



Computerization of University Personnel Administration: Design and Implementation of a Web-Based Management System

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DOI: <https://doi.org/10.68050/JAMS.2026.545>

Received: 20 Sept 2026; Accepted: 21 Sept 2026; Published: 23 September 2026

ABSTRACT

University personnel administration involves managing staff records, recruitment, leave applications, appointment documentation, official correspondence, and other personnel-related activities. In predominantly paper-based environments, these processes may present challenges relating to record storage, retrieval, updating and coordination across administrative units. This study presents the design and implementation of a web-based university personnel management system for computerising selected personnel administration activities. The study adopted an Object-Oriented Systems Analysis and Design approach. Requirements were gathered through semi-structured interviews involving ten (10) participants and through documentary analysis of relevant administrative procedures and literature. The identified requirements were translated into functional and non-functional system requirements and modelled using Unified Modelling Language (UML) techniques, including use-case, class and sequence diagrams. The system was implemented using HTML5, CSS3, PHP, JavaScript, AJAX, jQuery and MySQL with a centralized database supporting personnel information management. The implemented system provides functions for user authentication, staff record management, recruitment, appointment processing, leave management, correspondence management, information search and retrieval and report generation. Functional and integration testing evaluated the implemented modules against their specified requirements. The testing demonstrated that the tested functions operated according to their defined requirements. The study demonstrates the feasibility of integrating selected university personnel administration functions within a centralized web-based environment. However, further operational evaluation using measures such as processing time, record retrieval time, error rates, system availability and user satisfaction is required to determine the system's effectiveness in an institutional deployment.

Keywords: Personnel Management, University Administration, Human Resource Management, Web-Based System, Personnel Information System, Database Management.

INTRODUCTION

Universities depend on effective personnel administration to manage employee-related activities, including recruitment, staff records, leave administration, appointment documentation, training and development, retirement, and other personnel-related services. The personnel department therefore performs an important administrative function by maintaining and processing the information required to manage university staff effectively. As the volume of personnel information increases, the ability to store, retrieve, update, and process staff records efficiently becomes increasingly important to the administration of university activities.

Despite the growing application of information technology in organizational administration, personnel activities in some university environments may still depend substantially on paper-based procedures. The project examined a personnel administration environment in which documents were conveyed manually between administrative units and personnel records were maintained through paper files. Such procedures can make the processing of activities such as recruitment, retirement, resignation, termination of appointment, health management and pension administration time-consuming. The project further identified difficulties



associated with the storage and retrieval of paper records, including the possibility of misplaced documents and challenges relating to the integrity, security, and accessibility of personnel information. The use of stationery for typing, printing, photocopying, and circulation of documents also contributes to the administrative resources required to operate such processes.

The fragmented nature of some personnel activities presents an additional administrative challenge. The project identified overlapping responsibilities among different personnel service units, with various units handling different categories of staff requests and records. Consequently, personnel information and administrative activities may need to pass through multiple units before completion. A centralized computerized system provides an opportunity to bring relevant personnel information and processes into a common digital environment, thereby supporting easier information retrieval and management.

Web-based information systems provide a practical approach to computerizing administrative processes because users can interact with centralized applications through a web interface while information can be stored in a structured database. In the project, technologies associated with paperless administration, including electronic data interchange, electronic forms automation, content management, enterprise rights management and identity management, were considered as approaches for reducing dependence on paper-based processes. The proposed system consequently focused on providing a web-based platform through which university personnel and authorized administrators could perform selected personnel-related activities electronically.

The developed system was designed to support several core personnel management functions. These include user account creation and validation, job application, staff profile management, leave application, recruitment, appointment letter processing, mail recording, staff record management, personnel information search and retrieval and the generation of periodic personnel reports. The system also incorporates a relational database for storing and processing personnel information. These functions were derived from the requirements identified during the analysis of the existing personnel administration processes.

To develop the proposed system, the study employed an Object-Oriented Systems Analysis and Design approach and used Unified Modelling Language (UML) techniques to represent aspects of the system. Primary information was obtained through oral interviews with members of the personnel department and selected students, while secondary information was obtained from journals, textbooks, and other relevant materials. The proposed application was implemented using web development technologies including HTML5, CSS3, PHP, JavaScript, AJAX, jQuery and MySQL.

The objective of this study is therefore to design and implement a web-based personnel management system capable of supporting the storage, processing, retrieval, and administration of university personnel information. The study specifically seeks to provide functional modules for personnel-related activities, establish a centralized database for staff information, facilitate personnel information retrieval and support the generation of periodic personnel reports. The resulting system was subjected to module-level and integration testing to determine whether its implemented functions produced the expected outputs and satisfied the identified system requirements.

The contribution of this study lies in the application of a web-based approach to university personnel administration, particularly in an environment where personnel processes were previously characterised by paper-based documentation and movement of physical records. Rather than treating personnel administration solely as manual record-keeping, the developed system provides an integrated digital platform for selected personnel processes and information management functions. The study therefore demonstrates how web and database technologies can be applied to support the computerization of university personnel administration.

RESEARCH METHODOLOGY

A software development methodology defines a structured framework consisting of specific procedures, phase sequences, and guidelines followed from project inception to system completion. Selecting an appropriate software engineering methodology ensures that systemic requirements are thoroughly analysed, correctly designed and reliably implemented.



This research adopts the Object-Oriented Methodology (OOM) using Unified Modelling Language (UML) modelling tools. The selection of OOM is directly aligned with the system's target technology stack (PHP, JavaScript, and MySQL relational object structures). Utilising object-oriented analysis and design (OOAD) ensures a seamless conceptual transition from system architectural design artefacts (Class Diagrams, Sequence Diagrams, Use Cases) into functional server-side and client-side code.

Data Collection Techniques

The study employed both primary and secondary data collection techniques to obtain information required for the design and implementation of the web-based university personnel administration system.

Primary Data Collection

Primary data were collected through semi-structured interviews involving ten (10) participants. The participants were drawn from personnel and administrative stakeholders and intended users of the university personnel administration processes examined in the study. The interviews focused on the existing procedures for personnel administration and the challenges associated with the use of manual and paper-based processes.

The interview discussions covered major administrative activities, including staff record management, recruitment, appointment processing, leave administration, official correspondence, information retrieval and report generation. Participants were also asked about difficulties encountered in accessing, updating, storing and retrieving personnel information under the existing system. Their responses provided information on the activities performed, information required at different stages of each process, user roles and the problems that the proposed system was expected to address.

The information obtained from the interviews was reviewed and organised according to recurring administrative activities and user needs. The identified requirements were subsequently translated into system requirements. Functional requirements described the services and operations that the proposed system should provide, while non-functional requirements addressed characteristics such as security, usability, performance, availability, scalability, maintainability, reliability and data integrity.

Secondary Data Collection

Secondary data were obtained through the review of relevant administrative documents, existing personnel records, forms, procedures and related literature. The documentary review was used to understand the structure of the existing personnel administration process and the types of information generated, stored, processed and retrieved during routine administrative activities.

The information obtained from the secondary sources was compared with the information gathered during the interviews to develop a clearer understanding of the existing system. The findings from both sources informed the identification of system requirements and the design of the proposed web-based personnel administration system.

Requirements Analysis

The data collected from the interviews and documentary review were analysed to identify the major activities, user interactions, information flows and limitations of the existing personnel administration process. The identified requirements formed the basis for the subsequent system analysis and design.

The requirements were represented using Unified Modelling Language (UML) artefacts, including use-case, class, and sequence diagrams. The use-case model was used to represent the interaction between users and the proposed system, the class diagram represented the major system entities and their relationships, while the sequence diagrams described the interactions involved in selected system processes.

This requirements-gathering and analysis process provided the basis for defining the functional modules and



technical structure of the proposed system.

Functional Requirements

Based on the information obtained during the requirements-gathering process, the proposed web-based university personnel administration system was designed to provide the following major functional requirements:

1. **User Registration and Authentication:** The system shall allow authorised users to register where applicable and authenticate their identities before accessing protected system functions.
2. **Staff Profile Management:** The system shall provide authorised personnel administrators with the ability to create, update, view and manage staff information and personnel records.
3. **Recruitment Management:** The system shall support the management of recruitment-related information, including job applications and relevant applicant records.
4. **Appointment Management:** The system shall support the recording and management of appointment information and related personnel documentation.
5. **Leave Management:** The system shall allow eligible staff to submit leave applications and enable authorised personnel to process and manage leave records.
6. **Mail and Correspondence Management:** The system shall support the recording and management of relevant official correspondence, memoranda, and personnel-related communications.
7. **Information Search and Retrieval:** The system shall allow authorised users to search for and retrieve relevant personnel information from the centralised database.
8. **Report Generation:** The system shall provide facilities for generating relevant personnel administration reports from stored records.
9. **User Role and Access Management:** The system shall restrict access to system functions and information according to the responsibilities and privileges assigned to different categories of users.
10. **Record Management:** The system shall allow authorised users to add, update, view, and maintain relevant personnel administration records in a centralised database.

These functional requirements formed the basis for identifying the major system modules and defining the interactions between system users and the proposed system.

Non-Functional Requirements

In addition to the functional requirements, the proposed system was designed with non-functional requirements intended to guide the quality, reliability, and operational characteristics of the system.

1. **Security:** The system shall protect personnel information from unauthorised access through authentication and role-based access control. User input shall also be validated before being processed or stored.
2. **Usability:** The system shall provide a clear and understandable interface that enables authorised users to perform common personnel administration activities without unnecessary complexity.
3. **Performance:** The system shall respond to routine user requests, including login, search, record retrieval, and form submission, within a reasonable period under normal operating conditions.



4. **Availability:** The system shall be designed to remain accessible to authorised users during normal administrative operations, subject to the availability of the hosting environment and network infrastructure.
5. **Scalability:** The system shall be structured so that additional personnel records, users, and administrative functions can be accommodated as the institution's requirements increase.
6. **Maintainability:** The system shall use a structured application design that allows authorised developers or system administrators to modify, update, and maintain system components when required.
7. **Data Integrity:** The system shall maintain the accuracy and consistency of personnel records by applying appropriate validation and controlled database operations.
8. **Reliability:** The system shall perform its defined functions consistently and minimise errors during routine personnel administration activities.
9. **Data Management:** Personnel information shall be stored in a centralised database to facilitate controlled storage, updating and retrieval of records.

The functional and non-functional requirements provided the basis for the subsequent system analysis, UML modelling, database design, implementation and testing activities.

Analysis of the Existing Manual System

The existing personnel administration process was examined to understand its operational structure, information flow, major activities and limitations. The analysis focused on activities such as recruitment, staff record management, appointment processing, leave administration, official correspondence, personnel information retrieval and report preparation.

Under the existing system, a considerable proportion of personnel information is handled through paper-based documents and manually maintained records. Personnel officers and administrative staff are responsible for receiving documents, verifying information, updating staff records, processing administrative requests, retrieving personnel files and preparing reports when required. Consequently, the effectiveness of these activities depends substantially on the proper handling, storage, movement, and retrieval of physical records.

The analysis further showed that personnel-related activities involve interactions among different administrative units and categories of users. Information generated during one administrative process may be required during another process. For example, staff biodata and appointment information may subsequently be required during leave processing, record verification, correspondence, or report generation. The use of separate manual records can therefore make the coordination and retrieval of related information more difficult.

The existing organisational structure and administrative relationships considered during the system analysis are presented in Figure1

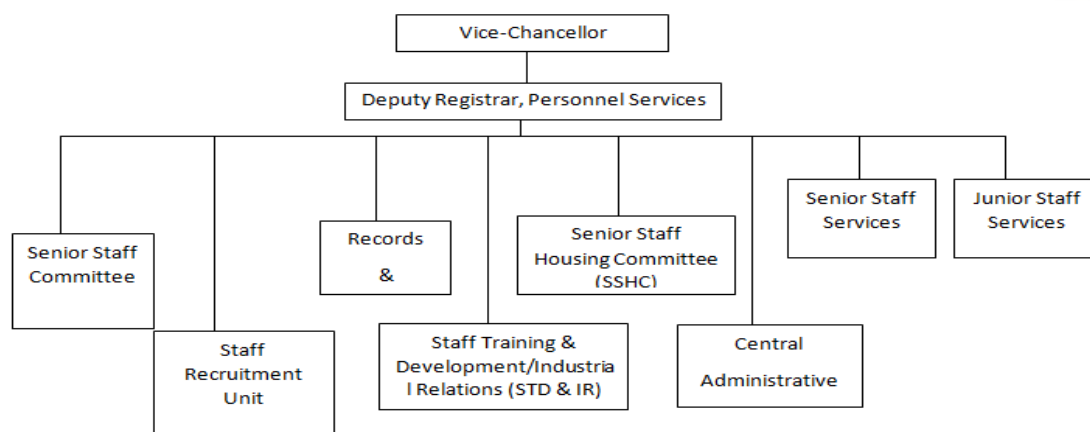


Figure 1: shows the organogram of a personnel Management.

Limitations of the Existing System

Based on the requirements-gathering process and analysis of the existing personnel administration procedures, the following limitations were identified:

1. Dependence on paper-based records: The use of physical documents increases dependence on manual filing, storage, and handling procedures.
2. Difficulty in information retrieval: Locating a particular personnel record may require searching through files or records maintained in different locations.
3. Duplication of records: Similar personnel information may be recorded in different documents or administrative records, creating the possibility of unnecessary duplication and inconsistency.
4. Manual processing of administrative activities: Activities such as recruitment documentation, leave processing, appointment records, and report preparation require substantial manual intervention.
5. Limited centralised access to information: Personnel information maintained in separate files or administrative locations may not be readily available to authorised users when required.
6. Challenges in updating records: Changes to personnel information may require updates to more than one document or record, thereby increasing the possibility of inconsistencies.
7. Risk associated with physical records: Paper-based records may be vulnerable to physical deterioration, misplacement or unauthorised access if appropriate administrative controls are not maintained.
8. Difficulty in generating reports: Preparing consolidated personnel reports from manually maintained records can require information to be gathered from multiple files and sources.

These limitations informed the design of the proposed system and the selection of functions intended to support personnel administration electronically.

Overview of the Proposed System

The proposed system is a web-based university personnel management system designed to provide a centralised platform for managing selected personnel administration activities. It was developed to support the electronic creation, storage, updating, processing, and retrieval of personnel-related information.



The system integrates major administrative functions identified during the requirements-gathering process, including user authentication, staff record management, recruitment, appointment management, leave administration, official correspondence, information retrieval, and report generation. These functions are organised into modules that interact with a centralised database.

Access to system functions is determined by the role and authorisation level assigned to a user. This approach is intended to restrict users to functions and information relevant to their responsibilities. Personnel information entered through the application interface is processed by the application and stored in the database for subsequent authorised retrieval and updating.

The proposed system follows a three-tier structure consisting of the presentation layer, application layer, and data layer. The presentation layer provides the user interface through which users interact with the system. The application layer processes user requests and implements the required system operations, while the data layer manages the storage and retrieval of personnel information from the database.

The proposed architecture therefore provides a structured approach to integrating the identified personnel administration functions within a single web-based environment.

Justification for the Proposed System

The proposed system was developed in response to the limitations identified during the analysis of the existing personnel administration process. A web-based approach was selected to provide a centralised platform through which authorised users can perform selected personnel administration activities and access relevant information.

Centralised electronic storage provides a structured means of maintaining personnel records and allows authorised users to search, retrieve, and update information through the application interface. The use of authentication and role-based access control also provides a mechanism for restricting access to system functions according to assigned user privileges.

The system further brings related personnel administration functions, including staff record management, recruitment, appointment processing, leave administration, correspondence, information retrieval, and report generation, into a common application environment. This integration is intended to reduce dependence on isolated paper-based procedures and provide a more structured approach to managing personnel information.

The justification for the proposed system is therefore based primarily on its functional design and its ability to implement the requirements identified during the system analysis. Although the implemented system can be evaluated for functional correctness through software testing, claims concerning improvements in processing time, reduction in administrative workload, cost savings, error reduction, or user satisfaction require empirical evaluation using measurable operational data. Such measures are distinguished from functional testing in the evaluation of the system.

System Flow Graph

The system flow graph provides a graphical representation of the major activities performed within the proposed web-based personnel management system and the relationships among these activities. It illustrates the sequence through which users interact with the system from authentication to the execution of authorized personnel administration functions.

The process begins when a user accesses the system and provides the required authentication credentials. The system validates the submitted information and, where authentication is successful, grants access according to the user's assigned role and privileges. An unsuccessful authentication attempt prevents access to protected system functions.



After successful authentication, the user is directed to the appropriate interface from which permitted operations can be performed. Depending on the user's role, these operations may include managing staff records, processing recruitment information, managing appointment records, submitting or processing leave information, handling relevant correspondence, searching and retrieving records and generating reports.

Information submitted through the various modules is processed by the application and stored in or retrieved from the centralized database as required. The system subsequently returns the appropriate output to the user. The session terminates when the user logs out of the system.

The flow graph shown in Figure3 summarizes these major system activities and provides a basis for understanding the operational flow of the implemented modules.

UML-Based System Design

Unified Modelling Language (UML) was used to model the structure and behaviour of the proposed web-based university personnel management system. The UML models served as design artefacts for translating the requirements identified during system analysis into system components, user interactions, data entities, and process sequences. The principal UML models used in the study were the use-case diagram, class diagram and sequence diagrams.

Use-Case Model

The use-case model was used to identify the major actors interacting with the system and the functions available to each actor. The model was derived from the functional requirements identified during the requirements-gathering and analysis stages.

The use cases represent major system operations such as user authentication, staff record management, recruitment activities, appointment processing, leave management, correspondence management, information retrieval and report generation. The relationships between actors and use cases assisted in determining the functions that should be accessible to different categories of users.

During implementation, the use-case model guided the organization of the system into functional modules and supported the implementation of role-based access to the available operations. For example, functions relating to personnel record administration were associated with authorized administrative users, while other users were provided access only to operations relevant to their roles.

Class Diagram

The class diagram was used to represent the major entities of the system, their attributes, operations, and relationships. The classes were derived from the information requirements and administrative activities identified during system analysis.

The model provided a structural representation of important system entities and the relationships required to support the personnel administration functions. It therefore informed the organization of application objects and the design of the corresponding data structures used for storing and managing system information.

During implementation, the attributes identified in the class model informed the definition of relevant data fields, while the relationships among the classes provided guidance for linking related records. This helped maintain consistency between the conceptual system design and the implemented database and application components.

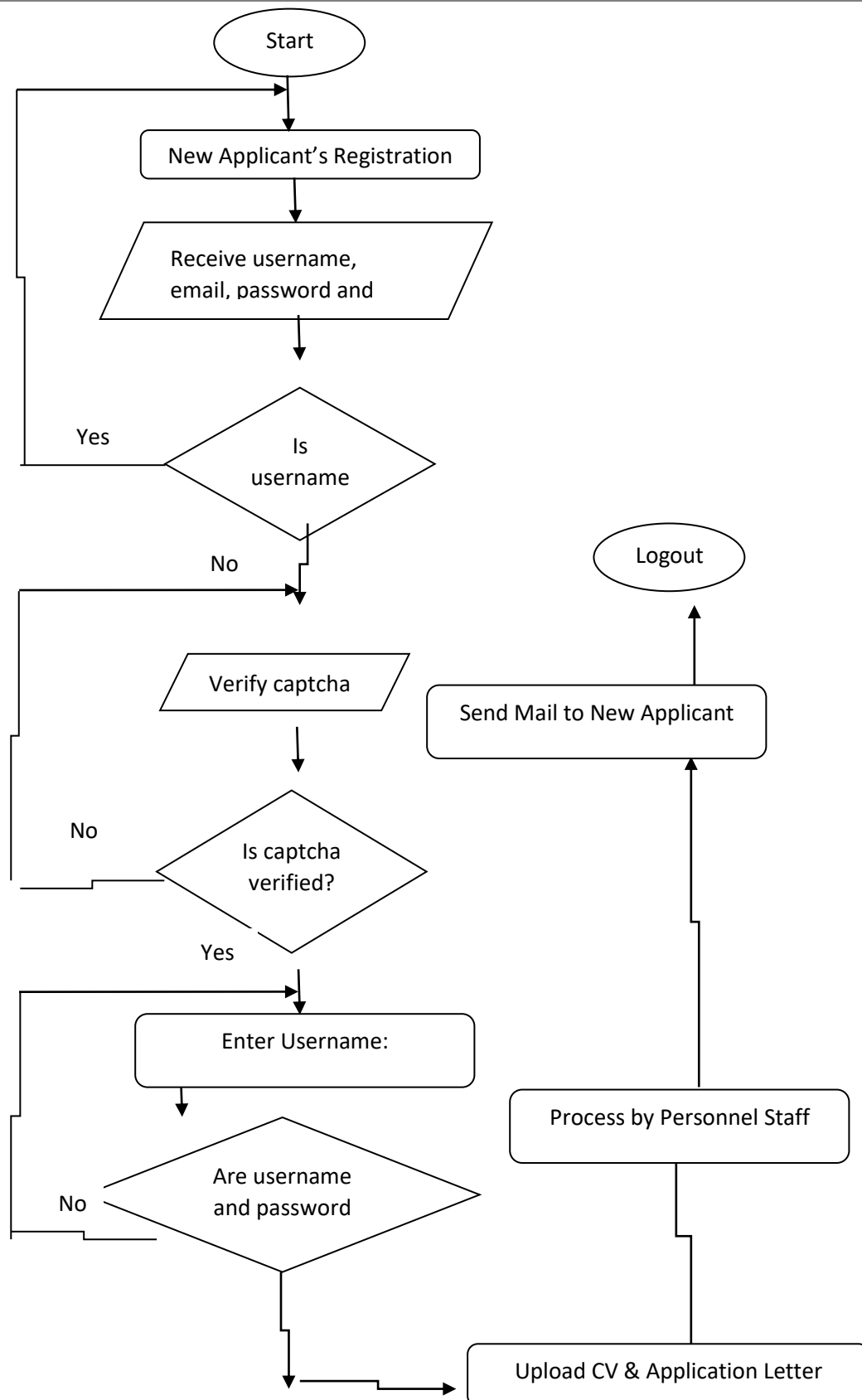


Figure 3: User Registration and Job Application Flow Graph

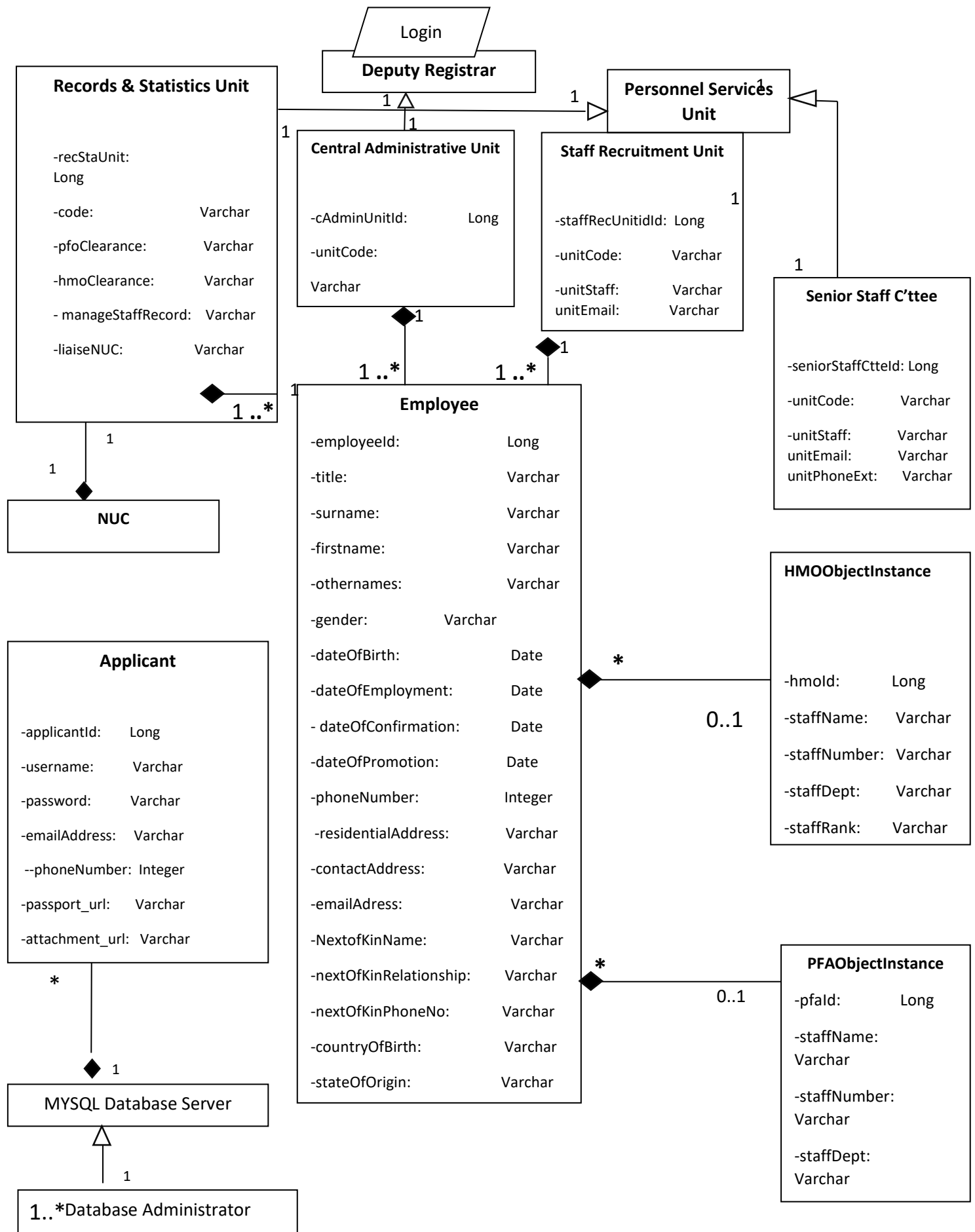


Figure 4: Class Diagram of the System

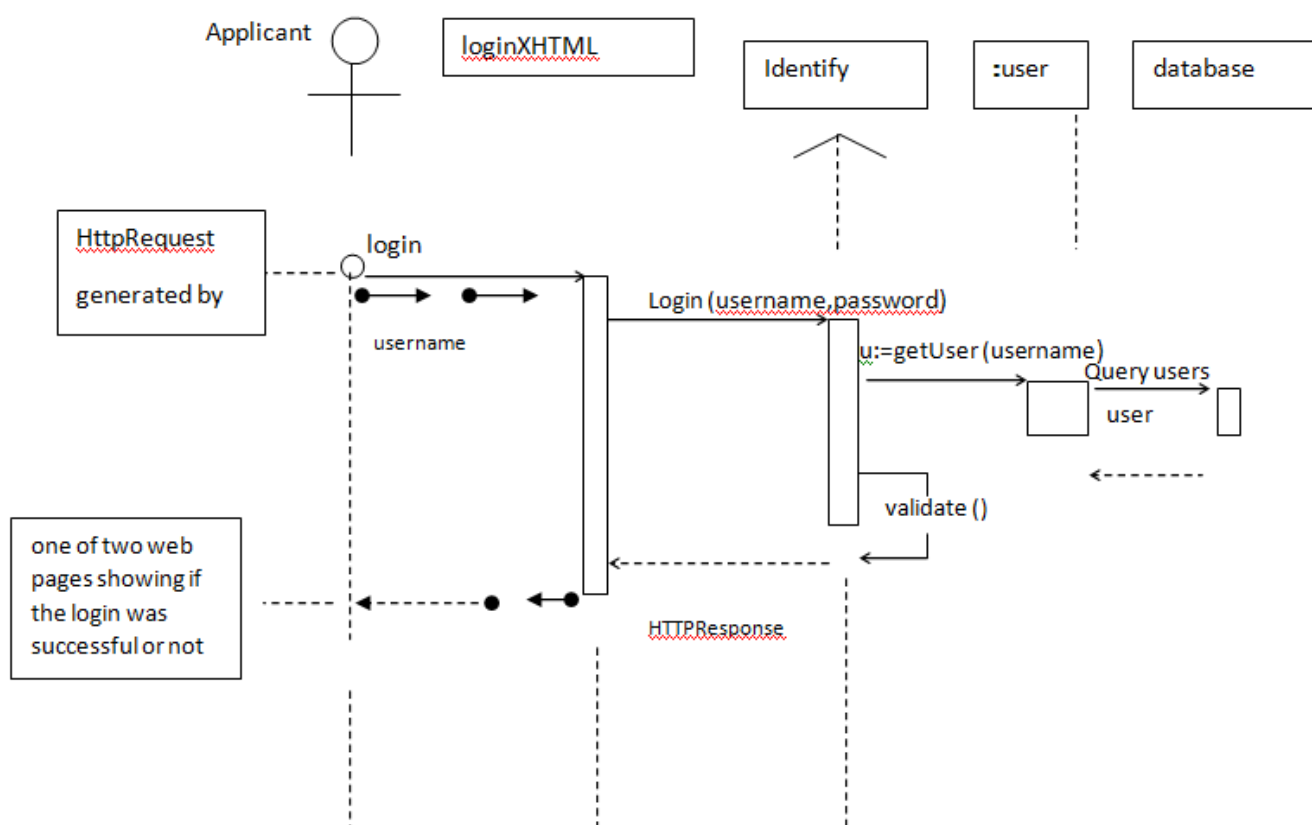


Figure 5: login sequence diagram of the system

After the class diagram, retain your existing descriptions of the individual classes, but ensure that the class names and attributes correspond to those actually shown in the diagram and implemented in the system.

Sequence Diagrams

Sequence diagrams were used to model the chronological interaction among users, system interfaces, application processes and data components during selected system operations. They show how messages and requests are exchanged among system components from the initiation of an activity to the production of the required response.

For example, in the authentication process, a user submits login credentials through the system interface. The application receives the credentials and performs the required validation against stored user information. Where the supplied information satisfies the authentication conditions, access is granted according to the user's assigned role; otherwise, access is denied and an appropriate response is returned.

The same modelling approach was applied to other selected system processes represented by the sequence diagrams. These diagrams informed the order in which application operations were implemented and helped define the interaction between the user interface, application logic and database during execution.

The use-case, class, and sequence models offered complementary perspectives of the proposed system. The use-case model outlined the functions accessible to system actors, the class model depicted the structural organization of system entities and the sequence diagrams illustrated the interactions needed to perform specific processes. Collectively, these UML models established a design framework for developing the functional requirements of the web-based university personnel management system.



METHODOLOGY

The Virtual University Administration System was implemented using the 3-Tier Web Architecture specified in Section 3.4. The application logic was written in PHP (version 8.x), with MySQL serving as the relational backend for persistent record storage. Client-side interaction and responsive user interfaces were realised using HTML5, CSS3, JavaScript and AJAX. The local development and testing environment was provisioned on an Apache HTTP Server via XAMPP.

System Testing and Evaluation

The implemented web-based university personnel management system was subjected to functional and integration testing to determine whether the major modules operated according to the specified functional requirements. Functional testing focused on the behaviour of individual system functions, while integration testing examined the interaction among the user interface, application logic and database components.

The testing process covered the major functions of the system, including user authentication, recruitment, leave management, staff record management, appointment processing, information search and retrieval and report generation. For each test case, an input or user action was supplied to the relevant module and the resulting system behaviour was compared with the expected outcome.

Functional Testing

Functional testing was carried out to verify that the implemented modules performed their intended operations. Representative test cases are presented in Table [insert table number].

Table1: Representative Functional Test Cases for the Implemented System

Test Case	Module/Function	Test Procedure/Input	Expected Result	Observed Result	Status
TC01	User Authentication	Enter valid registered user credentials and submit the login form.	The system authenticates the user and grants access to the appropriate authorised interface.	[Insert actual observed result]	[Pass/Fail]
TC02	Invalid Authentication	Enter invalid username/password details and submit the login form.	The system rejects the credentials and prevents unauthorised access.	[Insert actual observed result]	[Pass/Fail]
TC03	Recruitment	Submit the required recruitment/application information through the appropriate form.	The system validates and processes the submitted information and stores the record where all required conditions are satisfied.	[Insert actual observed result]	[Pass/Fail]
TC04	Leave Management	Submit a leave request containing the required information.	The system processes the request and records the leave information for subsequent authorised action.	[Insert actual observed result]	[Pass/Fail]
TC05	Staff Record Management	Create or update a staff record using valid personnel information.	The system validates the information and stores or updates the corresponding staff record.	[Insert actual observed result]	[Pass/Fail]
TC06	Appointment Management	Enter and submit the required appointment information.	The system processes and stores the appointment information and associates it with the relevant record where applicable.	[Insert actual observed result]	[Pass/Fail]



TC07	Search and Retrieval	Search for an existing personnel record using an available search parameter.	The system retrieves and displays the corresponding authorised record.	[Insert actual observed result]	[Pass/Fail]
TC08	Invalid/Unavailable Search	Search using information for which no matching record exists.	The system returns an appropriate response indicating that no matching record was found.	[Insert actual observed result]	[Pass/Fail]
TC09	Report Generation	Request an available personnel administration report using the appropriate system function.	The system retrieves the required information and presents the corresponding report.	[Insert actual observed result]	[Pass/Fail]
TC10	Role-Based Access	Attempt to access a function that is not assigned to the authenticated user's role.	The system restricts access to the unauthorised function.	[Insert actual observed result]	[Pass/Fail]

The test cases were selected to cover representative operations of the major modules identified during requirements analysis. A test case was considered successful where the observed system behaviour corresponded with the specified expected result.

Integration Testing

Integration testing was conducted to examine the interaction among the major components of the implemented system. Particular attention was given to the flow of information from the user interface to the application logic and subsequently to the database.

For example, when information was submitted through a system form, the test examined whether the application received and processed the submitted values, performed the required validation, communicated with the database, and returned an appropriate response to the user. Similarly, retrieval operations were examined to determine whether requested records could be obtained from the database and presented through the appropriate application interface.

Integration testing was also applied to operations involving related system modules to verify that information generated or stored through one operation could be appropriately accessed by another authorized operation where required.

The results of these tests were used to identify implementation errors and verify the interaction among the integrated components of the system.

Evaluation of Functional Correctness

The evaluation conducted in this study focused primarily on the functional correctness of the implemented system. Functional correctness refers to whether the implemented modules performed the operations specified during requirements analysis when subjected to representative test inputs.

Accordingly, successful completion of the functional and integration test cases provides evidence that the tested functions operated according to their defined requirements. It does not, by itself, demonstrate that deployment of the system reduces administrative processing time, reduces operational costs, improves user satisfaction, or produces a specific level of performance improvement over the existing manual system.

Assessment of such operational effectiveness would require additional empirical evaluation using measurable indicators such as processing time, record retrieval time, error rates, system availability, administrative

workload and user satisfaction. These measures were outside the functional testing presented in this study and constitute an area for further evaluation.

Portal Landing and Authentication Interface

The landing page serves as the entry point for applicants, personnel officers, and administrative staff. To ensure secure system access, the user authentication module enforces input validation and password hashing before granting system privileges.

User Interface design

This is the interface design in which the user interacts with

a. Main menu design

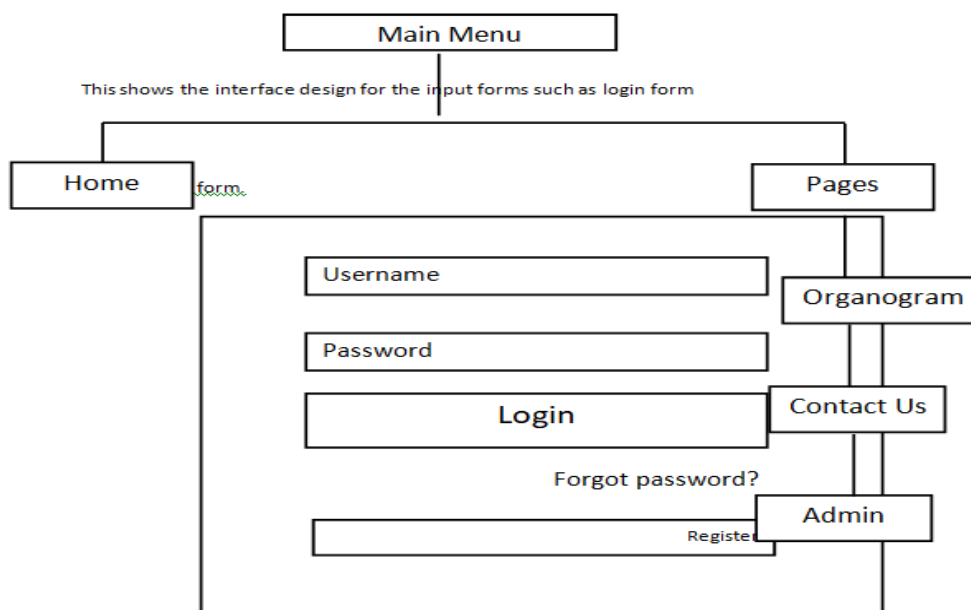
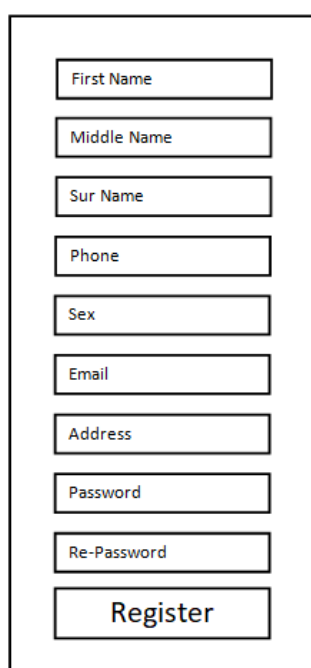


Fig. 4: Login from Interface Design



The diagram shows a registration form interface design. It consists of a vertical stack of input fields and a button. The fields are labeled "First Name", "Middle Name", "Sur Name", "Phone", "Sex", "Email", "Address", "Password", and "Re-Password". Below the "Re-Password" field is a "Register" button.

Fig 5: Registration Form Interface Design



System Implementation and Functional Results

The web-based university personnel management system was implemented using a three-tier architecture comprising the presentation, application, and data layers. The presentation layer provides the interfaces through which users interact with the system, while the application layer processes user requests and implements the required system functions. The data layer provides centralized storage and retrieval of personnel-related information using the database management system.

The implemented modules reflect the functional requirements identified during system analysis. These include authentication, staff record management, recruitment, appointment processing, leave management, correspondence management, information search and retrieval, and report generation.

Comparative Analysis of the Existing and Proposed Systems

A functional comparison was conducted between the existing manual approach and the proposed web-based system based on the characteristics identified during system analysis. The comparison focuses on differences in the mechanisms used to perform personnel administration activities rather than on statistically measured performance improvements.

Table 2: Functional Comparison of the Existing and Proposed Systems

Administrative Feature	Existing Manual System	Proposed Web-Based System
Personnel record storage	Primarily dependent on physical/manual records	Personnel information stored electronically in a centralised database
Record retrieval	Requires manual identification and retrieval of relevant records	Authorised users can search and retrieve stored records through the system interface
Record updating	Changes may require manual modification of relevant records	Authorised users can update applicable records through the system
Recruitment information	Managed through manual administrative procedures	Recruitment-related information can be processed through the designated system module
Leave administration	Leave information is handled through manual administrative procedures	Leave information can be submitted and managed electronically through the appropriate module
Appointment records	Appointment information is maintained using existing administrative records	Appointment information can be recorded and managed electronically
Report preparation	Information may need to be gathered manually from relevant records	Stored information can be retrieved and presented through available reporting functions
Access control	Primarily dependent on administrative and physical controls	Authentication and role-based authorization are used to control access to system functions
Information integration	Information may exist in separate files or administrative records	Related personnel information is maintained within an integrated application environment
Data storage	Dependent on physical storage and manually maintained records	Electronic records are maintained within a centralized database

The comparison indicates structural and functional differences between the existing and proposed approaches. In particular, the proposed system provides electronic storage, centralized access to personnel information, search and retrieval functions and integrated administrative modules.

However, the comparison does not constitute empirical evidence that the proposed system reduces processing time by a particular percentage or amount, reduces administrative costs, or improves user satisfaction. Establishing such effects would require a controlled or operational evaluation using measurable indicators collected before and after implementation.

Security and Data Management Considerations

Security considerations were incorporated into the system design because personnel records may contain information that should only be accessible to authorised users. Authentication is used to verify users before access to protected system functions is granted, while role-based access control restricts available operations according to assigned user privileges.

Input validation was incorporated into applicable data-entry operations to reduce the submission of invalid or improperly formatted information. Personnel records are maintained in a centralized database, allowing the application to provide controlled mechanisms for storing, updating, searching and retrieving information.

These measures represent application-level security controls incorporated into the implemented prototype. However, the study did not undertake a comprehensive security audit or penetration test. Consequently, the implementation of these controls should not be interpreted as evidence that the system is resistant to all possible security threats. Further security evaluation would be required before deployment in a production university environment.

LIMITATIONS AND FUTURE EVALUATION

The evaluation presented in this study was primarily concerned with the functional correctness and integration of the implemented system. It did not include a large-scale deployment within a university environment or a controlled before-and-after assessment of administrative performance.

Consequently, quantitative conclusions concerning reductions in processing time, administrative cost, paperwork, error rates, or improvements in user satisfaction cannot be established from the present evaluation alone.

Future work should evaluate the system in an operational university environment using measurable indicators such as average processing time for selected administrative tasks, personnel record retrieval time, frequency of data-entry errors, system availability, task completion rates, and user satisfaction. Security assessment, including vulnerability assessment and penetration testing, should also be considered before full-scale production deployment.

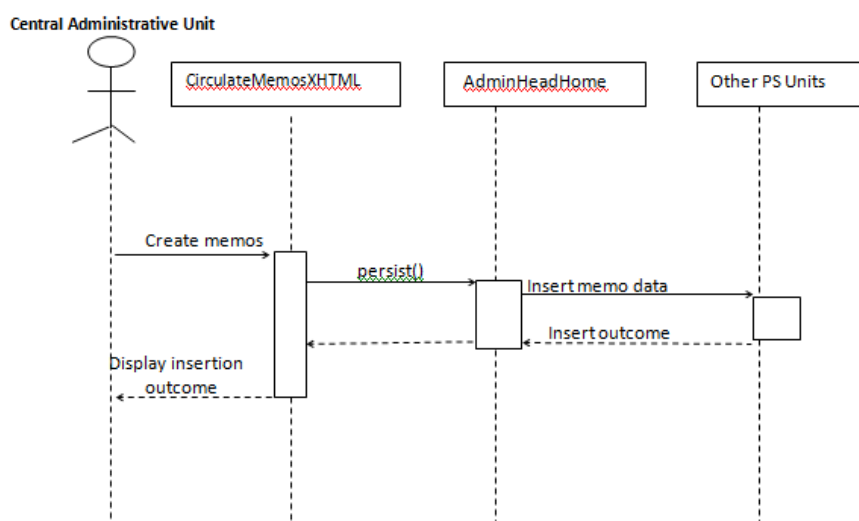


Figure 5: Circulate memos sequence diagram



DISCUSSION

The implementation demonstrates how the requirements identified during system analysis can be translated into an integrated web-based personnel administration application. The functional modules correspond to administrative activities identified during requirements gathering, while the UML models provided structural and behavioural representations that informed implementation.

The centralized database approach enables related personnel records to be managed within a common application environment rather than relying exclusively on separate paper-based records. Similarly, authentication and role-based authorization provide application-level mechanisms for controlling access to available system functions.

The functional and integration tests provide evidence concerning the correctness of the tested system operations. Where an observed result corresponded with the expected result, the relevant function was considered to have satisfied its specified functional requirement.

Nevertheless, functional correctness and operational effectiveness represent different dimensions of system evaluation. Demonstrating that a leave module correctly records an application, for example, does not by itself establish that the system reduces the overall time required for institutional leave approval. Similarly, successful electronic retrieval of a record does not establish a quantified improvement over manual retrieval unless both approaches are evaluated under defined and comparable conditions.

The findings should therefore be interpreted primarily as evidence of the technical implementation and functional operation of the proposed system. Further deployment-based evaluation would be required to determine its effects on administrative efficiency, processing time, record retrieval time, error rates, user experience and other operational outcomes.

CONCLUSION

This study presented the design and implementation of a web-based university personnel management system intended to support selected personnel administration activities within a centralized application environment. The study examined limitations associated with the existing manual approach and translated the identified user and administrative requirements into functional and non-functional system requirements.

Object-Oriented Systems Analysis and Design principles and Unified Modelling Language models were employed in the system design. The use-case model represented interactions between system actors and functions, the class diagram described the structural relationships among major system entities and the sequence diagrams represented interactions involved in selected system processes. These models provided a framework for the subsequent implementation of the system.

The implemented system integrates functions including user authentication, staff record management, recruitment, appointment processing, leave management, correspondence management, information retrieval and report generation. Functional and integration testing were used to assess whether the tested modules operated according to their specified requirements.

The results of the testing demonstrate the functional operation of the tested components of the implemented system. However, functional correctness should be distinguished from operational effectiveness. The present study does not provide sufficient empirical evidence to quantify reductions in processing time, administrative cost, paperwork, or error rates, nor does it establish improvements in user satisfaction following institutional deployment.

The developed system therefore provides a technical framework for computerizing selected university personnel administration processes and demonstrates the feasibility of integrating these functions within a web-based environment. Future work should evaluate the system under operational conditions using measurable indicators such as processing time, record retrieval time, error rates, system availability, security



performance and user satisfaction. Such evaluation would provide stronger empirical evidence concerning the effectiveness of the system in supporting university personnel administration.

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