

Development of Human Resource Management Portal for Nigerian Tertiary Institutions

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ABSTRACT

The core of this study is on the design and implementation of a web-based Human Resource Management Portal tailored to the unique operational context of Nigerian tertiary institutions with the aim of enhancing tertiary education management efficiency and contributing to national development. The Design Science Research Methodology was adopted to systematically identify existing HR challenges and gaps, which informed the development of an integrated system implemented using cost-effective web technologies: PHP, JavaScript, HTML/CSS, Joomla CMS, and MySQL within a Model-View-Controller Architecture. The HRM evaluation, conducted through system testing and comparative analysis, revealed notable improvements across key performance indicators, including processing time (30% to 85%), data accessibility (30% to 40%), and accuracy (60% to 92%). This study demonstrates the potential of a scalable, localized, and effective solution to human resource management challenges in Nigerian tertiary institutions, and recommends its phased adoption, policy integration, user training, and continuous system improvement to ensure sustainability and long-term impact.

Keywords— Electronic Human Resource Management (e-HRM), Web-based Information System, Design Science Research, Model View Controller Architecture (MVCA), Nigerian Higher Education

I. INTRODUCTION

Human Resource Management (HRM) plays a critical role in the effective functioning of tertiary institutions, as it governs the recruitment, development, motivation, and retention of teaching and non-teaching staff [1]. In universities, polytechnics, and colleges of education, HRM is central to ensuring that qualified personnel are available to deliver quality teaching, research, and administrative services. Traditional HRM practices in many tertiary institutions involve manual processes such as paper-based record keeping, face-to-face recruitment procedures, and periodic performance appraisals [2]. While these approaches have served institutions for decades, they are increasingly inadequate in meeting the demands of modern, complex educational systems.

The advent of digital transformation has significantly reshaped HRM practices globally. Digital HRM, often referred to as electronic Human Resource Management (e-HRM), leverages information and communication technologies to automate and streamline HR processes. Through web-based portals and integrated systems, institutions can manage employee records, recruitment, performance evaluation, and training more efficiently. Digital transformation enhances data accessibility, reduces administrative burden, improves accuracy, and supports data-driven decision-making. In advanced systems, HR analytics can further provide insights into workforce trends, productivity, and institutional performance.

In the Nigerian higher education context, however, the adoption of digital HRM systems remains limited and uneven. Many tertiary institutions still rely heavily on manual or semi-digital systems, leading to inefficiencies and operational challenges. Issues such as inadequate funding, poor ICT infrastructure, resistance to change, and lack of technical expertise have slowed the adoption of comprehensive HRM solutions [3]. Given the increasing demand for accountability, transparency, and efficiency in the education sector, the necessity for the development of localized, cost-effective, and scalable HRM portals becomes inevitable for the specific needs of Nigerian tertiary institutions [4]. This study assessed the current challenges and inefficiencies in HRM within selected Nigerian tertiary institutions, identified key features and functionalities required for a localized HRM portal, designed and developed a prototype HRM portal with modules including employee records, recruitment, performance evaluation, training and institutional communication.

A. Concept of Human Resource Management in Higher Education

Human Resource Management (HRM) in higher education refers to the strategic and systematic management of academic and non-academic staff to achieve institutional goals [5]. Unlike corporate organizations, tertiary institutions operate in a knowledge-driven environment where human capital, particularly faculty expertise, is the most valuable asset. Consequently, HRM in this context extends beyond administrative functions to include academic staff development, research productivity enhancement, and institutional governance [6].

HRM performs several critical roles and functions in tertiary institutions. These include recruitment and selection, which ensure that qualified personnel are hired to maintain academic standards; training and development, aimed at improving staff competencies and adapting to evolving educational demands; and performance management, which evaluates staff contributions to teaching, research, and administrative responsibilities. Additionally, HRM is responsible for compensation and benefits administration, employee relations, and compliance with regulatory frameworks set by educational authorities [7].

B. Digital HRM and HR Portals

The evolution of HRM from manual to digital systems represents a significant transformation in organizational management. Traditionally, HR processes were paper-based, involving manual record keeping, physical documentation, and face-to-face interactions [8]. These methods, while functional, were often inefficient, prone to errors, and difficult to scale. With advancements in Information and Communication Technology (ICT), organizations have increasingly adopted digital HRM systems, commonly referred to as electronic Human Resource Management (e-HRM) [9]. E-HRM involves the use of web-based technologies to automate and integrate HR functions, enabling real-time access to information and improved service delivery (Figure 1).

C. Theoretical Framework and Empirical Review

This study is grounded in three key theoretical models that explain the adoption, implementation, and success of information systems.

(i) Technology Acceptance Model (TAM)

The Technology Acceptance Model posits that the adoption of a technology is influenced by two main factors: perceived usefulness and perceived ease of use [10]. In the context of HRM portals, users are more likely to adopt the system if they believe it will improve their job performance and is easy to use. TAM provides a framework for understanding user acceptance and guiding system design.

(ii) Socio-Technical Systems Theory

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(ii) Information Systems Success Model

The Information Systems Success Model identifies key factors that determine the effectiveness of an information system, including system quality, information quality, service quality, user satisfaction, and net benefits. This model is used to evaluate the performance and impact of the developed HRM portal.

II. MATERIALS AND METHODS

A. Research Design

This study adopted the Design Science Research (DSR) methodology (Figure 2), which is well-suited for developing and evaluating information system artefacts aimed at solving identified organizational problems [12]. DSR focuses on creating innovative IT solutions and rigorously evaluating their effectiveness in real-world contexts.

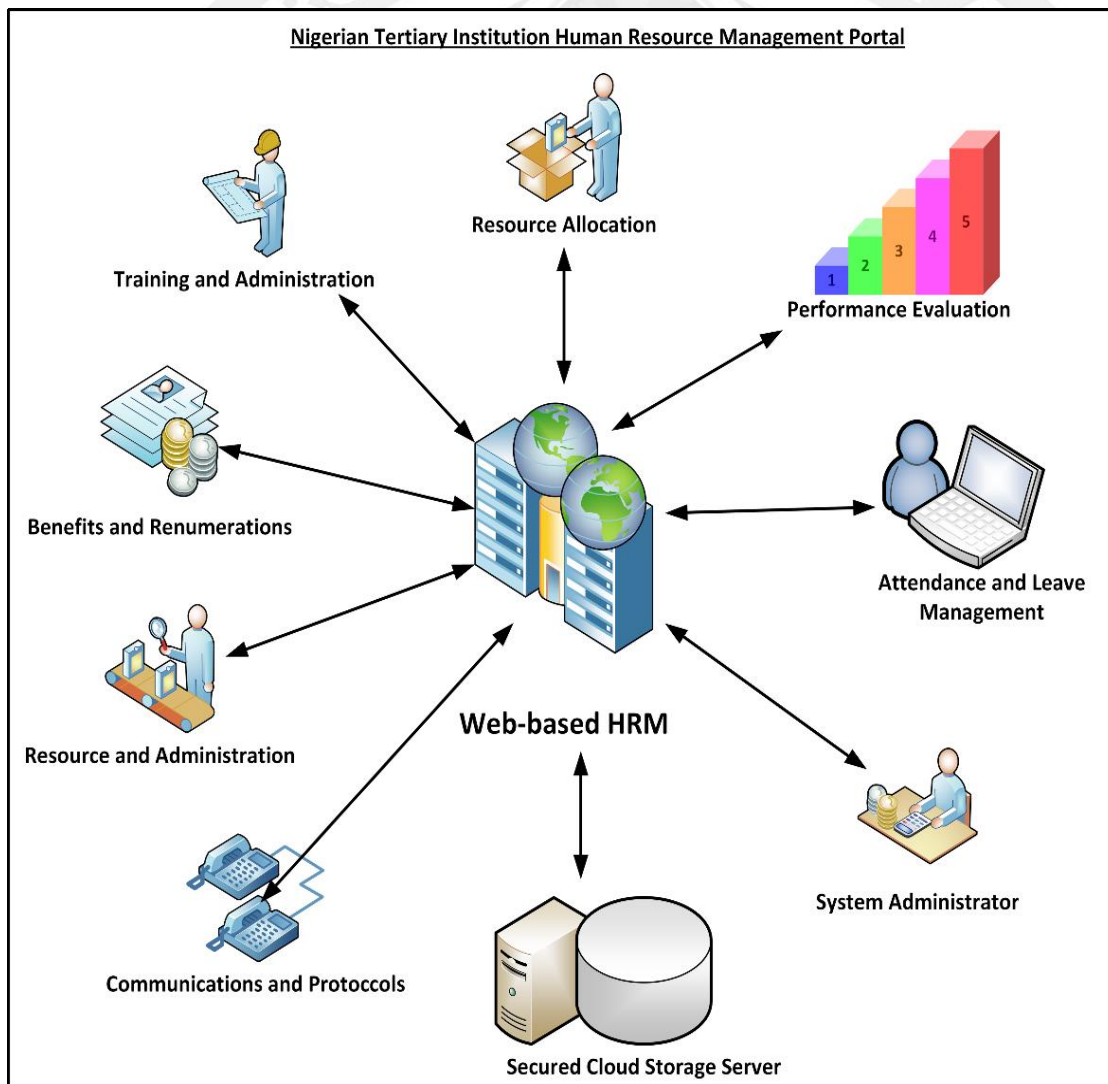


Figure 1: Web-based Human Resource Management (HRM) Portal.

Design Science Research (DSR) Cycle

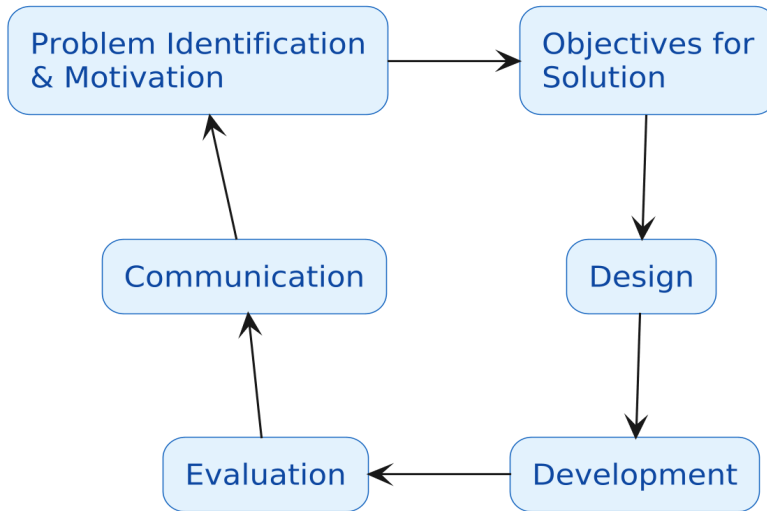


Figure 2: The Design Science Research cycle for HRM

The research follows a systematic process that includes:

1. Problem Identification and Motivation: Understanding HRM challenges in Nigerian tertiary institutions.
2. Definition of Objectives for a Solution: Translating identified problems into system requirements.
3. Design and Development: Creating the HRM portal architecture and implementing system modules.
4. Demonstration: Deploying the system in a real or simulated institutional environment.
5. Evaluation: Assessing system performance using defined metrics.
6. Communication: Presenting findings through this study.

B. Data Collection Methods

To ensure a comprehensive understanding of HRM challenges and system requirements, multiple data collection methods are employed, which includes interviews, Questionnaire and Document Analysis. The combination of these methods ensures both qualitative and quantitative data are captured for robust system design.

C. System Design and Architecture

The system design phase translates requirements into a structured technical solution. It is designed as a web-based system using the Model-View-Controller (MVC) architecture. This architecture separates:

Model: Data and business logic, View: User interface, and Controller: Interaction between model and view. This separation enhances system maintainability, scalability, and flexibility. The Unified Modelling Language (UML) diagram is used to illustrate the interactions between users and the system. It visualizes the system structure and behavior. Figure 3 presents the Use Case diagram of the HRM.y

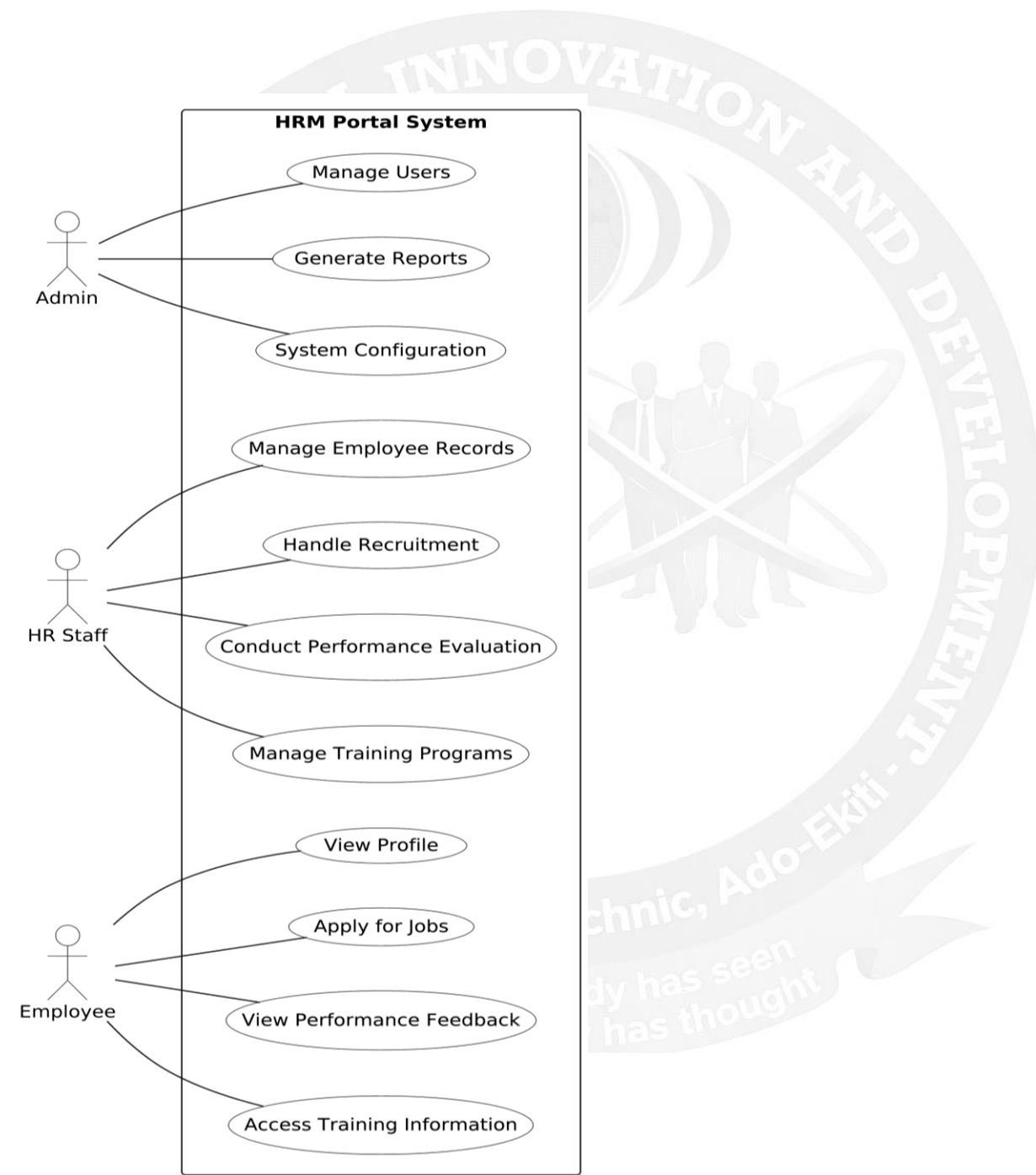


Figure 3: Use Case diagram of the HRM

D. System Workflow and Development

The system centralizes HR operations into a single digital environment, enabling efficient management of employee data, recruitment, performance evaluation, training, and communication. The workflow of the system, as diagrammatically presented in Figure 4, follows a structured sequence of operations:

- (i) User Authentication: Users (HR administrators, staff, management) log into the system through a secure authentication interface with role-based access control.
- (ii) Data Input and Management: HR personnel input and update employee records, job postings, and training schedules.
- (iii) Process Execution: Recruitment processes are initiated and tracked digitally. Performance evaluations are conducted using standardized templates. Training programs are scheduled and monitored.
- (iv) Communication and Notifications: The system disseminates notifications regarding job openings, evaluation schedules, and training programs.
- (v) Reporting and Decision Support: Management accesses real-time reports and analytics for informed decision-making.

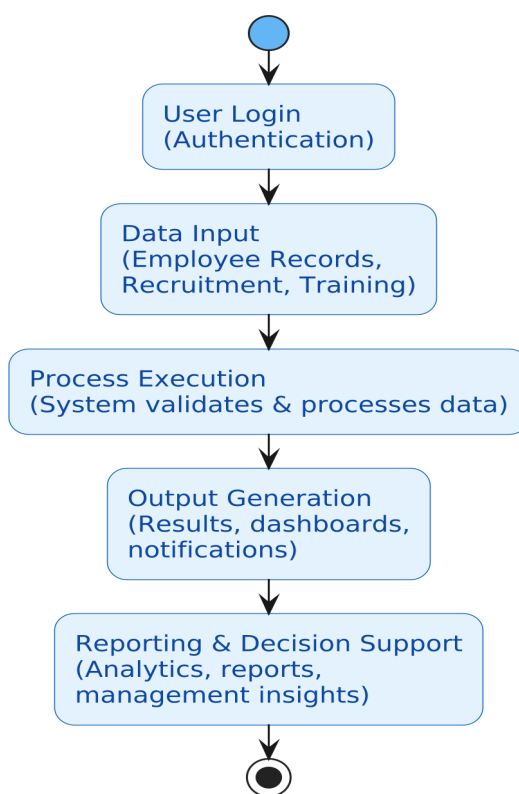


Figure 4: System Workflow of the HRM Portal

E. Server Architecture of the System

The HRM portal adopts a web-based client-server architecture, structured using the Model-View-Controller (MVC) design pattern. The Client-Server Architecture entails:

- (i) Client Layer: Users access the system through web browsers on computers or mobile devices. The client interface handles user interaction and displays system outputs.
- (ii) Server Layer: The server processes user requests, executes business logic, and communicates with the database. It hosts the application and ensures secure data handling.
- (iii) Database Layer: The database stores all HR-related data, including employee records, recruitment data, and performance evaluations.

The MVC Architecture Components (Figure 5) entails: Model, which manages data and business logic (e.g., employee records, recruitment data), View, which represents the user interface (forms, dashboards, reports), and Controller, which handles user inputs and coordinates interactions between the model and view.

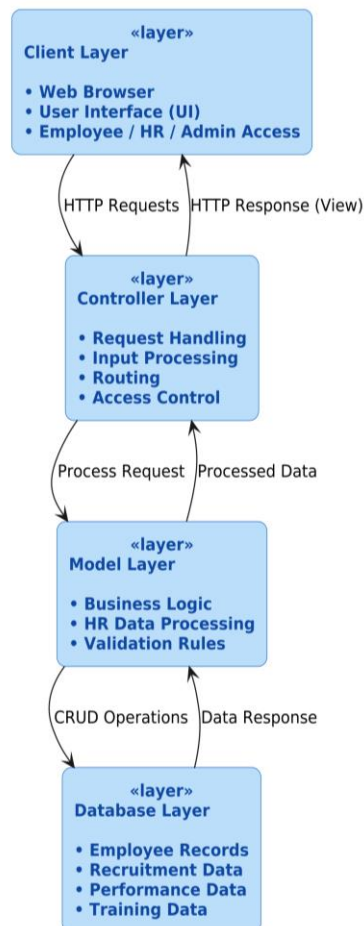


Figure 5: MVC-Based Client-Server Architecture for the HRM Portal

F. HRM User Interface

The user interface (UI) is designed to be intuitive, user-friendly, and responsive, ensuring accessibility for users with varying levels of technical expertise. The Admin and User Interfaces are shown in Figures 6 and 7.

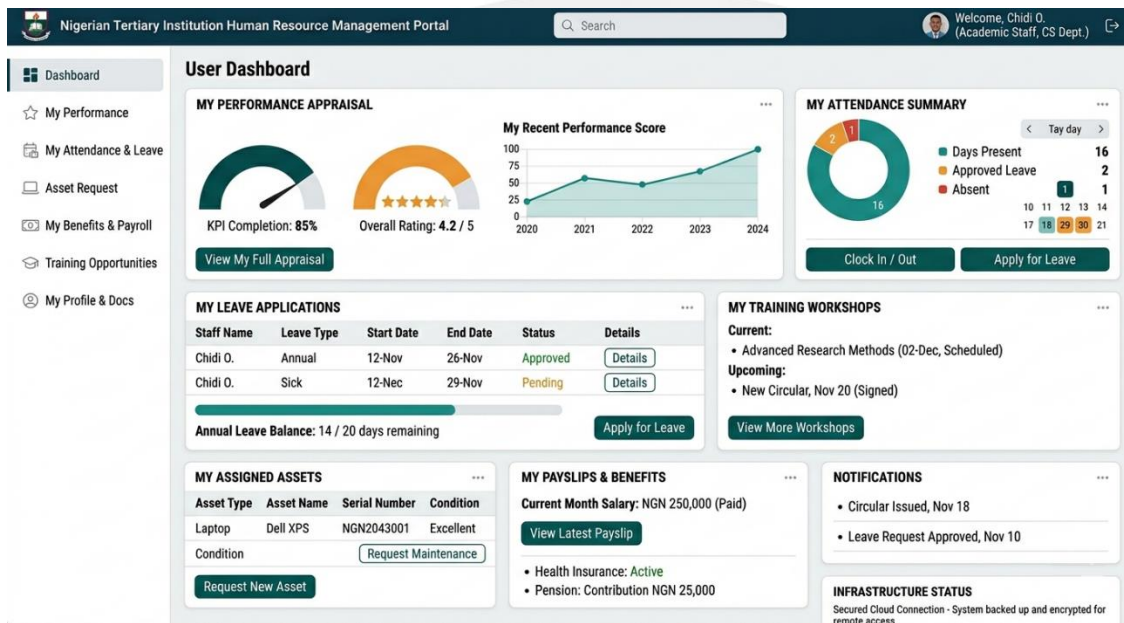


Figure 6: HRM Admin Dashboard

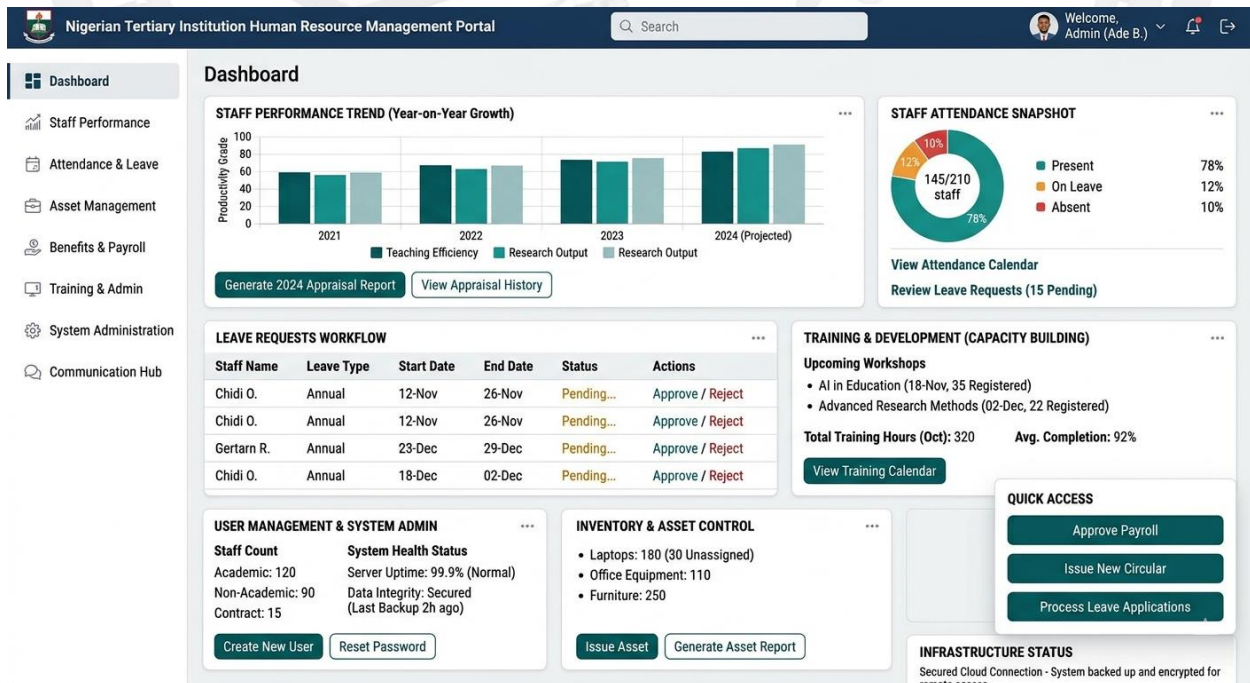


Figure 7: HRM User Dashboard

III. RESULTS AND DISCUSSION

A. Evaluation of System Performance

A comparative evaluation was conducted to assess system performance before and after implementation.

Figure 8 shows the comparison of the before and after performance for HRM

Before Implementation (Manual System):

- i. HR processes were paper-based and time-consuming
- ii. Data retrieval required manual file searches
- iii. High likelihood of errors and data inconsistencies
- iv. Limited accessibility to HR information
- v. Delayed decision-making due to fragmented data

After Implementation (HRM Portal):

- a. Automated processes significantly reduced manual workload
- b. Instant access to centralized HR data
- c. Improved data accuracy and consistency
- d. Enhanced accessibility through web-based interface
- e. Faster and more informed decision-making

The results indicate a substantial improvement in efficiency, accuracy, and accessibility, confirming the effectiveness of the developed system.

IV. CONCLUSION

The implementation of HRM portal demonstrated substantial improvements across key HR functions. The system successfully centralized employee records, streamlined recruitment processes, standardized performance evaluations, enhanced training management, and improved internal communication. These functionalities collectively reduced administrative workload, minimized errors, and improved access to real-time information. Furthermore, the evaluation results showed clear evidence of enhanced efficiency, including reduced processing time for HR tasks and improved data accuracy. The availability of timely and reliable information enabled better managerial decision-making, while structured HR processes contributed to increased staff productivity and engagement.

RECOMMENDATION

Based on the findings of this study and the demonstrated effectiveness of the developed Human Resource Management (HRM) Portal, the following recommendations are proposed:

(i) Adoption by Institutions

Nigerian tertiary institutions should prioritize the adoption of integrated HRM portals to replace manual and fragmented HR processes. Institutional leadership, including university management and governing councils, should support the deployment of such systems as part of broader digital transformation initiatives. Adoption should be carried out in phases, beginning with pilot implementations in selected departments before scaling across the entire institution. This approach will allow for system refinement, user adaptation, and effective change management. Institutions should also ensure the availability of necessary ICT infrastructure, including reliable internet connectivity, servers, and technical support personnel.

(ii) Policy Integration

For sustainable implementation, the use of HRM portals should be embedded within institutional and national education policies. Regulatory bodies such as the National Universities Commission (NUC), National Board for Technical Education (NBTE), and National Commission for Colleges of Education (NCCE) should develop guidelines that encourage or mandate the adoption of digital HRM systems. Policies should address key issues such as: Data governance and security, Standardization of HR processes, Digital record-keeping requirements, Compliance with labour and educational regulations.

FUTURE WORK

While this study has successfully developed and evaluated a functional HRM portal, several areas exist for further research and system enhancement.

(i) Integration with Artificial Intelligence (AI)

Future versions of the HRM portal can incorporate Artificial Intelligence (AI) to enable predictive and intelligent HR analytics. AI-driven features may include predictive analysis of staff turnover and retention, automated candidate screening during recruitment, Performance trend analysis and recommendations, and personalized training suggestions based on skill gaps

(ii) Mobile Application Development

To improve accessibility and user engagement, future work should focus on developing a mobile application version of the HRM portal. A mobile app would allow users to: access HR services anytime and anywhere, receive real-time notifications, submit requests (e.g., leave applications) on the go, participate in training and evaluation processes remotely.

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