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Academic Staff Promotion Eligibility System - A Case Study of The Federal Polytechnic Bida, Niger State, Nigeria

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ABSTRACT

The manual process for determining academic staff promotion eligibility at the Federal Polytechnic, Bida, is inefficient, time-consuming, and prone to errors. This research work tends to address these challenges by developing a system using information extraction techniques, and evaluate its performance. Developed with Next.js for a responsive front-end and a robust backend, the system provides a structured platform for staff to submit their credentials—including academic qualifications, publication records, and previous promotion letters. Administrators can configure promotion criteria and manage the verification process through a dedicated dashboard. The system automates the extraction and assessment of key eligibility factors, such as years in current rank and number of publications, against predefined rules. Performance testing confirmed the system's functionality and reliability. The system streamlines the promotion workflow, enhances transparency, reduces administrative workload, and minimizes human bias. It is recommended for adoption by the institution to modernize its staff promotion process. Future work could explore integration with institutional databases and the application of AI for more advanced data analysis.

Keywords: Promotion Eligibility, Automation, Information Extraction, Academic Staff, Web Systems

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I. INTRODUCTION

Technology has significantly transformed various administrative processes, including staff management and promotion evaluation. With the advent of digital solutions, organizations can now automate routine tasks, improve efficiency and reducing human errors. The integration of information systems in human resource management has been demonstrated to streamline decision-making processes and enhance organizational performance (Syahputra & Sembiring, 2020). Promotion is a critical aspect of career progression in any institution, serving as a motivational tool for employees and ensuring that the most competent individuals ascend to leadership positions.

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However, traditional methods of evaluating staff eligibility for promotion often suffer from biases, inconsistencies, and delays, necessitating the need for a more structured and automated approach (Orekhov & Malyhon, 2020). The documentation of credentials plays a crucial role in promotion assessment, as it provides verifiable records of an employee's qualifications, experience, and achievements. Manual documentation systems are prone to loss, forgery, and inefficiency, highlighting the importance of digitizing the credential verification process to enhance transparency and accuracy (Buhari & Mohammed, 2021).

Information extraction is a fundamental process in modern data-driven applications, enabling systems to retrieve relevant information from unstructured and structured datasets. In the context of staff promotion, information extraction techniques facilitate the automatic identification and classification of essential eligibility criteria, improving the accuracy and speed of decision-making (Wini et al., 2024).

An Information Extractor System is designed to automate the process of extracting relevant data from various documents and databases to determine staff eligibility for promotion. By leveraging artificial intelligence and natural language processing, such a system can ensure objectivity, efficiency, and reliability in promotion evaluations (Syahputra & Sembiring, 2020). Promotion serves as the foundation for career progression, which is a structured advancement in an individual's professional life.

Career growth is influenced by various factors, including education, skill acquisition, work experience, and performance appraisals (Strelnikova et al., 2021). Organizations recognize career progression as a way to retain employees by offering structured paths that provide motivation and professional fulfillment. Employees who perceive growth opportunities in their workplace are more likely to stay committed to their organizations, increasing overall productivity and reducing turnover rates (Priyanka & Parveen, 2022).

To be considered for promotion, staff members must meet these criteria alongside other required documents, including records of previous promotions and all necessary credentials. The current manual process of compiling, verifying, and printing these documents is tedious, time-consuming, and resource-intensive. The lack of an automated system leads to inefficiencies, delays, and potential errors, making the promotion process cumbersome and inconsistent. This study seeks to address these challenges by developing an Information Extractor System for Academic Staff eligibility for promotion at The Federal Polytechnic Bida.

The specific objectives of the study include:

i. To design a database schema to match the current documentation required for submitting credentials for promotion.
ii. To implement a system that utilizes information extraction techniques for eligibility determination and.
iii. To conduct performance tests.

2. LITERATURE REVIEW

A crucial aspect of career advancement is promotion, which signifies an elevation in an employee's role, responsibilities, and remuneration. Promotions are often linked to performance evaluations, which assess an employee's competence and readiness for a higher position (Orekhov & Malyhon, 2020). However, biases and inconsistencies in the assessment process can hinder fair promotions, necessitating structured evaluation criteria. With digitalization, many organizations are now leveraging automated systems to ensure fair and data-driven career progression decisions (Tuhairwe et al., 2023).

Employment documentation involves collecting, storing, and verifying an employee's credentials, including academic qualifications, work experience, and certifications. Proper documentation serves as evidence of an employee's skills and eligibility for career advancement (Buhari & Mohammed, 2021). Traditional documentation systems, which rely on paper records, are prone to loss, manipulation, and inefficiencies. Organizations are increasingly shifting to digital solutions to enhance accuracy and security in verifying employee credentials (Syahputra & Sembiring, 2020).

Verification of employment documentation ensures that promotions are granted based on merit rather than favoritism. In many institutions, fraudulent claims regarding academic qualifications or work experience can compromise the credibility of the promotion process. Automated verification systems leverage artificial intelligence to cross-check submitted credentials with official databases, reducing errors and fraud (Wini et al., 2024). Blockchain technology is also being explored for employment verification, as it offers an immutable record of an employee's history. This ensures that academic records, training certificates, and experience details are securely stored and verifiable when needed (Komala et al., 2021). The integration of digital documentation verification enhances efficiency, as manual processes are often time-consuming and prone to inconsistencies.

Promotion in organizations is a structured process where employees are elevated to higher positions based on performance, experience, and competency (Orekhov & Malyhon, 2020). This process is crucial for maintaining motivation among employees and ensuring that organizations retain their best talent. A well-defined promotion policy promotes fairness and transparency, preventing disputes and dissatisfaction among employees (Orekhov & Malyhon, 2020). Promotions typically follow structured pathways, with organizations establishing key performance indicators (KPIs) to assess eligibility. Traditional promotion methods rely on manual performance evaluations, which can be influenced by human bias. However, automated systems now provide data-driven approaches that ensure merit-based promotions (Ricárdez-Rueda et al., 2022).

Information extraction (IE) techniques play a critical role in modern document processing by enabling the automated identification, classification, and retrieval of relevant information from structured and unstructured data sources. These techniques utilize natural language processing (NLP), machine learning (ML), and pattern recognition to analyze documents, extract key attributes, and organize data efficiently (Wini et al., 2024).

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Traditional document processing methods rely heavily on manual review, which is time-consuming and error-prone. However, with advancements in artificial intelligence (AI) and computational linguistics, automated IE systems can streamline document handling, improve accuracy, and enhance decision-making in various domains, including human resource management and staff promotion assessments (Syahputra & Sembiring, 2020).

2.1 Review of Related Works

The concept of employee promotion has been extensively explored in various studies, with significant focus on the application of advanced technologies like machine learning, object-oriented approaches, and decision-making models. A growing body of research emphasizes the use of these methods in enhancing the efficiency, fairness, and accuracy of promotion processes within organizations. Ilwani, Nassreddine, and Younis (2023) explored the application of machine learning algorithms in predicting and managing employee promotions. Their study highlights the potential of machine learning in automating promotion decisions based on employee performance, work history, and other relevant data. The authors observed that by utilizing machine learning techniques, companies can reduce biases and improve the accuracy of their promotion processes. This aligns with current trends where technology is leveraged to make more data-driven and transparent organizational decisions.

Similarly, Ibrahim et al. (2014) focused on the development of a staff management system using a UML-based object-oriented approach. The study emphasized the design of a system that facilitates the management of employee data, including promotions. The system's ability to structure employee-related information in a comprehensive and organized manner allows for more informed decisions regarding promotions. This work illustrates how software engineering approaches, like UML, contribute to the efficiency of human resource management systems, particularly in the context of staff promotion.

The academic realm also benefits from promotion-related studies, as demonstrated by Saaludin et al. (2016). Their research, which applied the Analytic Hierarchy Process (AHP) to academic staff promotions in higher education, shows how multi-criteria decision-making models can be employed to evaluate and rank candidates for promotion. The AHP method allows decision-makers to incorporate various factors such as teaching performance, research output, and service contributions, offering a balanced and structured approach to the promotion process. This approach provides a clear and methodical way to assess complex decision-making scenarios in academic institutions.

Tuhairwe, Mukisa, and Al-Absi (2023) examined the use of a random forest classifier in predicting employee promotions within a web-based platform. Their research introduced the concept of using predictive analytics to forecast promotion outcomes, leveraging machine learning models to assess employee eligibility for promotion based on performance data. This study reflects the increasing reliance on artificial intelligence (AI) and machine learning in enhancing human resource functions, offering the potential for more personalized and accurate promotion predictions.

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Although existing studies on employee promotion have explored various technological and decision-making methods, there remains a significant gap in the development of an automated Information Extractor System specifically designed to assess staff eligibility for promotion. Most of the current approaches, such as those utilizing machine learning models, knowledge management systems, and decision-making frameworks like the Analytic Hierarchy Process (AHP), focus on the broader management or prediction of promotions but do not directly address the automation of the extraction and processing of relevant information for staff assessment. \

3. MATERIALS AND METHODS

In this study, the detailed procedures that will be followed for the successful completion of this research are discussed. This structured approach ensures a systematic and thorough development process for the Information Extractor System aimed at automating the assessment of staff eligibility for promotion at Federal Polytechnic Bida. The planning phase will define the project scope, objectives, and assess its feasibility within the institution's context. In the analysis phase, specific promotion criteria and staff data requirements will be identified and examined to understand the exact functional and non-functional needs of the system.

The design phase will involve outlining the system architecture, including the database structure, user interface layouts, and information extraction workflows. During implementation, the system components will be developed, including the integration of information extraction techniques for analyzing staff data. The testing phase will verify that the system accurately assesses eligibility and performs as intended. Finally, the deployment phase will make the system operational within the Polytechnic, with ongoing maintenance to ensure continued accuracy, performance, and compliance with any updated promotion policies.

System Specification and Design

The requirement for the installation and smooth running of the proposed system is subdivided into hardware and software requirements and are stated below;

- **Hardware Requirement:** The computer to install and run the application should have at least Intel Core i3 processor or equivalent, Minimum of 4GB RAM (8GB recommended for smoother performance), at least 250GB hard disk space and stable internet connection router.
- **Software Requirement:** The Operating System should be any of the following: Windows, macOS, or Linux, Framework: Next.js (for frontend and server-side rendering), Backend: Node.js runtime environment, the Database should be MySQL or PostgreSQL, Apache or Nginx as the Web Server, Visual Studio Code or equivalent can server as Code Editor. A modern web browser (Chrome, Firefox, or Edge) is required with additional Tools such as Git for version control and npm for dependency management and Installation of Firewall.

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The proposed system, promotion eligibility system, is designed to automate the promotion evaluation process at Federal Polytechnic Bida. The system will allow staff members to upload digital copies of their academic certificates, records of last promotion letter and scholarly publications, such as journal articles and conference papers as shown in table 1. The system will feature a user-friendly interface where staff can easily submit their credentials and documents, and moderators can access the submitted information on each applicant's eligibility status. The eligibility assessment will be performed based on predefined criteria, ensuring consistency and transparency. Furthermore, the system will generate alerts or flags for missing or incomplete documentation, helping to reduce delays and errors. By automating data extraction and evaluation, the new system enhances efficiency, accuracy, and fairness in the promotion process, providing a structured and reliable alternative to the manual approach.

Table 1: Input Specification

Field Name	Data Type	Stage	Description
username	VARCHAR(50)	User Authentication	Unique identifier for staff or admin login.
password	VARCHAR(255)	User Authentication	Hashed password for secure login.
full_name	VARCHAR(100)	Staff Profile Submission	Full name of the staff member.
staff_id	VARCHAR(20)	Staff Profile Submission	Unique staff identification number.
department	VARCHAR(100)	Staff Profile Submission	Department or unit within the Polytechnic.
current_rank	VARCHAR(50)	Staff Profile Submission	Current academic or administrative rank.
last_promotion_date	DATE	Staff Profile Submission	Date of last promotion.
years_of_service	INT	Staff Profile Submission	Total number of years worked.
degree_certificate	FILE (PDF/JPG)	Document Upload	Scanned copy of Bachelor's certificate.
masters_certificate	FILE (PDF/JPG)	Document Upload	Scanned copy of Master's certificate.
phd_certificate	FILE (PDF/JPG)	Document Upload	Scanned copy of PhD certificate (if any).
previous_promotion_letters	FILE (PDF)	Document Upload	Letters or documents from past promotions.
publication_files	FILE (PDF/DOCX)	Document Upload	Journal or conference papers submitted for consideration.
publication_list	TEXT	Document Upload	A typed list of all publications with titles,

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Field Name	Data Type	Stage	Description
			dates, and venues.
professional_certificates	FILE (PDF/JPG)	Document Upload	Optional certifications or training records.
employment_letter	FILE (PDF/JPG)	Document Upload	Staff employment letter.
nysc_certificate	FILE (PDF/JPG)	Document Upload	NYSC discharge or exemption certificate.
qualification_level	VARCHAR(20)	Eligibility Criteria Matching	Automatically extracted or admin-assigned academic qualification level.
num_publications	INT	Eligibility Criteria Matching	Count of extracted publications.
years_in_rank	INT	Eligibility Criteria Matching	System-calculated years in current rank.
promotion_requirements	TEXT	Admin Criteria Setup	Defined rules and requirements per rank, stored as JSON or key-value pairs.
eligible_status	VARCHAR(20)	Eligibility Criteria Matching	System-determined status: “Eligible”, “Not Eligible”, “Incomplete”.
admin_comments	TEXT	Review & Feedback	Optional remarks from admin or promotion committee.
missing_documents_flag	BOOLEAN	Review & Feedback	Flag for whether the staff’s upload is incomplete.

Use Case Diagram

Staff members begin their interaction with the Information Extractor System by logging in with their credentials. Once authenticated, they are presented with a user-friendly dashboard where they can input and submit their personal profile details, such as current rank, qualifications, and employment history. The system allows them to upload all necessary promotion documents, including academic certificates, past promotion letters, and scholarly publications like journal articles or conference papers. Each document is tagged and stored securely for automated analysis as shown in figure 1 and 2 respectively.

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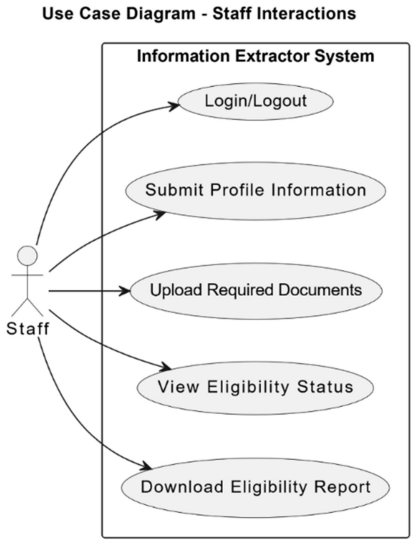

Figure 1: Staff Use Case Diagram

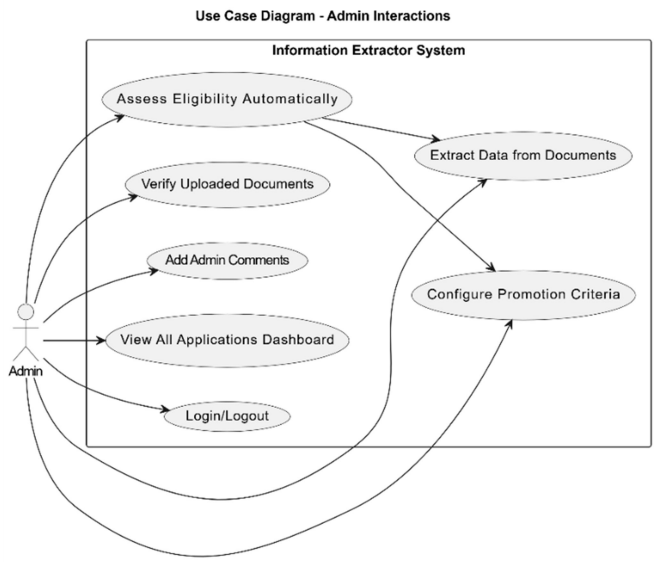

Figure 2: Admin Use Case Diagram

After submission, staff can monitor the status of their promotion eligibility directly from the portal. The system processes the submitted information using predefined promotion criteria, extracting relevant data and performing initial assessments. Staff members are then notified of their eligibility outcome, and they can download a structured eligibility report for their records. This automated process saves time, ensures transparency, and keeps staff informed throughout every stage of the promotion evaluation.

Use Case Diagram – Admin

Administrators log in through a dedicated admin portal where they can access a comprehensive dashboard displaying all ongoing applications for promotion. They can configure the eligibility criteria such as required qualifications, minimum years in current rank, and publication expectations which the system uses to automatically evaluate staff submissions. Admins can also review extracted data from uploaded documents and cross-check them with the submitted files for verification accuracy. Beyond automation, admins can manually verify documents, append comments for clarification, or flag incomplete applications. They have the authority to approve or reject submissions and oversee the generation of final eligibility reports.

System Workflow

This workflow diagram represents the logical flow of operations in a staff promotion management system, beginning from the initial login process and proceeding through the specific functions assigned to different user roles as shown in figure 3. The process starts when a user initiates the system and attempts to log in by selecting either Staff or Admin as their role.

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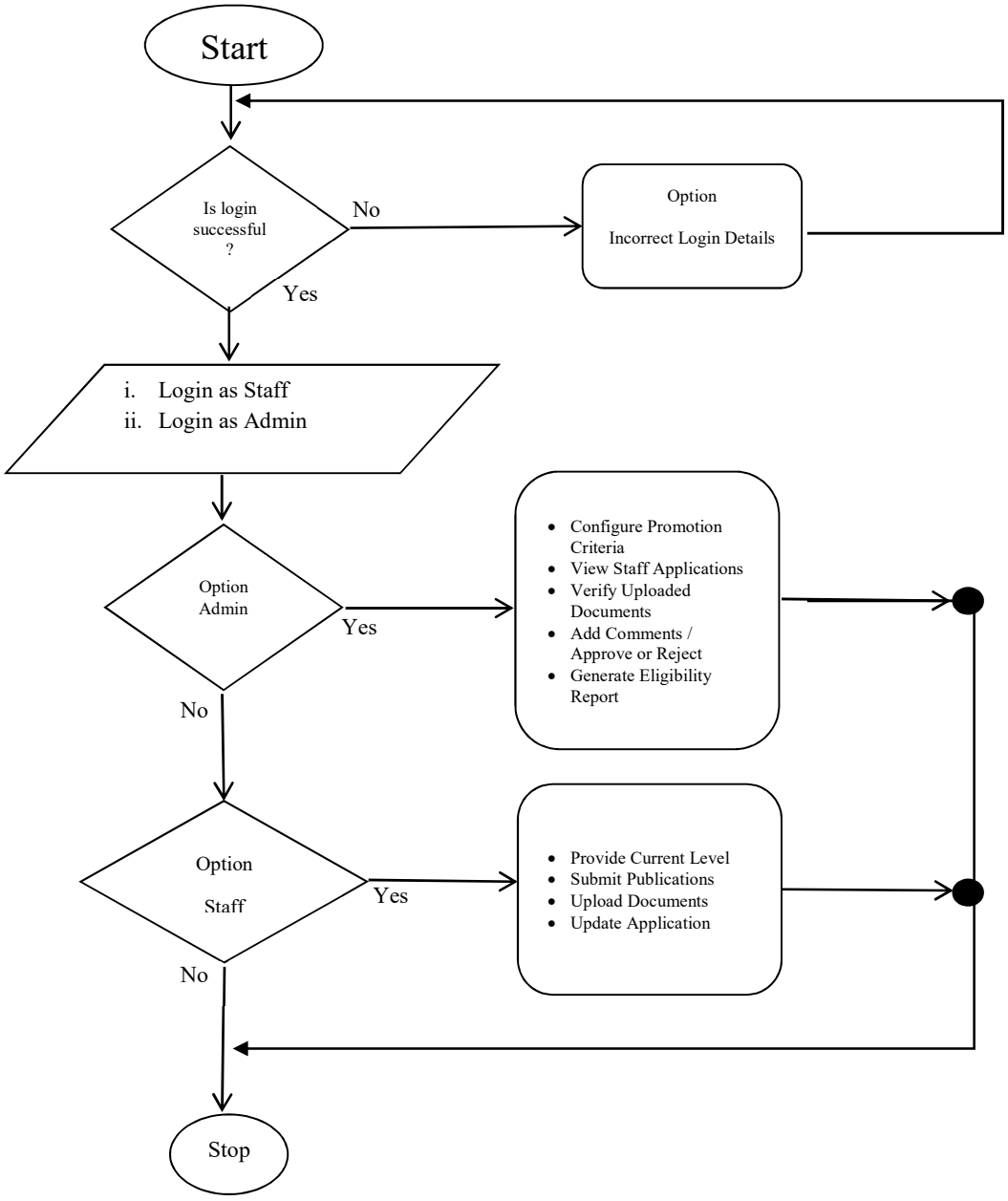

Figure 3: System Workflow

The system validates the login details; if the credentials are incorrect, an "Incorrect Login Details" message is displayed, prompting the user to retry or exit the process. However, if the login is successful, the system determines the user's role and directs them to the appropriate interface.

For users logging in as Admin, the system grants access to administrative operations, which include configuring promotion criteria, viewing staff applications, verifying uploaded documents, adding comments, approving or rejecting applications, and generating eligibility reports for staff promotion. These functions empower the Admin to oversee, regulate, and finalize promotion activities within the organization. Conversely, when a user logs in as Staff, the system provides options to manage individual promotion submissions by allowing them to provide their current academic or professional level, submit publications, upload required supporting documents, and update existing applications. Each role is guided by conditional checks ensuring that only authorized operations are executed, maintaining data integrity and security throughout the process. In the case of incorrect login attempts, the system redirects users appropriately, ensuring error handling and controlled termination. The workflow ultimately demonstrates a structured and hierarchical access system where Admins perform supervisory tasks, while Staff members handle personal promotion-related submissions, collectively ensuring smooth, secure, and transparent management of promotion activities within the institution.

4. RESULTS AND DISCUSSION

In line with the objectives of the study, the following were achieved and implemented for the system:

The database schema was meticulously designed after conducting a thorough analysis of the existing promotion documentation requirements to ensure that all relevant data elements were properly captured and logically represented. This process involved identifying key entities such as lecturer profiles, publications, academic qualifications, research contributions, and administrative assessments. Each entity was then mapped into structured relational tables with defined attributes, primary and foreign keys, and constraints to maintain data integrity and consistency. Relationships between the tables were carefully established to enable efficient querying, data retrieval, and reporting of promotion-related information as shown in figure 4. The result was a well-organized database schema that supports scalability, flexibility, and seamless integration with the system's backend for real-time data operations.

A system was subsequently implemented to automate the tedious and error-prone process of evaluating lecturers' promotion eligibility. Using automated information extraction methods, the system analyzed lecturers' records such as publication lists, years of experience, qualifications, and performance evaluations to assess compliance with institutional promotion policies. Academic criteria were defined within the system to serve as benchmarks against which lecturers' profiles were compared. The implementation was developed using modern web technologies and intelligent algorithms capable of filtering, validating, and interpreting structured and unstructured data sources. This ensured a fair, transparent, and consistent assessment process that significantly reduced human bias and administrative workload.

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After implementation, the system underwent rigorous testing and evaluation to ensure optimal functionality and reliability. Both real-world data obtained from actual promotion cases and simulated datasets were used to validate the system's accuracy in determining eligibility outcomes. The evaluation focused on performance metrics such as processing speed, data validation accuracy, and system responsiveness under varying load conditions. User acceptance testing (UAT) was also conducted with administrative staff and academic reviewers to assess the usability and clarity of system outputs. The results demonstrated that the system performed efficiently in analyzing complex promotion data, minimized errors, and provided consistent recommendations, thereby confirming its readiness for institutional deployment and future scalability.

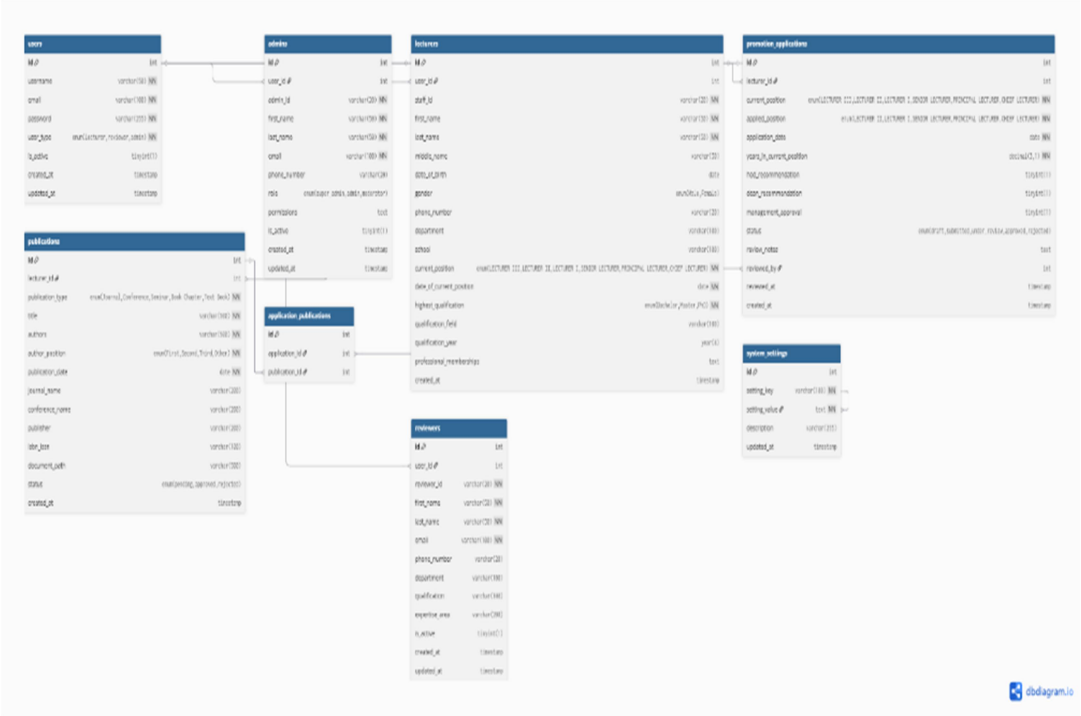

Fig 4 Database Schema

Home Page and Login Page

The home page of the Staff Promotion Eligibility System serves as the main entry point for both administrators and staff members. It provides a clear welcome message that introduces the purpose of the platform, which is to evaluate and manage staff promotion eligibility based on predefined criteria such as years of service, qualifications, and performance records as shown in figure 5.

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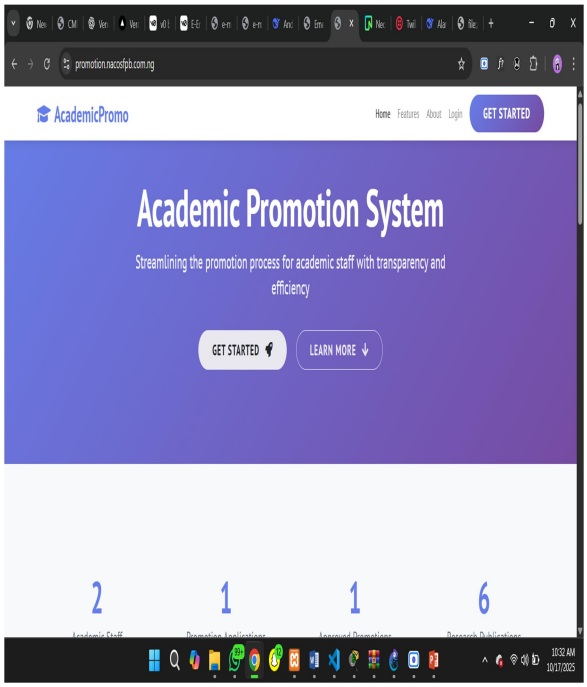

Figure 5: Home Page

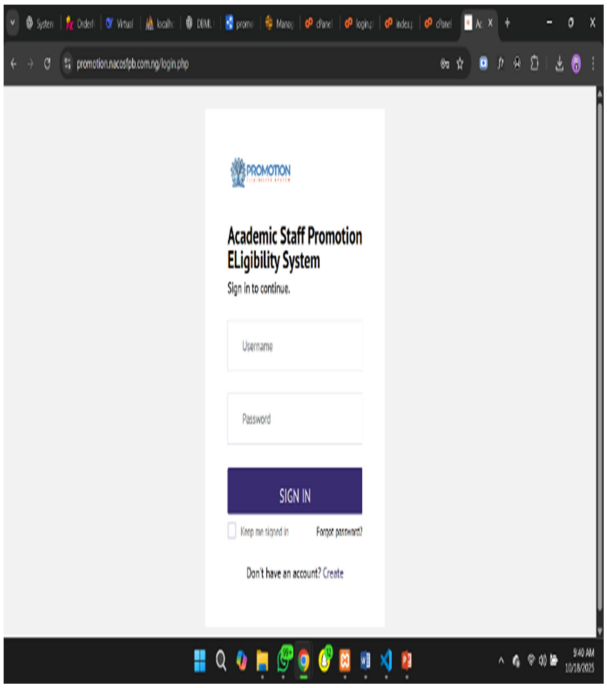

Figure 6: Login Page

The login page provides a secure access point for both staff members and administrators to use the Staff Promotion Eligibility System. Staff are required to enter their employee ID or registered email along with a password to check their promotion eligibility status, while administrators log in with their credentials to manage staff records and promotion criteria. The page is simple and intuitive, with options for password recovery and quick links to the registration page for new users as shown in figure 6. Once authenticated, users are redirected to their respective dashboards to perform tasks relevant to their role.

Staff Dashboard

The staff dashboard as shown in figure 7 is the personalized workspace where staff members can view and manage their promotion eligibility details. From this page, staff can see their profile information, employment history, years of service, qualifications, and performance records that contribute to promotion criteria. The dashboard also provides real-time feedback on whether they currently meet eligibility requirements and highlights areas needing improvement. In addition, staff can track past promotions, submit supporting documents, and receive notifications about promotion exercises. The interface is designed to be clear, interactive, and easy to navigate, giving staff members full visibility of their promotion status.

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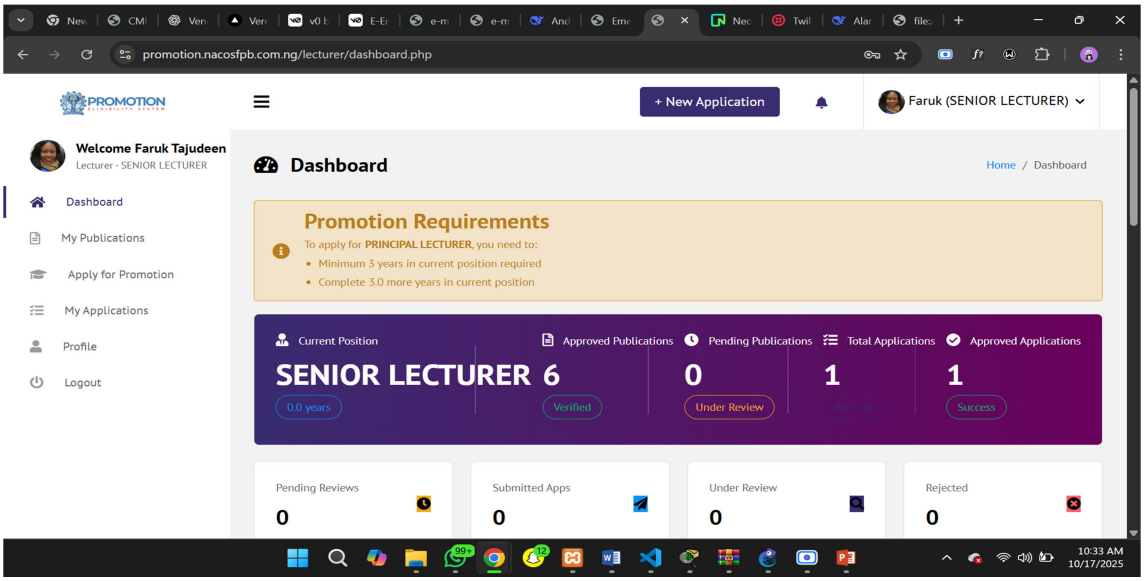

Figure 7: Staff Dashboard

Document Upload and Application Pages

The document upload page allows staff members to submit required supporting documents for promotion consideration, such as academic certificates, training records, performance appraisals, and letters of service. The page provides clear instructions and file format guidelines to ensure proper submissions, with fields for selecting document categories and attaching files securely as shown in figure 8.

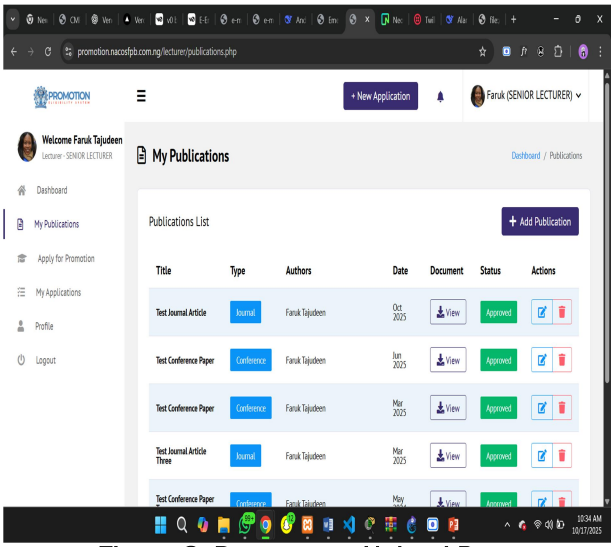

Figure 8: Documents Upload Page

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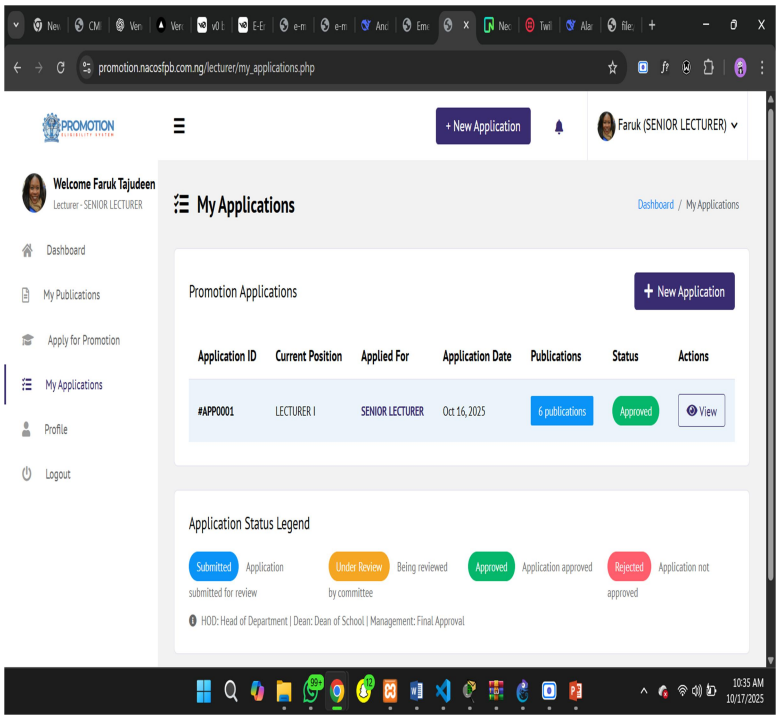

Figure 9: Application Page

The promotion application page enables staff members to formally apply for promotion once they meet the required eligibility criteria. On this page, staff can review their employment details, service years, qualifications, and uploaded documents before submitting an application as shown in figure 9. The system guides them through selecting the promotion level or position they are applying for and provides confirmation once the application is successfully submitted. It is designed to be straightforward and transparent, ensuring staff understand the process and that all applications are properly recorded for administrative review.

Promotion Eligibility Checker Page

The promotion eligibility checker page as shown in figure 10, allows staff members to instantly verify whether they meet the criteria for promotion based on institutional guidelines. By pulling data such as years of service, academic qualifications, performance records, and uploaded publications, the system automatically evaluates eligibility and displays the result in real time. The page provides a clear status message, either confirming eligibility or highlighting areas where requirements are not yet met, such as insufficient years of service or missing documents.

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This feature promotes transparency and helps staff prepare adequately before submitting a formal promotion application.

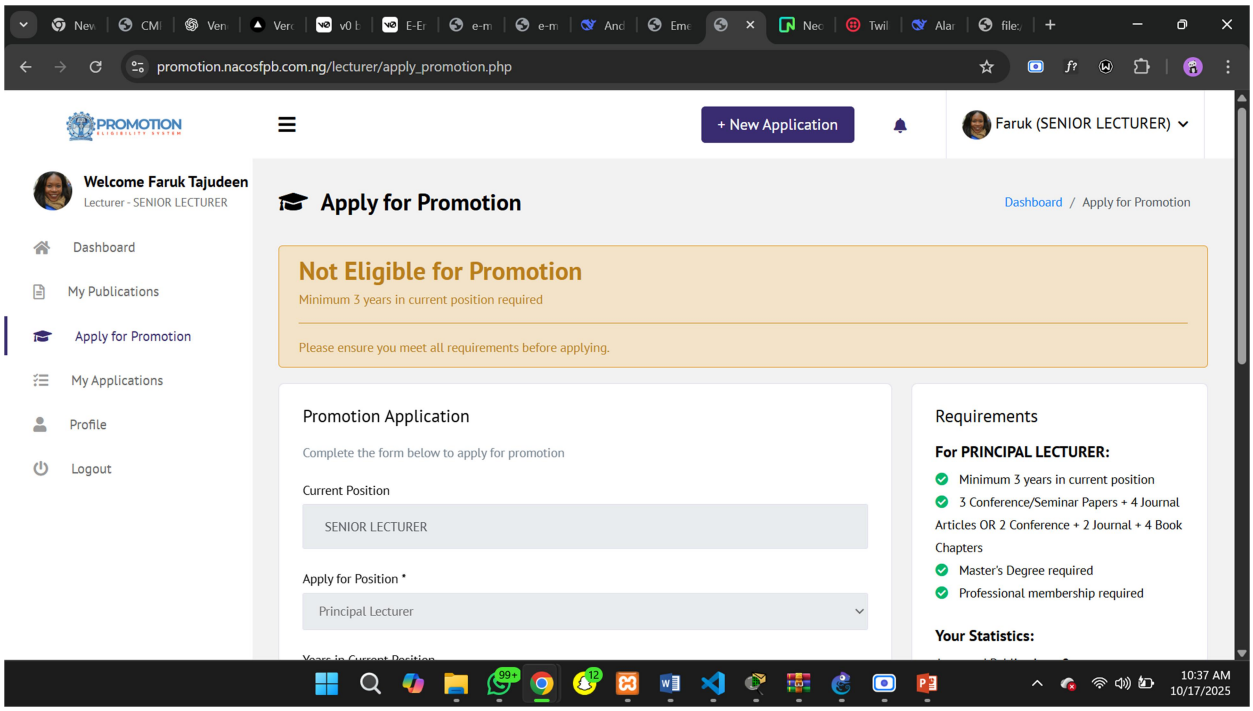

Figure 10: Promotion Eligibility Checker Page

Promotion Applications

The promotion applications page as shown in figure 11, provides administrators with a centralized view of all promotion requests submitted by staffs. It displays key details such as applicant information, department, desired promotion level, and attached documents, while also indicating the current status of each application. From this page, administrators can review submissions, approve or reject requests, or request additional information, ensuring that all promotion processes are handled in a transparent and well-documented manner.

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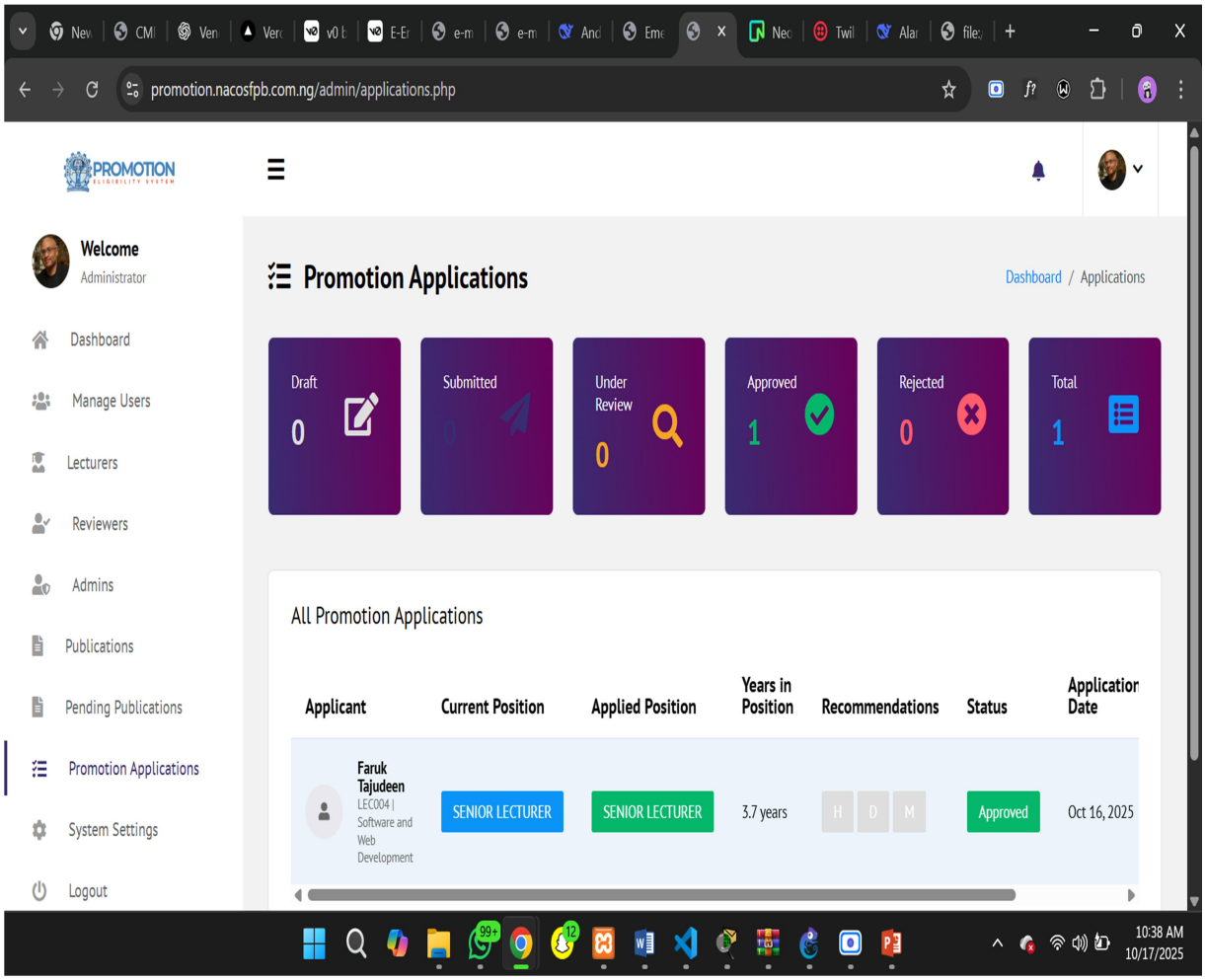

Figure 11: Promotion Applications

Performance Testing

The performance of the Staff Promotion Eligibility System was evaluated to ensure that it operates efficiently under various conditions. Testing involved simulating multiple staff and admin users accessing the system simultaneously to confirm its stability and responsiveness. The system was able to handle concurrent applications, document uploads, and eligibility checks without crashing or experiencing significant delays. Response times were measured and found to be within acceptable limits, ensuring smooth navigation between pages such as the staff dashboard, promotion application page, and publications upload page. The results of the performance tests indicate that the system is capable of supporting the promotion workflow reliably while maintaining a user-friendly experience.

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Discussion

The system was developed using Next.js, a React-based framework that offers both client-side and server-side rendering. This choice was made because Next.js provides excellent performance, scalability, and flexibility, which are crucial for handling staff promotion data and eligibility processes. It simplifies development with built-in routing, supports API integration, and ensures better search engine optimization for web applications. Additionally, Next.js has a strong developer community and extensive documentation, making it easier to maintain and enhance the system in the future. Its combination of React's component-based architecture and server-side capabilities made it a suitable choice for building a responsive, efficient, and user-friendly promotion eligibility system.

While the Staff Promotion Eligibility System meets its primary objectives, it is not without limitations. First, the system depends on internet connectivity, which may hinder access in areas with unstable networks. Secondly, it assumes that all promotion criteria can be effectively digitized, whereas certain qualitative assessments, such as leadership qualities and interpersonal skills, still require human judgment. Another limitation is the system's reliance on accurate data entry; errors in inputted staff records or uploaded documents could affect eligibility results. Furthermore, the system currently does not integrate with external institutional databases, which means some data may need to be entered manually. Despite these limitations, the system provides a reliable and transparent framework for managing staff promotion applications.

5. CONCLUSION AND RECOMMENDATIONS

Conclusion

The Staff Promotion Eligibility System has successfully addressed key challenges associated with traditional promotion processes, including delays, lack of transparency, and heavy reliance on manual documentation. By automating eligibility checks, providing a structured application process, and allowing administrators to manage applications more efficiently, the system contributes to a fairer and more organized promotion environment. The adoption of Next.js as the development framework ensured that the system is both scalable and responsive, capable of supporting multiple users simultaneously without compromising performance. In conclusion, the system offers a practical and innovative solution that can significantly improve the staff promotion process in academic and organizational settings.

Recommendations

1. Institutions should adopt the system to replace manual or semi-manual promotion processes.
2. Staff and administrators should be adequately trained on how to use the platform effectively.
3. Regular updates and maintenance should be carried out to ensure system efficiency and security.
4. Policies should be established to guarantee the accuracy of records and documents uploaded by staff.

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