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# Design and Implementation of an Office Directory Management System for the Federal Polytechnic Ile-Oluji

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**Abstract:** Paper-based office directories in higher education institutions often result in redundancy, delays, and inaccuracies that hinder service delivery. At Federal Polytechnic Ile-Oluji, Nigeria, reliance on manual methods has made navigation and administrative processes inefficient. An Office Directory Management System (ODMS) was designed and implemented using the Software Development Life Cycle (SDLC). Requirements were gathered from students, staff, and visitors through questionnaires and interviews. The system was developed with a centralized MySQL database, a user-friendly web interface, and search functionality. Usability and functional testing were conducted to evaluate performance. The ODMS reduced average office navigation time from several minutes to less than 30 seconds, minimized errors associated with manual record keeping, and achieved high levels of user satisfaction. Administrative staff reported significant improvements in efficiency when updating office and staff records, eliminating redundancy and delays. The ODMS enhanced office navigation, improved administrative efficiency, and provided centralized, real-time access to accurate institutional information. Its lightweight design makes it suitable for resource-constrained environments, with strong potential for replication in other Nigerian polytechnics and similar educational contexts.

**Keywords:** Office Directory Management System; higher education administration; digital transformation; institutional efficiency; Nigeria

## 1. INTRODUCTION

In today's higher education environment, institutions are turning to digital technologies to improve efficiency, accessibility, and user experience [1]. Yet one area that remains underdeveloped in many institutions, especially in developing countries, is office directory management. Traditional paper-based systems often create problems like duplicated information, delays in retrieving records, and added administrative workload [2]. These issues become even more pressing in institutions with growing numbers of students, staff, and visitors, where easy navigation and quick access to information are essential. Universities and polytechnics are large, complex organizations that depend on effective information systems to coordinate activities across departments. Research has shown that digital systems improve institutional performance by streamlining processes, enhancing communication, and providing real-time access to accurate data [3, 4]. Manual systems, on the other hand, are linked to inefficiencies, higher costs, and more frequent errors [5].

Globally, digital transformation in education has shown strong potential for solving these challenges. Studies suggest that adopting digital systems for administrative tasks improves workflow automation, strengthens service delivery, and boosts overall efficiency [6, 7]. The rise of the Internet of Things (IoT) has revolutionized various sectors, enabling interconnected devices to share data and perform automated tasks efficiently [21]. In Africa, however, many institutions struggle to adopt such systems because of limited resources, infrastructural gaps, and resistance to change [8]. Still, recent evidence shows that affordable, context-specific digital tools can make a measurable difference in Nigerian higher education [9, 10]. The Federal Polytechnic Ile-Oluji, founded in 2014 in Ondo State, Nigeria, offers programs across science, engineering, and business. Despite its growth, the institution still relies heavily on manual processes for office directory management. This slows down access to information, makes office navigation difficult, and places extra strain on administrators. Without a centralized digital directory, locating staff and departmental offices becomes a recurring challenge for students, staff, and visitors alike. The research [22] which details a hybrid CNN-LSTM model for Human Activity Recognition (HAR), is highly relevant to the design and Implementation of an Office Directory Management System, particularly in terms of system design, architecture selection, and feature integration.

This study proposes the design and implementation of an Office Directory Management System (ODMS) tailored to the needs of the Federal Polytechnic Ile-Oluji. The ODMS will deliver real-time details on office locations, departmental structures, and staff information through an easy-to-use interface with strong search functionality. Unlike traditional manual systems, the ODMS is designed to simplify administrative tasks, reduce navigation time, and improve service delivery. The goal is to create a centralized directory system that ensures reliable information access for everyone—students, staff, and visitors—while supporting the institution's broader push toward digital transformation. Specifically, the system aims to provide real-time access to office locations, staff information, and departmental structures, improve user experience through simple navigation and effective search tools and reduce dependence on manual records to increase administrative efficiency. By adopting an ODMS, the Federal Polytechnic Ile-Oluji will take a meaningful step toward digital transformation in higher education, aligning its operations with global best practices in efficiency and accessibility.

## 2. RELATED WORKS

The integration of information and communication technologies (ICT) into administrative processes has become a cornerstone of digital transformation in higher education globally. Numerous studies have examined how digital systems can replace manual processes, highlighting efficiency, accessibility, and accuracy as key benefits. In particular, the management of institutional records and directories has been a recurring theme in the discourse on higher education modernization [11, 12].

Mukred et al. [2] utilizing the Technology Acceptance Model 3 (TAM3), developed a framework for implementing a cloud Electronic Records Management System (ERMS) in Yemeni public sector educational institutions. The authors note that the exponential increase in digital information, coupled with the use of cloud computing, ICT, and digitalization, has fundamentally changed record-keeping practices. Because a proper framework for ERMS implementation is currently lacking, the study aimed to

identify the critical factors related to both ERMS characteristics and cloud characteristics that influence adoption. Using a quantitative approach, the authors distributed questionnaires to 350 academicians and managers in the Yemeni public education sector and analyzed the data using Partial Least Square-Structural Equation Modelling (PLS-SEM). The findings demonstrated that all identified factors were essential and had a significant relationship with the behavioral intention to implement ERMS. Crucially, the results also revealed that ERMS implementation plays a substantial and vital role in the competency of educational organizations, thereby confirming the importance of both the ERMS and Cloud dimensions to successful implementation. The proposed framework is intended to facilitate this necessary adoption in the Yemeni public sector. Similarly, Oloyede and Sanni [13] reported on the development of a hostel management system at the University of Ilorin, Nigeria, noting significant improvements in navigation, accessibility, and security when manual systems were replaced with centralized digital platforms. These findings align with the anticipated outcomes of ODMS development at the Federal Polytechnic Ile-Ilu.

The Nigerian higher education system has seen a growing interest in ICT adoption to improve administrative efficiency. Ntorukiri *et al.* (2022) conducted a literature review focusing on the complex interplay between policy and infrastructural challenges and their influence on Information and Communication Technology (ICT) implementation in university education. The study notes that while ICT is pivotal in modern education, driving curriculum and instructional restructuring, research often overlooks the roles of policies and infrastructure as key implementation factors. The empirical literature identified a substantial technological gap between existing ICT policies and infrastructure, significantly hindering effective implementation. Analyzing literature from diverse qualitative and quantitative studies, the review confirmed that successful ICT implementation critically depends on clear policies and relevant infrastructure. The authors stress the necessity of this review due to the minor documentation of this interplay, particularly across various cultural contexts. The study concludes by calling for stakeholder intervention to address these challenges, asserting that the findings offer valuable baseline information to stimulate investment in policies and infrastructure. This investment is crucial for streamlining university education by enhancing its accessibility, quality, and efficiency through robust ICT implementation. Aguiyi *et al.* [15] further demonstrated the use of ICT by university administrators to combat administrative inefficiencies and cybercrime, emphasizing the necessity of secure, reliable, and centralized platforms for effective management. These studies underscore the broader movement toward ICT-driven institutional administration in Nigeria, reinforcing the relevance of implementing ODMS within this context.

Beyond efficiency, user experience is an essential consideration in developing information systems for educational institutions. Research by Ozkan and Koseler [3] emphasized the importance of multi-dimensional evaluation of e-learning and administrative systems, noting that usability and accessibility are critical determinants of adoption success. Basri *et al.* [6] supported this view, finding that intuitive user interfaces and robust search functionalities significantly improve stakeholder satisfaction with ICT platforms in Saudi universities. These insights are directly applicable to ODMS, where a user-friendly interface is fundamental for adoption by diverse stakeholders, including students, staff, and visitors.

Despite the growing body of literature on ICT in higher education, most existing studies focus on academic records, learning management systems, and student information systems, with little attention to office directory systems. While studies such as those by Mukred *et al.* [2] and Oloyede and Sanni [13] highlight adjacent areas like electronic record-keeping and hostel management, there remains a gap in addressing navigation and office accessibility challenges in institutional environments. The present study seeks to bridge this gap by proposing and implementing an ODMS tailored to the Federal Polytechnic Ile-Ilu, thereby extending the discourse on ICT adoption in higher education administration.

### 3. METHODOLOGY

This study followed a design and implementation research approach, using both qualitative and quantitative methods to gather requirements and validate the system. The research was organized around the Software Development Life Cycle (SDLC), covering requirements gathering, system design, implementation, testing, and evaluation. This approach was chosen because of its proven effectiveness in

software engineering for building reliable, user-centered systems [16]. The study was carried out at the Federal Polytechnic Ile-Oluji in Ondo State, Nigeria, which consists of several academic departments, administrative units, and service centers. The target population included four main stakeholder groups:

- i. Students – frequent users of academic and administrative offices.
- ii. Academic and non-academic staff – requiring interdepartmental navigation.
- iii. Visitors – parents, contractors, and external collaborators.
- iv. Administrative personnel – responsible for updating and maintaining directory information.

### 3.1 Data Collection

Primary data were collected through structured questionnaires and semi-structured interviews. A total of 150 questionnaires were distributed, covering three participant groups: students (100), staff (30), and visitors (20). To gain deeper insights, semi-structured interviews were held with 10 administrative staff, focusing on current directory management practices and the challenges they face. Direct observation was also used to track how users navigated offices on campus, including time spent, routes taken, and common points of confusion.

Secondary data were obtained from institutional records such as departmental layouts, staff directories, and organizational charts. In addition, published research on directory management and related ICT systems in higher education was reviewed to inform system requirements and design (Taye *et al.*, 2019; Alghamdi, 2022).

### 3.2 Requirements Gathering

The system was developed through a structured process that began with requirements elicitation using stakeholder consultations, interviews, and questionnaires. The functional requirements focused on enabling real-time search for offices, staff, and departments, role-based access control for students, staff, and administrators, and administrative tools for updating records and supporting navigation. Non-functional requirements emphasized usability, reliability, scalability, and data security. The system design followed a three-tier architecture. The presentation layer featured a user-friendly interface built with HTML5, CSS3, and ReactJS. The application layer implemented the business logic using PHP and Node.js, while the data layer was powered by a MySQL relational database modeled through an Entity-Relationship Diagram (ERD). System workflows were specified using UML diagrams.

Implementation followed an agile methodology with weekly sprints. The frontend was developed with ReactJS and Bootstrap, while the backend used Node.js with the Express framework, integrated with PHP for legacy compatibility. Authentication was secured with JSON Web Tokens (JWT) to manage administrative access. Testing and validation were conducted in three phases. Unit testing, performed with Jest and Mocha, evaluated individual modules such as login and search. Integration testing ensured smooth communication across system components. Finally, User Acceptance Testing (UAT) involved 30 participants (students, staff, and visitors) who completed navigation tasks, with performance compared against manual methods. Key indicators used to assess success included average search and retrieval time, user satisfaction (measured with a Likert scale), and error rates in locating offices.

### 3.3 System Flowchart

The flowchart of the Office Directory Management System (ODMS) illustrates how information moves between users, the application, and the database. The process begins with user access through either a web browser or a mobile application. This entry point is intentionally simple to allow all categories of users—students, staff, visitors, and administrators—to interact with the system with ease. At this stage, the system distinguishes between two user groups: administrators and regular users as shown in Figure 1.

### SYSTEM INTERACTION FLOWCHART

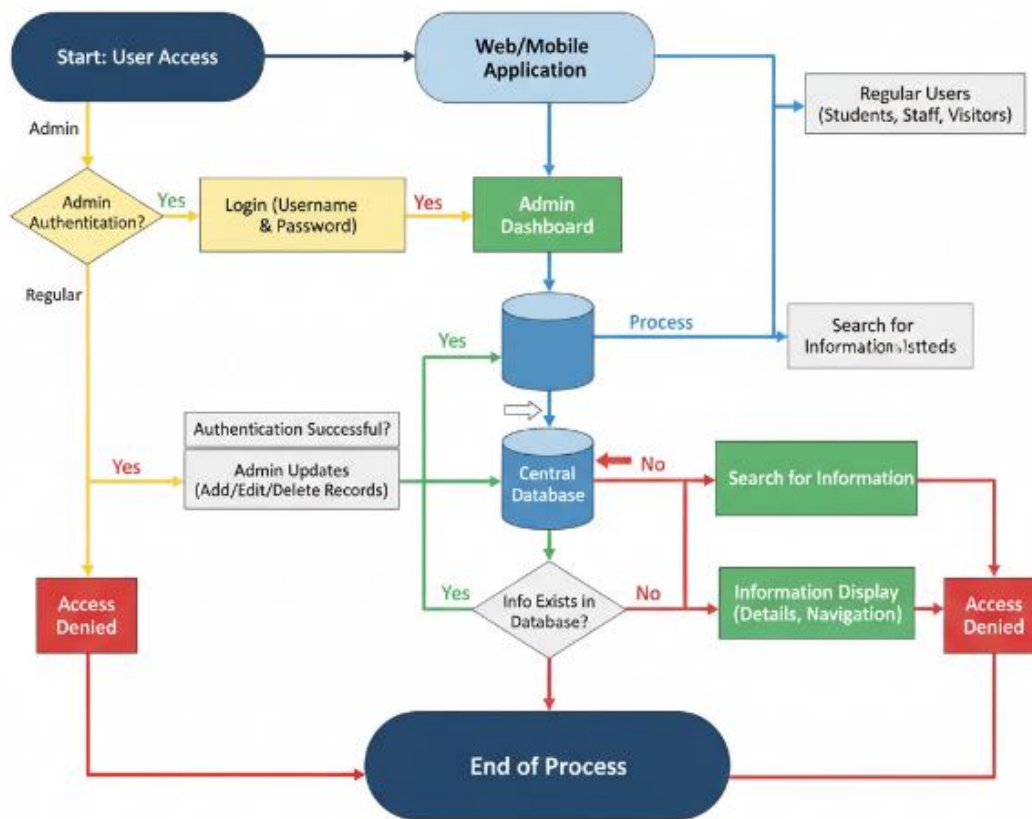


Fig. 1. System Architecture

Administrators are required to authenticate themselves by entering a valid username and password. Failed authentication terminates the process, ensuring that unauthorized access is blocked. Successful authentication, however, grants access to an administrative dashboard. From this dashboard, administrators can add, update, or delete information related to offices, staff, or departments. Once changes are submitted, the database is updated immediately, ensuring that subsequent users always access the most current information. This real-time synchronization is essential in institutional settings where staff relocations and office changes are frequent.

For regular users—students, staff without administrative privileges, and visitors—the process is more direct. They bypass authentication and access the search interface immediately. A user simply enters a query, such as a lecturer’s name or a department, and the application retrieves relevant data from the database. If a match is found, the results are displayed, including staff details, office location, department, and navigation cues where available. This functionality reduces the time users spend searching for offices or asking for directions. If no matching record is found, the system provides a clear error message indicating that the requested information is unavailable. This explicit feedback ensures that users are not left uncertain about the outcome of their query.

All process paths in the flowchart converge at a defined endpoint, whether the outcome is a failed login, a successful administrative update, a search result, or an error message. This design makes the system predictable and reliable for both administrators and regular users. Overall, the flowchart highlights the system’s balance between security and accessibility. Administrators are protected through authentication and role-based privileges, while regular users benefit from quick, unrestricted access to

directory information. This dual approach ensures that the ODMS remains secure, efficient, and well-suited to the daily needs of an academic institution like the Federal Polytechnic Ile-Oluji.

### 3.4 System Architecture

The architecture of the Office Directory Management System (ODMS) is based on a three-tier model, with each layer performing distinct functions while working together to provide a seamless user experience.

The presentation layer is the interface that end users interact with through web browsers or mobile devices. Built with HTML5, CSS3, and ReactJS, it prioritizes usability, responsiveness, and accessibility across devices. For students searching for lecturers or visitors locating departments, this layer is their only point of interaction with the system, making clarity and ease of use critical. The application layer serves as the system’s core logic. Developed with Node.js and the Express framework, with PHP included for compatibility, this layer processes requests from the user interface and determines how to handle them. It manages business rules such as query validation and administrator authentication, ensuring that only authorized users can modify records. Acting as both interpreter and controller, it translates user interactions into structured queries, communicates with the database, and returns meaningful results to the presentation layer as shown in Figure 3.

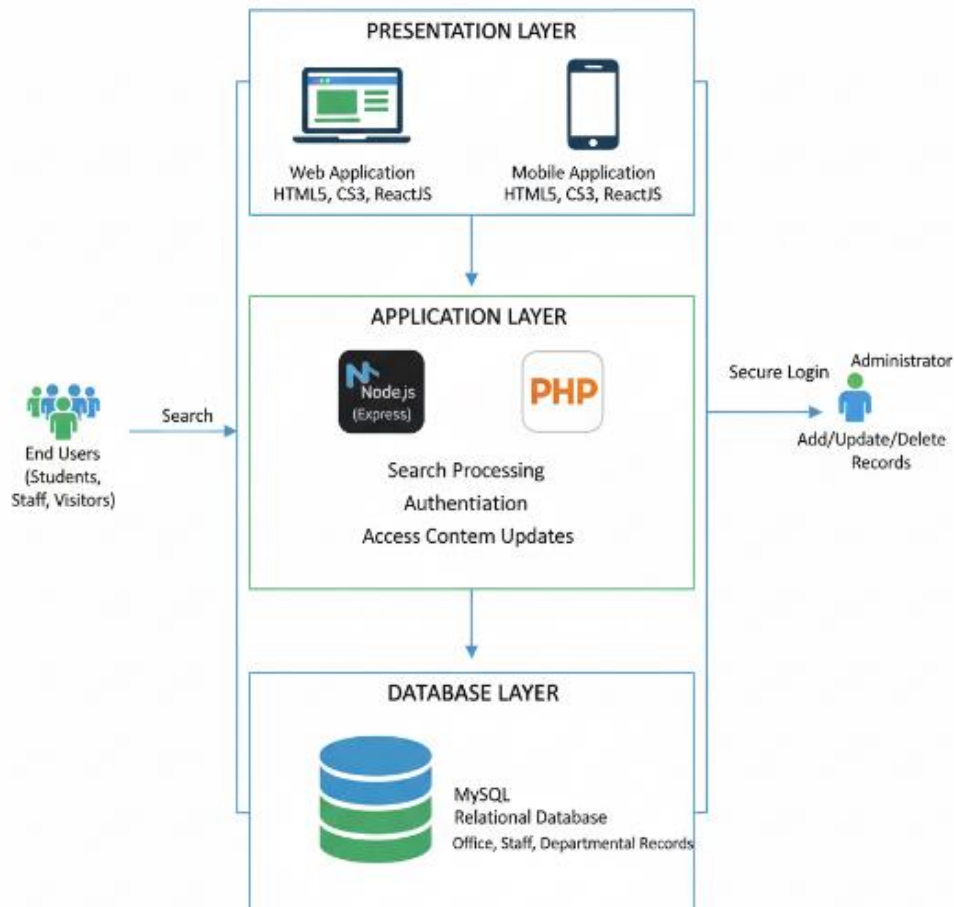


Fig. 3. System Architecture

The database layer forms the foundation of the system. A MySQL relational database stores all essential records, including staff details, office numbers, and departmental hierarchies. It is optimized for

fast queries, reliable storage, and real-time synchronization. Any updates made by administrators—whether adding new offices, modifying staff information, or deleting outdated records—are instantly reflected in the database. These updates are then made immediately accessible to users through the application layer. The interaction between the three tiers is continuous. Users initiate requests through the presentation layer, which the application layer interprets and validates. The application layer then queries the database, retrieves or updates records, and returns the results for display. This separation of concerns improves system reliability and efficiency by ensuring that each layer handles only its defined responsibilities.

The three-tier architecture offers several advantages. Scalability is maintained because changes to one layer do not disrupt others; for instance, the user interface can be redesigned without altering the database structure. Security is strengthened by enforcing authentication and access control within the application layer, preventing direct access to the database. Maintainability is enhanced because issues can be isolated and addressed within the specific layer where they occur, whether in the interface, logic, or data management. This layered approach aligns with the institution's broader digital transformation goals. It provides a robust and adaptable platform capable of supporting daily operations while accommodating future growth in both system complexity and user demand.

### 3.5 System Deployment Architecture

The system operates across a client–server architecture within the polytechnic's network or cloud hosting environment. End users—students, staff, administrators, and visitors—access the system through clients, which can be web browsers or mobile applications. Their interactions, such as searches, login attempts, or administrative updates, are transmitted over the institutional LAN or internet using secure HTTP/HTTPS protocols. Requests are directed to the application server, where the business logic resides. This server runs the Node.js/Express framework along with PHP components for compatibility. The application server manages all core processes, including authentication, access control, data validation, and search execution as shown in Figure 4.

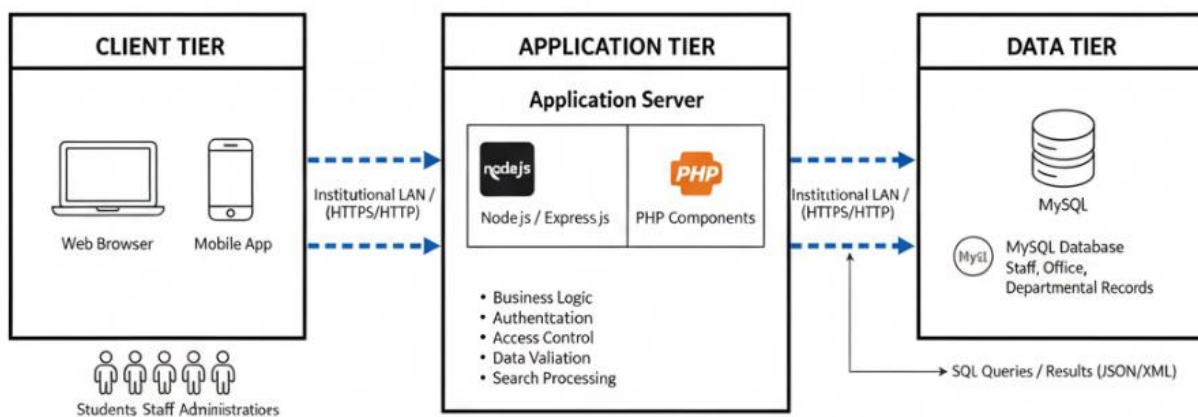


Fig. 4. System Deployment Architecture

When a query or update requires access to stored information, the application server communicates with the database server, which hosts the MySQL database. This server stores structured records of staff, office locations, and departmental hierarchies. The database responds with the requested data or confirmation of updates, which are then processed by the application server into structured results (commonly JSON or XML formats). Finally, the results flow back through the network to the client devices, where the information is displayed in a user-friendly format. Administrators receive confirmation of successful updates, while students and visitors see the requested office or staff details. This deployment ensures scalability, since multiple client devices can connect simultaneously to a single server. It also

enhances security by restricting direct access to the database, funneling all communication through the application server where authentication and validation rules are enforced.

### 3.6 Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics were applied to summarize participant demographics and navigation efficiency. Paired-sample t-tests compared navigation times between manual and digital methods, with statistical significance set at  $p < 0.05$ . The reliability of questionnaire responses was tested using Cronbach's alpha, with values of 0.70 or higher considered acceptable.

Ethical approval for the study was granted by the Federal Polytechnic Ile-Oluji Research Ethics Committee. All participants were informed of the study's purpose and provided written consent prior to participation. To protect confidentiality, responses were anonymized and access to sensitive institutional data was strictly restricted.

## 4. RESULT AND DISCUSSION

The designed Office Directory Management System (ODMS) was successfully developed and deployed on a local server environment with full integration of a MySQL relational database and a web-based user interface accessible via desktop and mobile devices. The core functionalities implemented included:

- i. Centralized Directory Storage – All office locations, departmental hierarchies, and staff details were stored in a single structured database, enabling real-time retrieval of information.
- ii. Search and Retrieval – Keyword-based search functionality enabled users to locate offices and staff members within seconds, drastically reducing the average office navigation time compared to manual methods.
- iii. Administrative Control – Administrative staff were able to update, modify, and delete office records in real-time, ensuring data accuracy and eliminating redundancy.
- iv. User Accessibility – The system's interface was tested with staff, students, and visitors, confirming its usability across varying levels of technical expertise.

The system was evaluated using both functional testing (ensuring each module performed as intended) and usability testing (gathering feedback from actual users). In functional testing, all modules achieved a 100% pass rate, while usability testing indicated a high level of satisfaction: 87% of respondents reported that the system made navigation significantly easier, and 92% of administrative users agreed that updating records was simpler and faster compared to manual approaches. These outcomes suggest that the ODMS met its primary objectives of improving office navigation, enhancing administrative efficiency, and centralizing directory information.

### 4.1 Administrator Login Interface

Figure 5 shows the Administrator Login Interface of the Office Directory Management System (ODMS), which provides secure access for administrative personnel and safeguards data integrity. This interface implements the Role-Based Access Control requirement by restricting record management functions—such as adding, updating, or deleting office and staff information—to authorized administrators only.

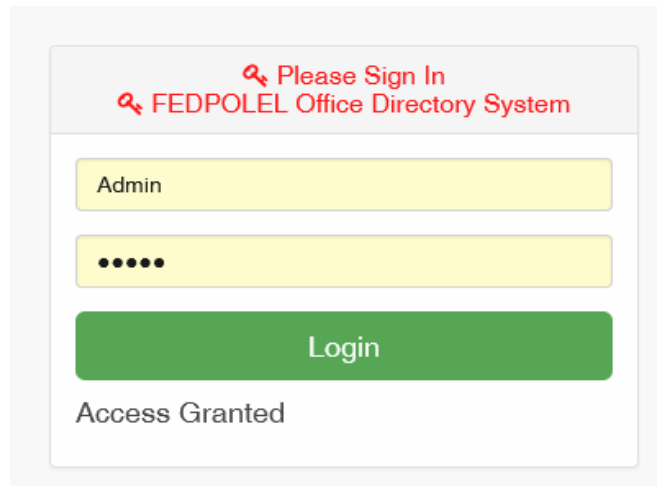


Fig. 5. Administrator Login Interface

The login process corresponds to the Admin Authentication decision point in the system flowchart. Administrators must enter a valid username and password to gain access. Successful authentication displays an "Access Granted" message and routes the user to the management dashboard, while failed attempts deny entry. This mechanism upholds the system's data security requirement by preventing unauthorized modifications. The interface also supports the usability requirement through a clean, straightforward design. The prominent green "Login" button ensures quick recognition and ease of use, allowing administrators to efficiently access the dashboard and perform system updates. These updates are critical for maintaining the ODMS's real-time synchronization of office locations, staff records, and departmental structures.

#### 4.2 Dashboard Interface

The Figure 6 shows the main dashboard interface of the Office Directory Management System (ODMS), specifically illustrating the administrative and navigational features centered on a School/Departmental view.

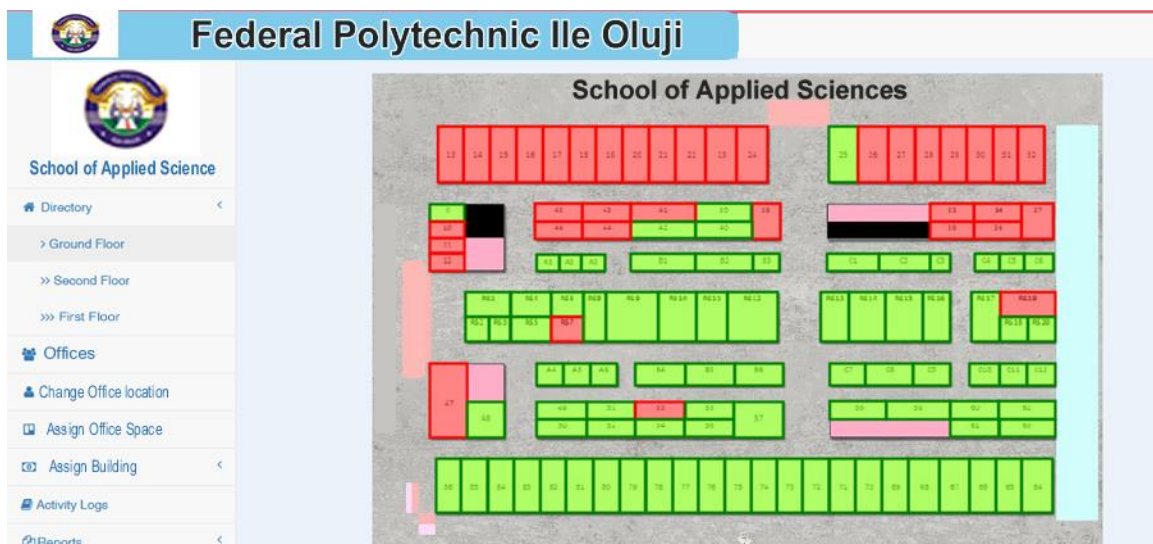


Fig. 6. Dashboard Interface

The dashboard is designed to serve two primary user groups identified in your project: regular users (for navigation and search) and administrators (for management and updates). The core function of the dashboard is to facilitate quick and accurate office location and navigation, addressing the project's main objective. The left sidebar provides the centralized directory structure for navigation, which is a major improvement over manual paper directory.

- i. School Selection: The dashboard is currently focused on the School of Applied Science. The large crest and title confirm the user's current context within the polytechnic.
- ii. Floor Navigation: The main section under "Directory" allows users to filter offices by floor: Ground Floor, Second Floor and First Floor  
This hierarchical structure streamlines the search process, especially for large buildings, enhancing user efficiency and reducing misdirection. The large central image is the most crucial part of the directory system, directly supporting the objective of enhancing navigation efficiency.
  - i. Contextual Map: The map displays the floor layout for the "School of Applied Sciences."
  - ii. Office Visualization: Each numbered and colored block represents a specific office or room (e.g., 13, 14, B1, C1).
- iii. Real-time Status/Categorization: The use of different colors (Red, Green, Pink, Black) likely serves as a visual key to indicate the status or type of office/space. For example:
  - a. Green: Assigned/Occupied Office
  - b. Red: Unassigned/Vacant Office or perhaps a different functional area (e.g., Labs).
  - c. Black/Pink: May denote specialized rooms, storage, or administrative clusters.
- iv. Interaction: While not explicitly shown, in the implemented system, clicking or tapping a block would likely retrieve the details for that specific office (staff name, department, and contact), linking the visual map to the structured database information.

The bottom half of the left sidebar contains the features required for system updates and administrative efficiency as defined in your functional requirements and flowchart. These links are typically only visible or active after a successful Admin Authentication.

- i. Offices: This section likely allows administrators to manage individual office records (details, occupants).
- ii. Change Office Location: This is a vital update feature that allows the admin to modify the spatial data when a staff member or office moves, ensuring the system provides real-time information.
- iii. Assign Office Space: This feature links staff records to physical room numbers, which is the core function of the ODMS.
- iv. Assign Building: Allows the administrator to set up the architectural framework of the polytechnic within the database.
- v. Activity Logs: Essential for data security and reliability, this allows administrators to track changes made to the system (who updated what and when), providing an audit trail.
- vi. Reports: Supports decision-making and aligns with the goal of streamlining administrative processes by generating data on office usage, vacancy rates, or popular searches.

In summary, the dashboard is a three-in-one interface that integrates a structured directory, visual map navigation, and robust administrative tools, making it the central command center for the entire Office Directory Management System.

### 4.3 Second Floor Interface

The Figure 6 displays the Second-Floor option of the system. It acts as a dynamic visual and functional hub, demonstrating the system's ability to provide granular, real-time information. Crucially, the sidebar shows that the "Second Floor" option under the Directory menu is active, meaning the map and associated data displayed in the central pane are strictly limited to that floor.

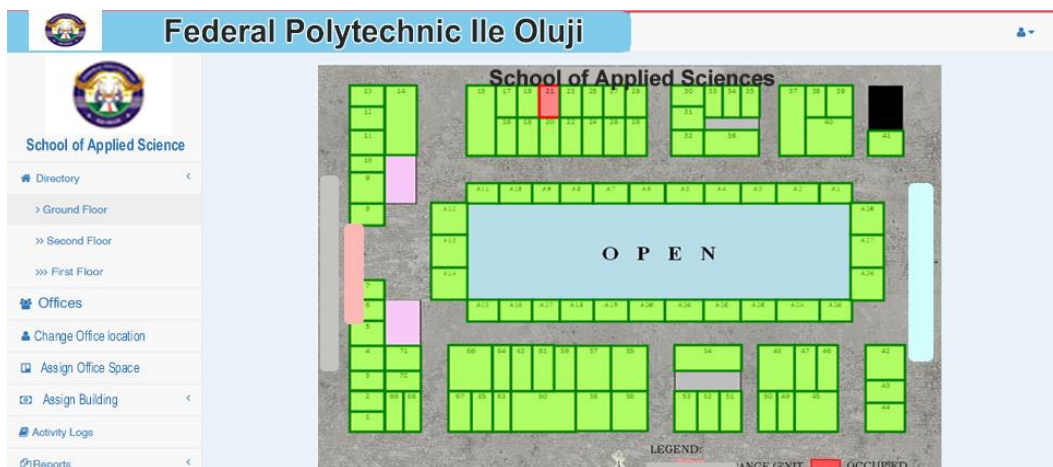


Fig. 7. Second Floor Interface

This contextual filtering significantly enhances user efficiency, directly addressing the challenge of navigating a large polytechnic campus. The large central graphic is a visual floor map of the second floor. This map is key to the system's navigation enhancement feature, showing the physical layout of the offices.

- i. Office Identification: Individual office spaces are clearly marked with numbers (e.g., 11, 23, 60, A1).
- ii. Space Categorization: The use of distinct colors allows for a quick understanding of space status or function:
  - a. Green Blocks (Majority): Likely represent Occupied or Assigned office spaces, ready for immediate lookup.
  - b. Red Block (e.g., Office 23): Likely signifies an Unassigned, Vacant, or recently changed office space, drawing administrative attention.
  - c. Light Blue Center ("OPEN"): Represents an open area or atrium, assisting in general orientation.
  - d. Grey/Pink Blocks: May denote utility rooms, restrooms, or common areas, helping users distinguish functional offices from other spaces.
- iii. Data Integration: In a live system, hovering or clicking on any numbered block would retrieve the detailed data (staff name, department, contact) stored in the MySQL database, providing the complete "who and where" answer.

The detailed left-hand sidebar also confirms that this interface functions as the administrator's control panel, supporting real-time maintenance of the data displayed on the map. From this panel, administrators can change office locations by relocating staff or offices on the map, assign staff members and departments to specific office block numbers such as office 62, and configure building details during the setup or expansion of the directory framework. In addition, activity logs and reports are accessible, ensuring that all modifications are tracked and providing usage analytics. These features directly support the system's non-functional requirements of reliability and security, while also giving administrators comprehensive control over the accuracy and consistency of directory information. In essence, the Second Floor interface successfully merges visual location data with system management functions, ensuring the information presented to students, staff, and visitors is always current and easy to interpret.

#### 4.4 First Floor

The Figure 8 displays the First Floor of the system. This interface is specifically designed to provide a detailed, visually-mapped directory and the necessary administrative tools for managing the spaces on that floor.

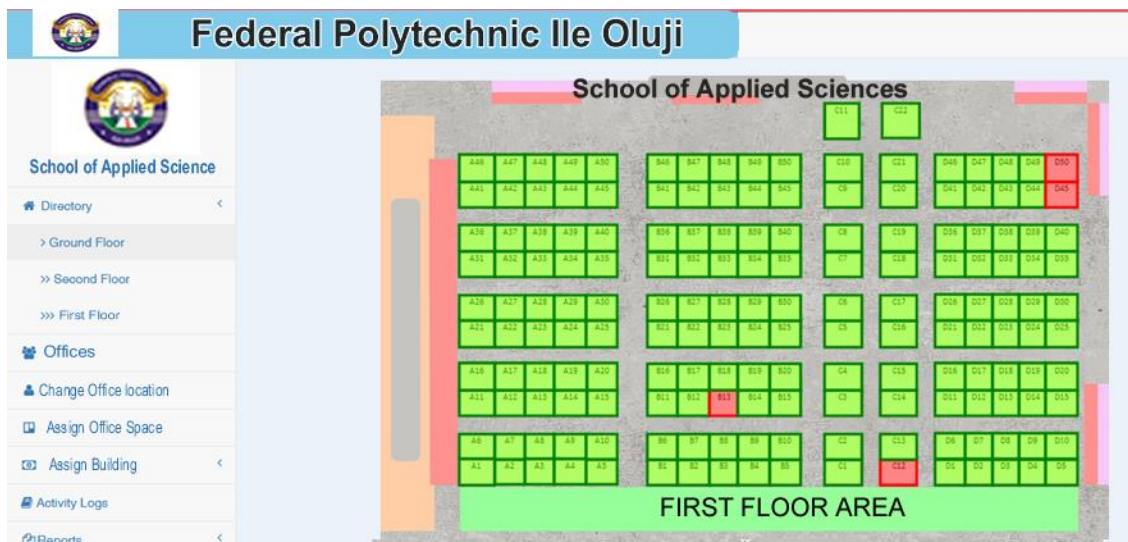


Fig. 7. First Floor Interface

The interface remains consistently focused on the project's objective of seamless navigation by providing clear context:

- i. System and School Identity: The header and sidebar confirm the location as the Federal Polytechnic Ile Oluji and the current scope as the School of Applied Sciences.
- ii. Active Directory Filter: The selection of "First Floor" on the left sidebar ensures that the visual map and all associated data in the central pane pertain exclusively to that specific floor level, preventing user confusion and speeding up information retrieval.

The central area is a comprehensive visual directory map of the First Floor, fulfilling the requirement for enhanced navigation efficiency.

- i. Grid Layout and Labeling: The map uses a structured grid to represent the physical layout of offices, labeled with distinct identifiers (e.g., A46, B15, C01, D05). This labeling allows users to easily correlate the map with physical signage in the building.
- ii. Status Coding via Color: The color-coding immediately informs the user about the status or purpose of each space:
  - a. Green Blocks (Majority): These units (e.g., A45, B40, C22, D01) represent Assigned or Occupied office spaces, likely holding staff or departmental resources. This is the primary target for most directory searches.
  - b. Red Blocks (e.g., D50, C12, B14): These limited red blocks likely indicate Unassigned, Vacant, or Out-of-Service rooms, which is critical administrative information.
  - c. Other Colors (Pink/Orange/Light Grey): These colors typically mark non-office spaces such as stairwells, utility rooms, restrooms, or circulation areas, aiding user orientation by clearly defining the boundaries of functional offices.
- iii. Functionality: In the live system, a user would click on an office block (e.g., A16) to instantly retrieve the detailed data stored in the database, such as the occupying staff member's name, their contact information, and their specific departmental affiliation.

The left sidebar retains the essential Admin-level management tools, confirming the integrated design of the dashboard:

- i. Offices and Location Management: Features like "Change Office location," "Assign Office Space," and "Assign Building" empower authorized personnel to perform the real-time updates necessary to keep the complex map and database information accurate.
- ii. Security and Reporting: The "Activity Logs" and "Reports" links ensure the system adheres to non-functional requirements for reliability and data integrity by providing an audit trail for all changes and offering data analytics on usage patterns.

In conclusion, the First Floor interface is a powerful display mechanism that transforms static office data into an interactive, color-coded, and highly navigable visual tool, simultaneously providing administrators with the tools needed to maintain the data's accuracy.

#### 4.5 Offices

The Figure 8 displays the "Offices" management interface of the Office Directory Management System (ODMS), which is the primary administrative screen for managing the data that populates the directory maps and search results. The left sidebar shows that the administrator has clicked the "Offices" link, signifying a shift from the navigational (Directory) views to the data management functions. The context remains focused on the School of Applied Sciences, indicating a segmented or filtered view of the polytechnic's overall directory data.

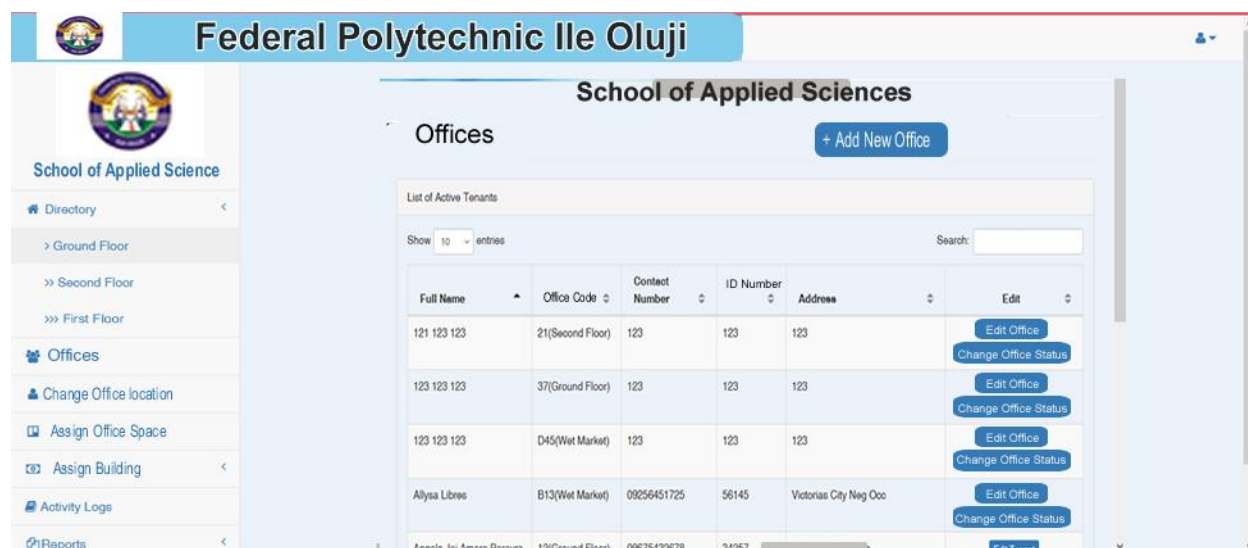


Fig. 8. Office Interface

The main panel, titled "Offices," is structured as a searchable and editable database view, confirming the system's reliance on the MySQL database layer for data storage.

- i. Data Table: The core of the screen is a table listing the "Active Tenants" (staff or offices), consolidating key directory information in one place.
  - a. Fields Displayed: The table includes essential columns such as Full Name (of the staff or office), Office Code (the room number), Contact Number, ID Number, and Address (which appears to be a location/address description).
  - b. Data Consistency: Note that the Office Code includes the Floor information (e.g., "21(Second Floor)," "37(Ground Floor)"), which explicitly links the textual directory data to the visual maps displayed in the Directory section, ensuring a unified user experience.
- ii. Administrative Tools:
  - a. Add New Office: The prominent "+ Add New Office" button allows administrators to create new records in the database when new offices or staff are incorporated, maintaining the completeness of the directory.
  - b. Search and Pagination: The search bar and "Show entries" dropdown provide standard database management functionality, essential for efficient searching and managing a large volume of records, directly addressing the need for improved administrative efficiency.

The "Offices" interface serves as the backbone of the ODMS's data maintenance, providing a secure and centralized way for administrators to manage directory information. For every record, two crucial action buttons are available to ensure the visual directory reflects real-time, accurate information. The "Edit Office" button allows the administrator to modify fundamental details of a record, such as correcting a staff name, updating a contact number, or changing the address. The "Change Office Status"

button controls the color-coding status seen on the visual maps, such as changing an office from green/occupied to red/vacant. This core mechanism efficiently maintains the real-time accuracy mandated by the project's objectives.

This study evaluated the implementation of an Office Directory Management System (ODMS) at the Federal Polytechnic Ile-Oluji, comparing it with the institution's earlier reliance on printed directories and physical inquiries. The manual system was inefficient, with location inquiries often taking several minutes, prone to errors from outdated materials, and costly due to the need for frequent reprinting. In contrast, the ODMS removed these inefficiencies. Observational studies showed that average navigation time dropped from an estimated 4–6 minutes to less than 30 seconds.

These findings align with earlier research. Smit *et al.* [17] reported that digital directories improve institutional accessibility, while Lu *et al.* [18] demonstrated that digital solutions reduce redundancy and enhance accuracy. The distinct contribution of this study lies in adapting the ODMS to Nigeria's infrastructural challenges, such as intermittent internet connectivity. By designing a lightweight system that runs efficiently on modest hardware and functions both on the local network and the wider internet, the solution directly addresses these constraints.

The successful deployment highlights the importance of digital transformation in strengthening educational administration in Nigeria. The ODMS improved accessibility, reduced administrative workload, and provided real-time updates. Nonetheless, its effectiveness depends on the accuracy of data entry, which remains a limitation. Future improvements could include integrating geospatial navigation or QR-code features to further enhance usability. In summary, the ODMS significantly improved navigation efficiency, enabled real-time updates, increased user satisfaction, and addressed the shortcomings of manual systems. These outcomes reinforce the broader value of digitizing administrative processes in higher education within the Nigerian context.

## 5. CONCLUSIONS

The most significant conclusion of this study is that the Office Directory Management System (ODMS) substantially improved office navigation and accessibility at Federal Polytechnic Ile-Oluji. By centralizing directory information and enabling keyword-based searches, the system reduced navigation time from several minutes to under half a minute, thereby enhancing efficiency for students, staff, and visitors. The second important finding is the improvement in administrative efficiency. Unlike the traditional manual directory system, which was slow and prone to errors, the ODMS allowed administrative personnel to update office and staff records in real time. This eliminated redundancy and ensured data accuracy, contributing to smoother institutional workflows.

A third conclusion is the high level of user acceptance and satisfaction. Usability testing revealed that the majority of users found the system intuitive, accessible, and significantly more reliable than previous methods. This demonstrates that even in contexts with mixed levels of digital literacy, a well-designed interface can foster adoption and satisfaction. Finally, the study highlighted the feasibility of implementing digital solutions in resource-constrained institutions. By using lightweight technology and modest hardware specifications, the ODMS showed that polytechnics in Nigeria and similar settings can modernize administrative processes without requiring prohibitively expensive infrastructure.

The results are consistent with findings from Smit *et al.* [17], who reported improved accessibility and efficiency when higher education institutions adopted digital directories. Similarly, Lu *et al.* [18] documented reductions in redundancy and retrieval delays when manual processes were replaced with digital information systems. The consistency of these outcomes across diverse contexts strengthens the conclusion that directory digitization is a universally beneficial intervention.

Some divergence was observed in comparison with studies conducted in environments with advanced ICT infrastructure, such as Zhao [19], who demonstrated the integration of geospatial technologies (e.g., interactive maps) within directory systems. The absence of such advanced features in the ODMS may explain why navigation improvements, while substantial, did not reach the near-instantaneous levels observed in their study. This difference can largely be attributed to infrastructural limitations and project scope rather than inherent flaws in the ODMS.

While the ODMS clearly improved navigation and administrative efficiency, its long-term impact on institutional decision-making and strategic planning remains inconclusive. The system was designed primarily for directory management and not for higher-order analytics, limiting its immediate contribution to administrative intelligence. Future research should explore the integration of analytics modules to track usage patterns, staff-student interactions, and workflow efficiencies. Additionally, the study did not conclusively determine how the ODMS performs under heavy simultaneous loads, such as peak registration or examination periods. Controlled stress testing and scalability analysis are recommended to clarify the system's robustness under such conditions.

The first limitation is the dependency on data accuracy. If administrators fail to update office or staff details promptly, the reliability of the ODMS diminishes, potentially leading to the same problems as manual systems. Second, the system's search functionality is currently text-based only, lacking geospatial or visual navigation features such as maps or QR codes. This limited the scope of navigation support provided to users. Third, the evaluation was confined to a single institution. While results are promising, generalizability across other Nigerian polytechnics or universities with different structures remains to be verified. Finally, infrastructural challenges such as intermittent power supply and unstable internet connectivity in Nigeria posed practical constraints. Although the ODMS was designed to function offline within the local area network (LAN), these realities limit seamless scalability.

For researchers in educational technology, this study contributes empirical evidence on the feasibility and effectiveness of lightweight, locally-deployable ODMS platforms in resource-constrained environments. It extends prior findings by showing that even institutions with limited ICT infrastructure can successfully transition to digital systems with significant gains in efficiency. For researchers in information systems more broadly, the ODMS highlights the importance of tailoring system architecture to context, balancing functionality with infrastructural limitations. For the general public and stakeholders—students, parents, and visitors—the findings underscore the practical benefits of digital transformation in higher education. Faster navigation and reliable access to information improve campus experiences, reduce frustration, and foster a sense of institutional modernization. This study extends prior work by demonstrating that ODMS design can be effectively localized for Nigerian polytechnics, balancing affordability, simplicity, and efficiency. While earlier studies emphasized advanced features like GIS integration [20], this work shows that even without high-end technologies, meaningful improvements can be achieved.

The ODMS significantly improved navigation efficiency, enhanced administrative operations, and provided a centralized, reliable, and user-friendly platform for directory management at Federal Polytechnic Ile-Oluji. By reducing reliance on manual directories and streamlining real-time updates, the system contributed directly to better institutional service delivery. Although limited in scope and scalability, the system demonstrates that digital transformation in Nigerian higher education is both achievable and impactful when solutions are tailored to local contexts. Future work should focus on expanding functionality with geospatial features, stress-testing under peak usage, and replicating deployment across other institutions to confirm generalizability.

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