the user requires while keeping records safe. Equally, Tan (2018) indicated that clear and simple file structures save time and make it easier for users. This section has labels, such as school year and subject, to locate grade sheets easier and

quicker. According to Patel (2020), the addition of this information simplifies the process of locating files on demand. The grade sheets can only be opened by teachers and registrars to keep them safe. According to Kwan (2021), it is important to guard student records against mistakes or misuse. In general, this feature allows faculty and staff to easily arrange, secure and find grade sheets, making it quite handy for academic record management.

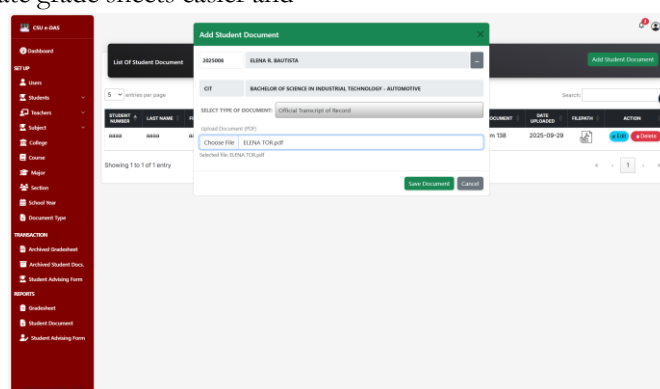


Figure 5. Module for Archiving Student Documents

This module is meant to help schools manage and protect important student documents efficiently, like Transcripts of Records (TOR), Form 138, NSO-issued birth certificates, and other necessary documents. The selection and registration by the registrar are easy: they select the type of document that the student has, upload it to the system, and save it to be used later. All files are well-structured according to the name of the student, the type of document, and the date

of uploading for quick and hassle-free searches. Security is a priority: the login controls and role-based access are tight so that only authorized staff such as the Registrar, students, and administrators can access or manage the files. As Primozic (2024) points out, structured and safe document storage improves teamwork and minimizes the chances of lost or misplaced files. The system also simplifies document handling, which saves time and improves school efficiency.

Subject Name	School Year	Semester	Section	Date Uploaded	File
Integrative Programming	2022-2023	Summer	2	2025-10-07 08:39:00	View

Figure 6. Module for Exporting Student Grade Sheet

TYPE OF DOCUMENT	DATE UPLOADED	FILE PATH
Form 138	2025-10-08 13:54:55	View Document

Figure 7. Module for Exporting Student Document

These modules (Figure 6 and 7) provide the Registrar and administrators with a convenient way to save, share and utilize significant student records. It simplifies the data management because it enables the user to export records and grade sheets to other formats such as CSV or PDF, which work with most software. The procedures typically involve the selection of the student records, choosing the format, and initiating the export, ensuring that the files are structured and prepared for activities like reporting, backup or analysis.

This helps the Registrar in audits, accreditation or transferring data between systems. It also ensures that records are backed up in a safe place with ease of access where necessary. Exporting files in standard formats also eases the collaboration

among departments and allows fast sharing with outside groups, like accrediting bodies or government offices. This is a good practice for managing school data. Research shows that gradebook and student data exporting enhances efficiency and assists schools in achieving record-keeping rules. It also minimizes the possibility of data loss and facilitates organized storage of information.

The exporting of archived documents involves steps as illustrated in Figure 6 and 7: select what to export, choose the file format and options, execute the export, and verify the files. Schools and offices can be secured by taking these steps export reports and keep them useful in the long run.

Figure 8: Module for Saving Advising Form

The Add Student Advising Form can be seen in the CSU e-DAS system in Figure 8, which facilitates the management of the academic work of students. This module improves the storage of advising data by enabling users to input the information such as the student's name, course, semester, and school year. By bringing together these records into one electronic repository, the system makes them simple to arrange and handle. The shift to scanning and uploading of physical forms reduces manual filing and drastically

eliminates the chances of losing documents because of physical environment factors (Abdulkadhim et al., 2015). Moreover, this online strategy improves the disclosure and availability of student information by making sure that confidential records are exclusively processed by authorized persons in a safe system (Amutha, 2020). Overall, this module improves the efficiency of managing academic records and student advising material to a considerable extent.

Figure 9: Module for Exporting Scanned Advising Form

Figure 9 indicates the 'Exporting Scanned Advising Form' option of CSU e-DAS, which enables users to easily access stored advising forms. A considerable advantage of this is that it enables one to swiftly find the form of a student by typing the name, program, semester, or school year. This enables users to recall and save the form to be verified or approved within a short time, as opposed to manually scanning paper files for reporting. It also lessens the workload,

allowing the employees to concentrate on other significant responsibilities. Also, the storage of the documents in electronic form lessens the use of paper and is environmentally friendly. This safe method of storing documents guarantees the availability of advising forms and their utilization for school purposes, both on and off campus. This module is important for maintaining clarity and making it easy, and quick to retrieve student advising records.

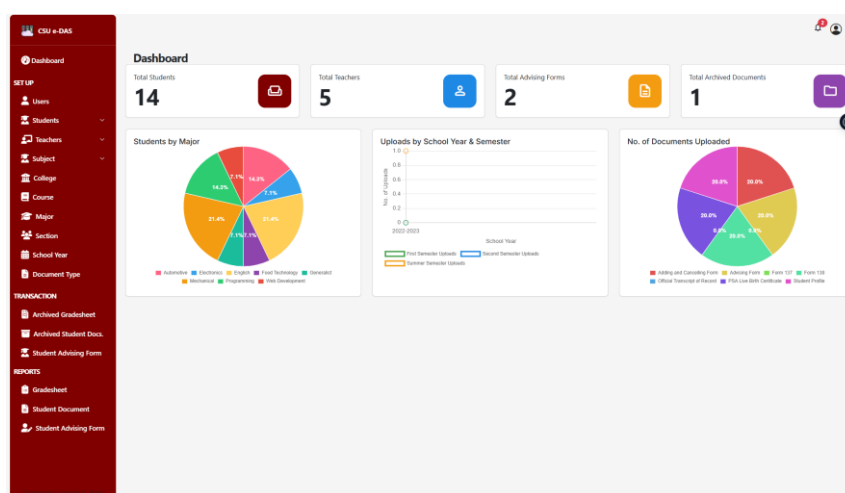


Figure 10. Menus of the Web Application

e-DAS must satisfy the needs of a high-quality user experience (UX) and meet user expectations. A UX that is well-designed promotes user engagement through the prioritization of usefulness, reliability, functionality, and aesthetics (Garrett, 2011). Furthermore, a valuable online experience should be believable, discoverable, desirable and easy to use. (Morville, 2004). e-DAS has a friendly interface (Figure 10) with Bootstrap integration (as shown in Figure 6 and 7), generating credible and precise outputs during the testing stages. By keeping grade sheets and other important student papers available and properly organized, e-DAS makes sure such records are preserved and available, which is advantageous to students, faculty, and school personnel.

5. Conclusion

A system is developed through a process in which certain steps are followed to arrive at the desired output. In this case, the issues faced by the office were revealed, such as a document misplacement, document security, storage, and leaving of records vulnerable to flood, termite, and pest attacks. The office also had some challenges in monitoring and document retrieval. Conversely, there were a number of coping strategies used by others, including seeking budgetary assistance, using a log book, and performing periodic maintenance with technologies and infrastructure, but they were limited.

These budget-constrained steps were more time consuming and resulted in the late release of records, especially since the number of staff was

small. Consequently, an electronic document archiving system (or e-DAS) was created to solve the problems at the Registrar's Office. It is better to use the Bootstrap framework to enhance web software such as e-DAS because it can be easily adjusted to different screen sizes and orientations. Effective security measures implemented protect critical academic records, promoting trust and utilization. The new system aids in the consolidation and reporting of student records as support to decision-making processes, academic priorities, and administrative goals. e-DAS is a trusted document repository that is viable and handy, and easy to use by students and personnel.

Recommendations or future research directions

Adopting Electronic Document Archiving Systems provides many benefits in managing student records. Accessibility implies that the users have access to their records across multiple sites using multiple devices. The records are easy to use and understand for all, regardless of their familiarity with technology. The usability includes the information structure and design, and the ease of direction, and the understandability of instructions and feedback. High usability minimizes error and frustration, thereby increasing user satisfaction and the efficiency of information retrieval (TransAccess, 2024). Research about the integration of e-DAS into existing institutional work processes and its efficiency in addressing administrative requirements of permanence and timeliness should also be conducted in the future.

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8. Author Declaration

The authors confirm that this work is original and that there are no conflicts of interest.