METHODOLOGY

System Development Methodology

This study employed the Evolutionary Development Model as the system development methodology for CredentiaTAU: A Web-Based Academic Record Archiving System. The Evolutionary Development Model is an iterative software development approach in which the system is developed and refined through repeated cycles (Lafferty, 2024). Instead of delivering the entire system at once, core functionalities are initially implemented, tested, evaluated, and then progressively enhanced based on user feedback and identified improvements (Gowtham, V., et al., 2023).

Since the system needed ongoing validation from ARS administration to match features with record management procedures, the methodology was appropriate for CredentiaTAU. Prior to deployment, incremental updates improved performance, security, and usability while fine-tuning functions.

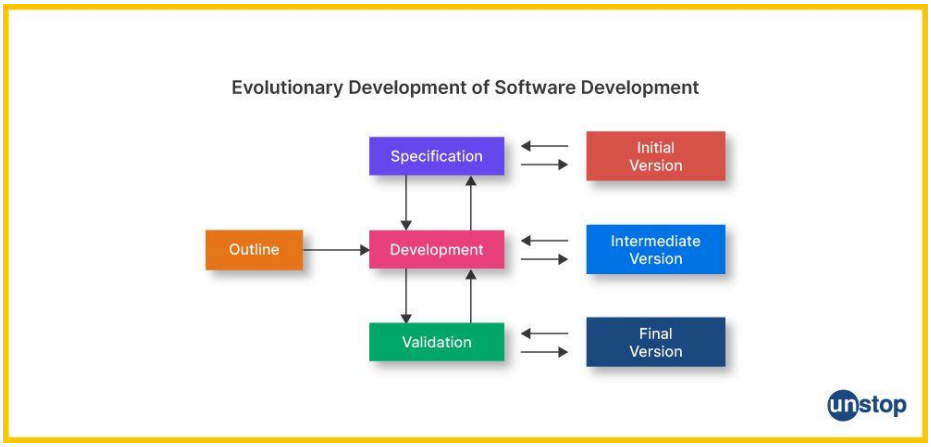


Figure 1. Evolutionary Development Methodology

Requirements. The researchers collaborated with stakeholders, particularly the Tarlac Agricultural University Admission and Registration Services (ARS) administration, to identify and document the key functionalities of CredentiaTAU. They gathered detailed information regarding existing record management procedures, security concerns, reporting requirements, and retrieval inefficiencies. Functional and non-functional requirements were carefully defined to ensure that the system addressed operational challenges in academic record archiving.

Design. After gathering sufficient information from interviews, consultations, and document analysis, the researchers designed the overall structure of CredentiaTAU. The system architecture, database schema, user roles, and workflow processes were carefully planned to ensure secure storage, efficient retrieval, and organized record categorization. The design emphasized usability, scalability, and data integrity to support long-term institutional use.

Development. The researchers developed the initial version of CredentiaTAU after finalizing the system design and requirements. Using PHP with the CodeIgniter framework and MySQL as the database management system, the core modules were implemented. These included user authentication, record archiving, search and retrieval functionalities, automated reporting, and role-based access control. The system was developed incrementally, beginning with essential features before proceeding to additional enhancements.

Testing. After each development cycle, the researchers conducted functionality testing, usability testing, and security checks. Individual modules were

tested to ensure they operated according to specifications. Identified errors, inconsistencies, and performance issues were corrected before proceeding to further refinements. Feedback from ARS administration was also gathered to determine necessary improvements in workflow and interface design.

Deployment. Once the system passed functional and security validations, CredentiaTAU was deployed within the ARS environment. The web-based system was made accessible to authorized personnel for official use. This deployment allowed ARS administration to archive, retrieve, and manage student academic records digitally through a centralized platform.

Review. To ensure continuous improvement and system reliability, the researchers collected feedback, observations, and recommendations after deployment. The evaluation results were analyzed to determine which features performed effectively and which required refinement. Based on these findings, additional improvements were implemented, thereby evolving the system into a more stable, secure, and efficient academic record archiving platform.

Data Gathering Procedures

Literature Survey. The researchers conducted a literature survey by reviewing related studies, journal articles, institutional reports, and technical frameworks concerning web-based information systems, academic record management, digital archiving, and data security. This technique provided theoretical foundations and

technical guidance that supported the conceptualization of data requirements for the IT solution.

Interviews. Structured interviews were conducted with the Tarlac Agricultural University Admission and Registration Services (ARS) administration. These interviews gathered insights regarding current record management procedures, challenges encountered in manual and semi-digital systems, security concerns, and desired system functionalities. The information obtained served as the primary basis for defining system requirements.

Document Sampling and Record Searching. The researchers examined existing student record formats, filing procedures, archival policies, and report templates used by ARS. Document sampling helped conceptualize the data requirements of the IT solution, while record searching clarified the reporting and retrieval needs. This ensured that the proposed system aligned with institutional standards and accurately reflected the workflow of academic record handling.

Questionnaires. After the deployment of CredentiaTAU, structured questionnaires were distributed to ARS administration who directly used the system. The questionnaires evaluated the system's performance based on ISO/IEC 25010 software quality characteristics, including functional suitability, usability, reliability, security, and performance efficiency. The responses were analyzed to measure overall system acceptability and effectiveness.

System Design

This section presents the overall architectural structure and database design of CredentiaTAU: A Web-Based Academic Record Archiving System. The system was designed to ensure secure storage, efficient retrieval, structured categorization, and controlled access to student academic records. The design focused on scalability, maintainability, data integrity, and security to support the operational requirements of the Admission and Registration Services (ARS).

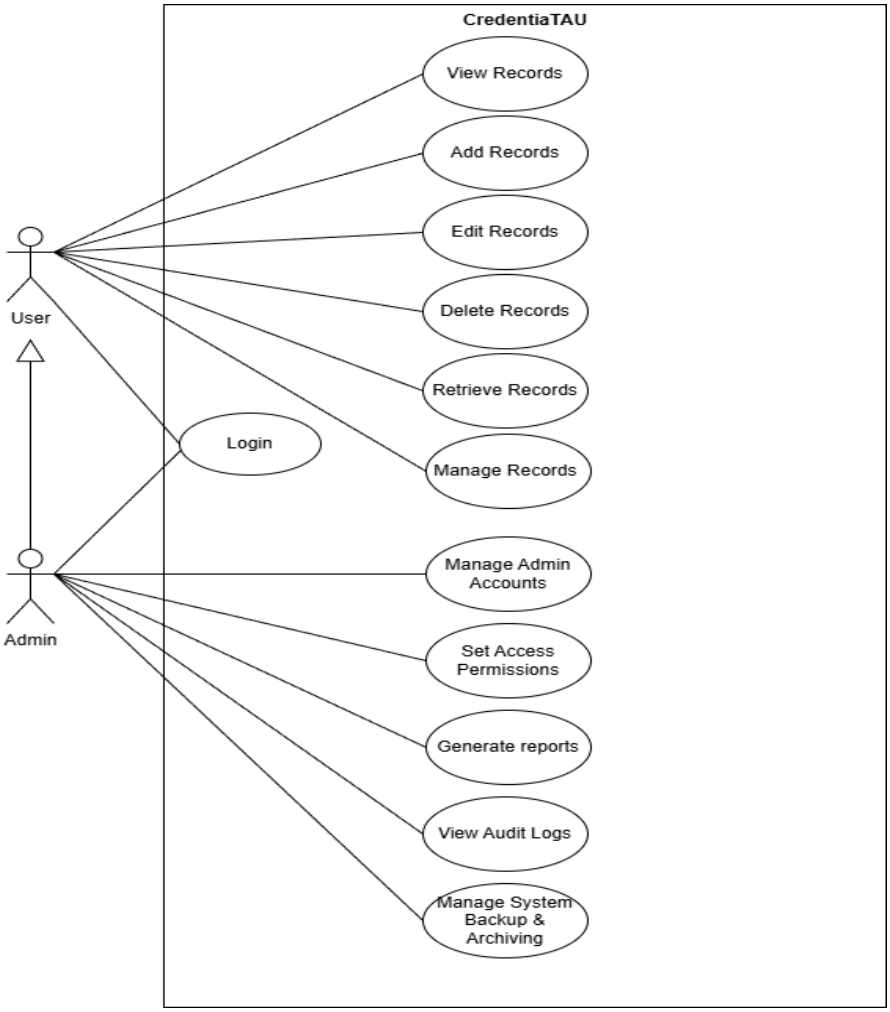


Figure 2. Unified Modelling Language

The role-based responsibilities of both Clients and Administrators within the Academic Record Archiving System are depicted in the CredentiaTAU Unified Modeling Language (UML) diagram, which also shows how each user interacts with the system to guarantee safe and effective record management. Academic records can be added, edited, viewed, retrieved, managed, and deleted by clients. Administrators have all of these features plus more, including the ability to manage admin accounts, set access permissions, generate reports, view audit logs, and handle system backup and restore. This structure makes sure that all authorized users contribute to the integrity and efficacy of the archiving process by highlighting the system's emphasis on full usability, accountability, and operational transparency.

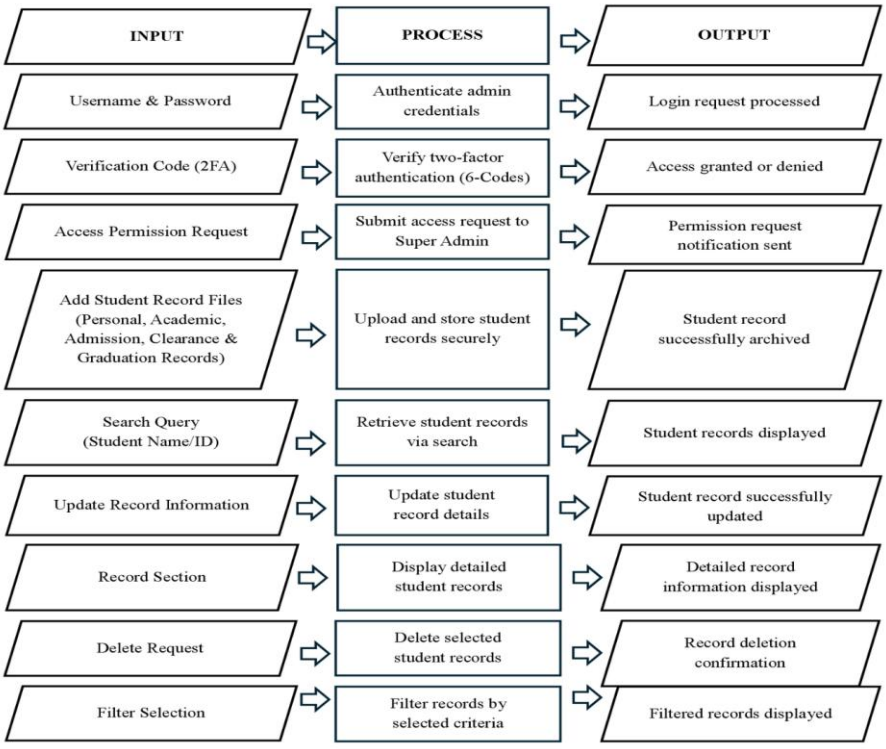
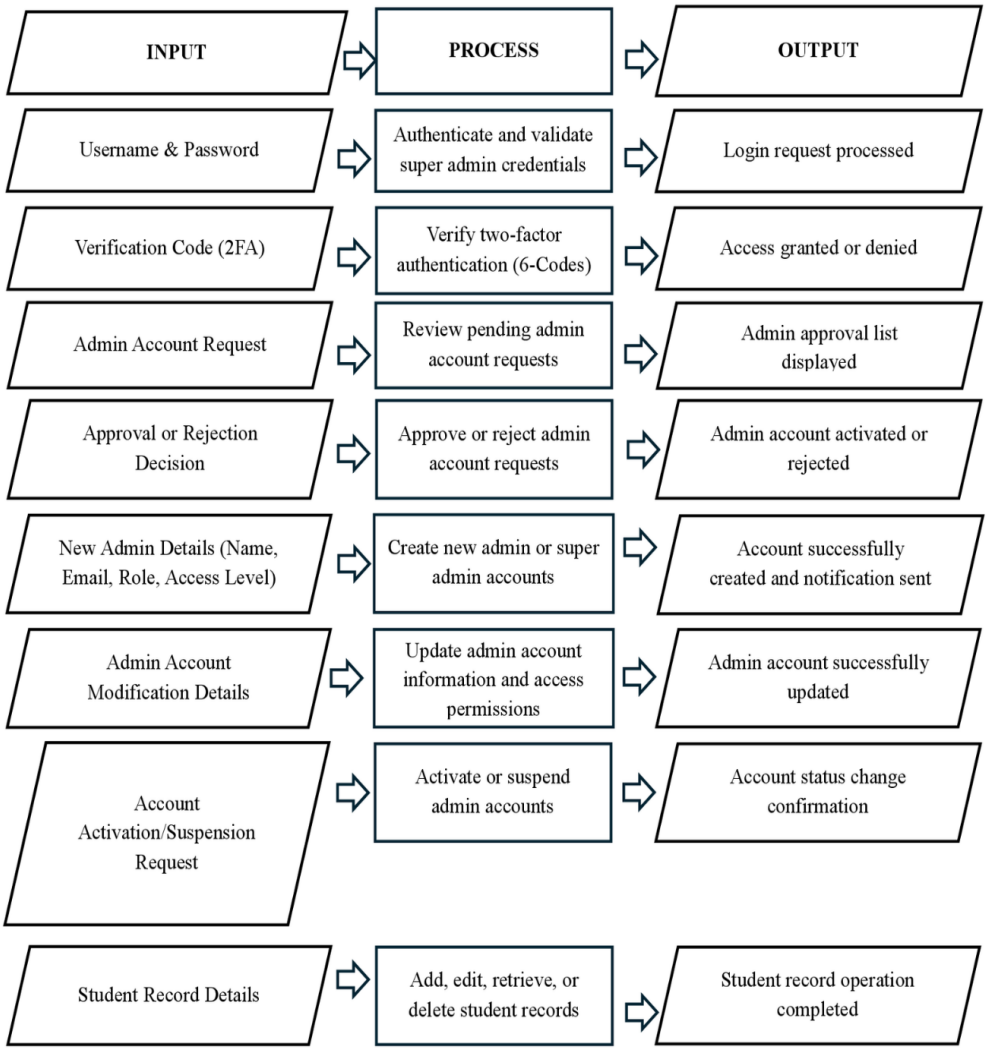


Figure 3. Input-Process-Output of the User of CredentiaTAU

Figure 3 presents the Input–Process–Output (IPO) diagram for users of the CredentiaTAU Web-Based Student Academic Record Archiving System. Inputs consist of login credentials, search queries, record details, and filter selections. These inputs undergo processing steps including user authentication, record submission, secure storage, retrieval, updating, filtering, and deletion. The outputs comprise access being granted or denied, alongside academic records being archived, updated, displayed, filtered, or deleted.



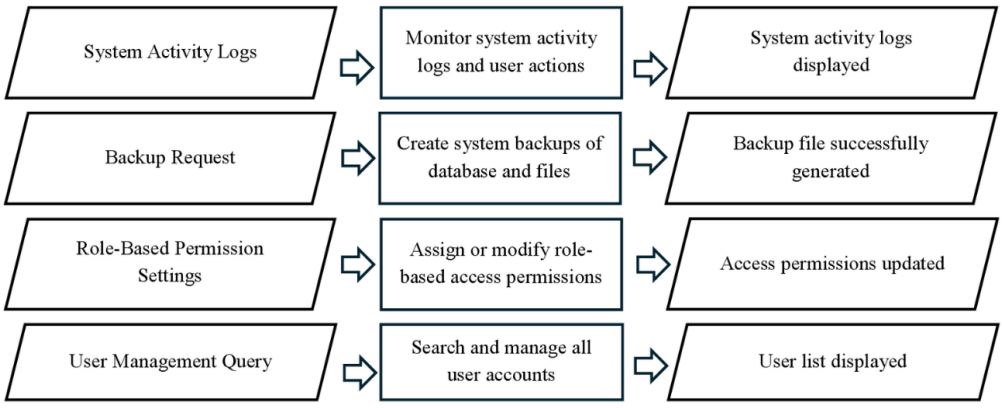


Figure 4. Input-Process-Output of the Admin of CredentiaTAU

Figure 4 illustrates the Input-Process-Output (IPO) diagram for system administrators. Inputs include login credentials, account requests, new administrator details, modification data, report parameters, backup requests, and permission settings. These inputs are processed through authentication, account approval or rejection, account creation and updates, report generation, record management, activity monitoring, user account management, and database backups. Outputs comprise account activations or suspensions, updated permissions, generated reports, displayed system logs, completed backups, and successful student record operations.

These diagrams show how the system uses secure authentication, handles academic records efficiently, and keeps administrative processes clear. They highlight the separation of roles between users and administrators, ensuring that only authorized users can access and manage sensitive student records. The system uses input validation, organized workflows, and consistent output to support data integrity, accountability, and efficiency. In summary, the IPO diagrams show that

the CredentiaTAU Web-Based Student Academic Record Archiving System meets the institution's needs for reliability, security, transparency, and long-term record keeping.

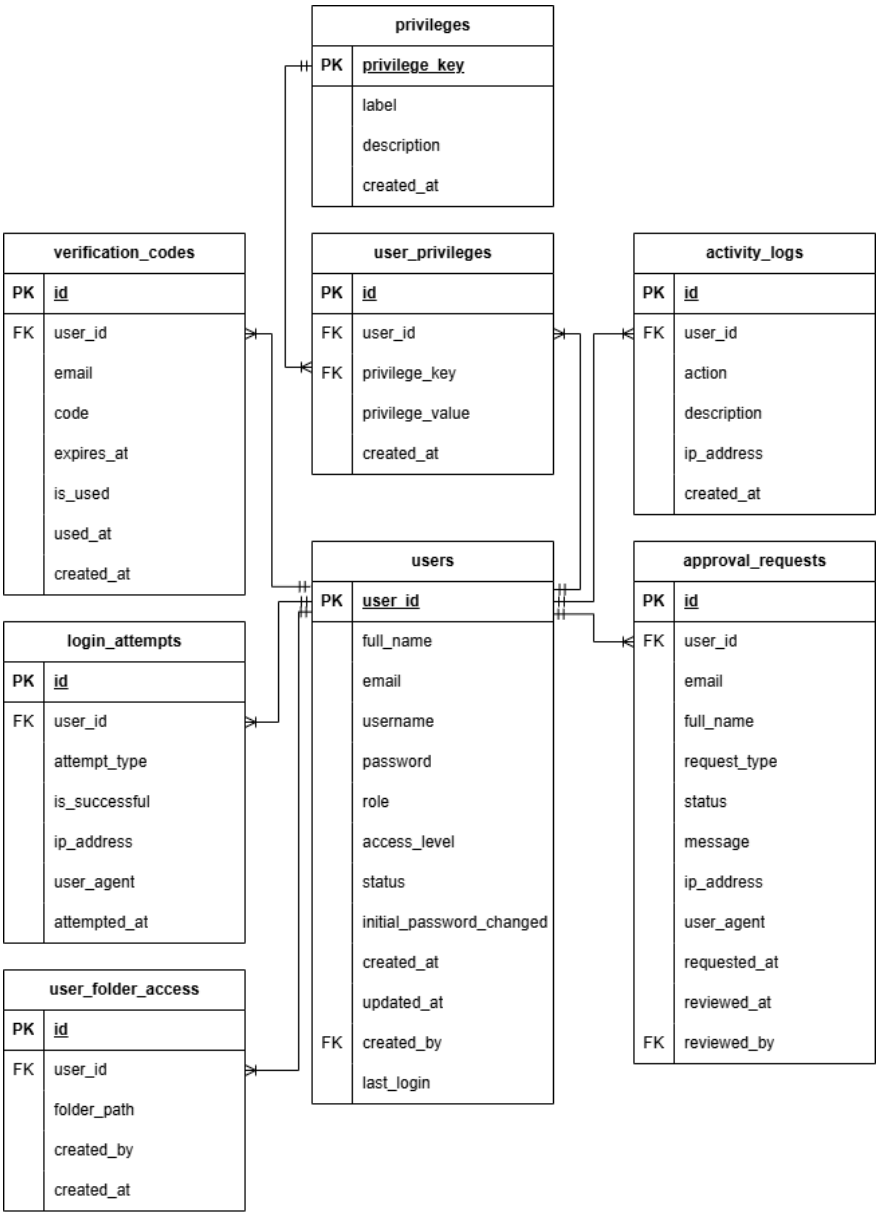


Figure 5. Entitiy Relationship Diagram

The Entity-Relationship Design (ERD) for CredentiaTAU creates a secure, organized database focused on user authentication, privilege control, and access monitoring. The Users entity sits at the center, connecting to components that handle privilege assignments, folder access, login tracking, verification, approvals, and activity logs. This setup ensures only authorized users can access specific academic record folders, and every action is recorded to support transparency and accountability. The ERD meets the institution's needs for data security, audit trails, and dependable academic record management.

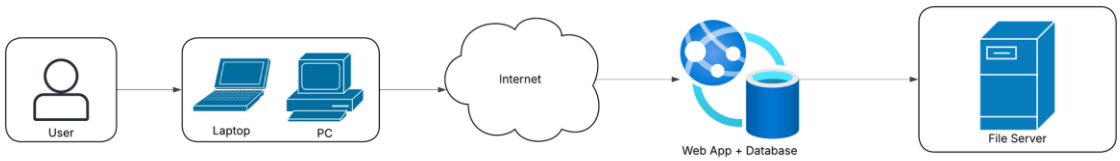


Figure 6. System Architecture Design

The CredentiaTAU Web-Based Student Academic Record Archiving System uses a client-server model. Users connect to the system online from their laptops or personal computers. The web application handles authentication, access control, and record management, working with a central database and a file server to keep academic records secure and easily accessible.

Tools used in the Development

Hardware. This part presents the devises and equipment and other hardware used during the development and implementation.

Table 1. Hardware used for the System Development.

TOOLS	SPECIFICATIONS
Laptop	LAPTOP-A5A15O1J
GPU	AMD Radeon Graphics
Processor	AMD Ryzen 3 5300U
RAM	8.00 GB (5.85 GB usable)
Storage	236 GB SSD
System Type	64-bit operating system, x64-based processor
Windows Edition	Windows 11 Edition
Monitor	
Screen Visible Size	16.1''
Refresh Rate	60Hz
Native Resolution	1920 x 1080

Software. This part presents the software that was used to develop CredentiaTAU: A Web-Based Academic Record Archiving System

- **XAMPP.** Local server environment (Apache, MySQL, PHP)
- **Visual Studio Code.** Source code editor
- **PHP.** Server-side scripting language
- **CodeIgniter.** PHP framework for backend development
- **MySQL.** Relational database management system
- **HTML5 and CSS3.** Frontend structuring and styling

- **Bootstrap.** Responsive UI framework
- **JavaScript.** Client-side interactivity
- **PHPUnit.** Unit testing framework

End-user Evaluation

Scale to be Used in the Evaluation. The criteria for evaluating CredentiaTAU: A Web-Based Academic Record Archiving System for Tarlac Agricultural University Admission and Registration Services focused on the system's usability and functionality.

Likert Scale. It measured the participants' level of agreement with statements related to the system's usability and functionality.

Table 2. Scale used for Evaluation.

FIRST	LEVEL HEADING
5.00	Excellent
4.00	Very Satisfactory
3.00	Satisfactory
2.00	Satisfactory
1.00	Poor

The researchers used the scale shown in Table 3 to interpret the results of the evaluation of the system's usability and functionality:

Table 3. Scale used in the Analysis of the Result of the Evaluation.

FIRST	LEVEL HEADING
5.00	Excellent
4.00	Very Satisfactory
3.00	Satisfactory
2.00	Fair
1.00	Poor

Table 4 shows the scale used in analyzing the evaluation results. It follows a Likert-type rating where scores from 4.50–5.00 are interpreted Excellent, 3.50–4.49 as Very Satisfactory, 2.50–3.39 as Satisfactory, 1.50–2.29 as Fair, and 0.00–1.49 as Poor. This scale served as the basis for interpreting the overall acceptability and performance of the system.

Respondents to the Evaluation. The respondents of the evaluation consisted of authorized personnel from the Tarlac Agricultural University Admission and Registration Services (ARS) who directly interacted with CredentiaTAU during its implementation period. Since the system was specifically designed for institutional academic record archiving, only staff members and supervisors who regularly handled student records were selected to participate in the assessment. Their direct involvement in daily record management operations enabled them to provide informed and experience-based evaluations regarding the system's functionality, usability, security, and overall performance. The evaluation period was conducted

over several working days to ensure that respondents had sufficient exposure to the system's features before completing the assessment instruments.

Complete Enumeration Sampling (Total Population). The researchers employed the Complete Enumeration Samplin, also known as Total Population Sampling, in determining the respondents of the study. This approach ensured that all ARS personnel who had direct access to and responsibility for managing academic records were included in the evaluation process. Since the number of authorized users within the department was limited and manageable, the inclusion of the entire population eliminated sampling bias and strengthened the validity of the evaluation results. By gathering responses from all system users, the researchers were able to obtain comprehensive feedback that accurately reflected the operational effectiveness and practical usability of CredentiaTAU within the institutional setting.

Vulnerability and Penetration Testing

The researchers conducted Vulnerability Assessment and Penetration Testing (VAPT) to evaluate the security posture of CredentiaTAU and identify potential weaknesses that could compromise the confidentiality, integrity, and availability of academic records. The assessment involved examining possible threats such as SQL injection attacks, cross-site scripting vulnerabilities, authentication bypass attempts, improper session handling, and unauthorized privilege escalation. Simulated attack scenarios were performed within a controlled environment to determine whether the system could resist common web-based security threats. The results of the assessment

were documented, and necessary security enhancements, including input validation improvements, strengthened access control mechanisms, and secure session configurations, were implemented to mitigate identified risks and ensure compliance with recognized cybersecurity practices.

Unit Testing

Unit testing was performed to verify the correctness and reliability of individual modules within CredentiaTAU before system integration. Using PHPUnit as the testing framework, the researchers evaluated critical components such as user authentication, record archiving processes, search and retrieval functions, and automated report generation features. Each module was tested independently to confirm that it produced the expected outputs when provided with valid and invalid inputs. Identified defects and logical inconsistencies were corrected immediately to prevent error propagation during integration testing. This systematic approach ensured that each functional unit of the system operated accurately and consistently, thereby contributing to overall system stability and maintainability.

Model Testing

Data. The data used in the evaluation of CredentiaTAU consisted of anonymized academic record entries derived from existing Admission and Registration Services (ARS) document formats and record templates. These data included student identification details, academic classifications, enrollment records,

document categories, and metadata associated with archived files. Prior to testing, the researchers performed data preparation procedures such as data cleaning to remove duplicate entries, validation of required fields to ensure completeness, and format standardization to maintain consistency across records. Sensitive information was anonymized to protect privacy while preserving structural integrity for testing purposes. The prepared dataset was then uploaded into the system database to simulate real operational conditions and evaluate retrieval speed, storage reliability, and reporting accuracy.

Accuracy. The accuracy of CredentiaTAU was determined by evaluating the correctness of record retrieval results and system-generated reports compared to the original dataset used during testing. The researchers verified whether the system returned complete and correct data entries when specific search queries and filter conditions were applied. Accuracy was calculated by comparing the number of correctly retrieved records against the total number of expected records based on the prepared dataset. The computation followed the standard accuracy formula shown below.

$$\text{Accuracy} = (\text{Number of Correct Results} \div \text{Total Number of Expected Results}) \times 100 \quad (1)$$

Accuracy was calculated using Equation (1) to determine the percentage of correct outputs produced by the system during retrieval and reporting tests. Multiple query scenarios were executed to ensure consistency across different record

categories and academic year filters. The resulting accuracy percentage provided quantitative evidence that the system processed and retrieved archived academic records reliably and without data discrepancies.