

Design and Implementation of a Web Based Leave Management System

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Abstract: In current era of net-centric computing, the availability of a web-based leave management system has become an essential and indispensable tool for any organization and corporation. It can track and manage a variety of employee leaves, as well as process requests for time off for employees. However, there were issues raised concerning inefficiency, downtime, and delays in the processing and approval of leave requests in the human resources departments of corporations and agencies. This paper explains why it is necessary to develop a system that uses web-technologies to eliminate bottlenecks in getting leave approved on time. This paper used a qualitative research approach to gather insights and familiarity with what is in existence so that more research can be done. Data was gathered through interviews, scenario generation using stakeholders' and participants' experiential narratives, and analysis of present processes and structures. The development approach followed a software development methodology. A web-based leave management system (WBLMS) was designed using Unified Modelling Language (UML) tools with its database designed using SQLite, implemented using web technologies such as HTML, CSS, Python Programming language and its Django framework and evaluated using DeLeon and McLean Information theory. The outcome of the system evaluation revealed a positive result. Upon the use of the system developed, the response from respondents yielded 76.67% satisfaction rate. This is indicative of the fact that when users (junior and senior staff) use the leave system, it was considered acceptable and good enough to achieve or meet the requirement specified). The system also yielded 81.67% accuracy and gave 81.67% ease of use. The paper concluded that a proposed leave system developed enhance user satisfaction, increase productivity and ensure efficiency as well as the effectiveness of the process and employees while reducing the time taken in processing leave application.

Keywords: Leave; Efficiency; Effectiveness; Web-Technologies; Information Systems; Communication; Management; Human Resource.

1. INTRODUCTION

Human resource management is concerned with the process of dealing with people at work. Human resource management (HRM) is the process of connecting individuals with organizations in order to assist them achieve their objectives. Human resource management (HRM) in organizations and enterprises throughout the world has become a vital arm of any firm in the quest for ever-increasing human productivity. This is due to the fact that their responsibilities include concerns such as remuneration, performance, development, safety, wellness, benefits, employee motivation, and training [1].

With the advancement and improvement in Information and Communication Technology (ICT) in recent years, there has been a paradigm change in the understanding of the role of ICT in human resource management. Several organizations and enterprises have realized the growing relevance of using IT to maximize the effectiveness of their HR responsibilities. This takes the form of electronic human resource management [2, 3), which relies on cutting-edge technology ranging from internet-based human resource management information systems (HRIS) to shared and common intranet and enterprise portals.

As a result, HRMIS can be defined as a system that allows you to keep track of your personnel and their information. In fact, information technology (IT) and human resource management have a wide range of effects on one another, so human resource personnel should be allowed to adopt technological advancements that allow for the re-

engineering of human resource action, be prepared to maintain an organization and work project caused by technology, and be able to maintain an effective administrative atmosphere for innovation and knowledge-driven organizations.

Within the field of ICT, the use of electronic or online Web-based Leave Management System (WBLMS) is to ensure that standard effective management and productivity (Physical and mental) of employees in the organization are maintained. Therefore, there is a need to develop a system that reduces the delay in granting leave application. The need for a web-based system is therefore based on the fact that there is a large volume of paperwork that is processed manually and takes a long time to process and that the application needs to be reduced. This does indeed cause a great deal of damage or danger to the overall productivity and efficiency of employees in the organization. There is a need to develop a system that reduces the delay encountered in the granting of leave applications.

Therefore, developing a WBLMS will help reduce the downtime as well as the paperwork and manual record keeping information about the worker quicker with a quick analysis of the problems. The main aim of this study is to build a user-friendly web-based/online integrated public service leave management system, which is focused on a functional leave management system in the public service domain. In this paper, attention is focused only on public agencies using the African Regional Center for Space

Science and Technology Education in English (ARCSSTEE), Nigeria as our case study.

A Web-based Leave Management System (WBLMS) is described as a Human Resource (HR) software web application that is designed with the purpose of managing human capital, leave request, procedures and records. In other words, it is seen to be a useful HR subsidiary system set aside for overseeing employee leave matters. Leave Management System (LMS) is simple to understand, easy to use and more convenient to implement.

The main aim of LMS development for the public sector is to shift away from a conventional model to a more reliable and effective level of leave management [4, 5]. Nowadays, the current way of managing leave request is paper-based for many public organizations in Nigeria.

Studies has shown that the manual leave management approach utilized by most public sector firms has proven to be inefficient and inconvenient. Anyone who has applied for leave understands how unpleasant and tiresome it is to write and submit an application and then wait for it to be approved as the hard copy moves up and down the approval chain. With its capabilities, a digital leave management web application will eliminate physical movements and allow HR to have a bird's eye perspective of the organization's leave status. This will undoubtedly aid in the efficient disposition of leave-related duties such as easy application of leave request, easy tracking of employees on leave, coordinated leave workflow process, reduced accumulation of leave forms, structured data presentation for report analysis generation and quick approvals in the pursuit of a long-term, redundancy-free system.

Public service organizations are known for large human capital workforce. Therefore, leave management remains a vital area to be considered in terms of proper leave records management. The much-desired new public management system in Nigeria can only be achieved if we begin to adopt more implementation of management information systems in eliminating redundant operations.

2. LITERATURE REVIEW

The relevance of information systems within enterprises has increased as a result of the growth of the Internet, globalization of trade, and the rise of information economies. Researchers and practitioners must understand how information technologies impact the corporate world. Management information systems (MIS) is a field of study that focuses on the use of computer-based information systems in businesses and government agencies. It first emerged in the 1970s [6].

An information System (IS) is defined by [7] as an interconnected set of interactions that share information and are capable of integrating into a common information unit. The goal of Information System Theory is to create a link between the formalistic approach of general system theory and the world of information and information technology. They must retrieve information, store it, access it, convert/change it, transport/transmit/communicate it, and process it in order to generate the intended information service [8]. It turns out that conceptually separating retrieval and processing systems is difficult from this standpoint. However, an IS strategy must be adaptable to both functions. Any data processing system's job is to offer data to aid in decision-making, problem-solving, or

operational tasks. As a result, such a system can only be truly comprehended as an information system. The information aspect understands that the data's main purpose is to provide individuals with information.

Information systems have been existing for more than three decades, according to [9]. In this regard, various types of Information Systems are accessible for a variety of purposes. Currently, the types of information systems available are Transaction Processing, Process Control, Office Automation, Management Information Systems, Decision Support system, Executive Support System, Expert systems, knowledge Management system, Strategic Information and Functional-based Information system. Functional-based information systems assist an organization's operational and management applications. Finance and Accounting Information Systems, Manufacturing and Production Systems, Sales and Marketing Systems, and Human Resource Management Information Systems (HRMIS) are all examples of information systems

Today, the growth of organizations is driven by the availability of a large amount of information. The Human Resources office in organizations helps to the public service's organizational purpose by supporting informed employee benefit decision-making by delivering accurate, timely, and useable data. However, with the rise in globalization, it has become important to identify less challenging and more convenient systems to help organizations in managing their data for efficiency and efficiency.

[10] opined that the efficiency and effectiveness of activities within an organization can be improved by developing computer-based Information Systems across every functional unit. Out of the many advantages that workers have, leave is one of the most important functions carried out by the HRM.

Leave is defined as an officer's approved absence from duty for a specified period of time, according to the public service rule of 2008. The act of taking time off work cannot be overlooked or dismissed, since every employee has the right and opportunity to request time off to rest or attend to personal matters outside of the workplace. There are various types of leave and reasons why employees want time off from work. The availability of various types of leave that are commonly acknowledged in Nigerian public sector organizations include maternity, medical, study, Sabbatical, proportionate, annual, casual, deferred leave, leave for compulsory and non-compulsory examination, leave of permanent invalidation and others alike, is critical to workers' physical and emotional health. If appropriately constructed, it can have the desired positive influence on workplace health and safety, as well as boost productivity and performance.

The Human Resource Management Information System (HRMIS) which is an aspect of MIS is one of the vital digital solutions human resource personnel uses in managing most of their operations. Therefore, Leave Management System (LMS) is a human resource sub-system or under HRMIS dedicated to collecting, disseminating, storing and managing employee leave applications.

Given the understanding of HRMIS, it can be deduced that a web-based LMS is a Human Resource (HR) software web application that is designed to manage human capital leave requests, procedures and records. It is captured to be a useful HR subsidiary system segregated for managing employee leave matters. Employees use LMS to request permission for leave by filling their desired dates for management approval (Singh, 2016). Other subsystems used are Payroll System, Employee Attendance System and Employee Management System like ADP, Peoplesoft and others to mention a few [11]. LMS is simple to understand, easy to use and more convenient to implement within a workspace environment. One of the many advantages of designing a Web-based LMS for the public sector is to transcend from a traditional conventional system to a more reliable and effective system [4].

In general, the Nigerian public service sector has fallen short of expectations in terms of building an effective ICT and Management Information System-based applications to improve the overall operational performance of the nation's public service. As the zenith of the Nigerian public sector, federal ministries provide administrative structures for the implementation of government programs, plans, and policies.

According [12], the structure and operations of ministries and parastatals, particularly federal, reveal that senior managers engage in traditional management operations and make key choices in the course of their regular duties. In this sense, there is unquestionably a pressing need for ministries to implement effective MIS. As a result, the use of MIS technology represents a new public management agenda aimed at reforming the public and civil service sectors. To improve the character of the civil service operation, this management promotes efficiency, effectiveness, and performance [13]. With the advent of globalization, however, it has become critical to identify less difficult and more convenient technologies to assist firms in managing their operations and data for efficiency and effectiveness.

The Nigeria Government requires a departure from the traditional method of administration and the urgent need for a reviewed public sector to propel the government to its quest for sustainable, socio-economic, political and technological development [14]. The drive towards technological advancement in public service can be achieved using IS. As a result, it is clear that in order to carry out these functions effectively, public service organizations need IS to address recurring issues like poor information management, inaccuracies, data non-availability, and a lack of information for monitoring, regulating, communicating, and controlling public service operations [15].

2.1 RELATED WORK

Some existing relevant systems are examined in relation to this study to determine how our proposed system will be developed. For instance, Mobile HRM online leave management system, Student leave management system, University and other short academic leave management system, Web based staff management system, and an E-Leave management system for the banking sector are some of the systems available.

[16] in their work demonstrated a desktop-based payroll management system. The architecture of the proposed system is a three-tier, which was designed using Software development lifecycle methodology and built with technologies such as HTML, CSS, and JQuery for the frontend, C#, ASP.net for the backend, and JSON and Ajax for data parsing. The outcome revealed that the proposed system is more efficient since it provides a user-friendly environment, reduces manual calculation errors, and improves security. This study shows relevance to the task of developing a leave management system, thus providing tools and technologies needed to construct the system.

[17] investigated the issue of students being unable to submit their leave applications. The system developed was created to keep track of a student's attendance, records as well as allow students to submit their leave requests online rather than using a manual approach that relies on pen and paper. A real method Group technique was used by the authors. The brainstorming process entails getting into groups and coming up with ideas. The authors created a student leave management system to solve the issue of attendance using Java programming language and cascading Stylesheet (CS) for Android. The outcome demonstrated that the developed approach was unique and effective.

[18] presented a leave and payroll management system to reduce manual work and to overcome the problem of time management. In an attempt to achieve the aim, the authors developed a web portal system that provides the employees of an organization with an online platform to view their leave history and apply for leave. The payroll system was implemented using VB.net as frontend and Microsoft Access 2007 SQL server 2008 as the backend. However, the system developed is desktop-based and could allow users to use it dynamically anywhere.

[19] in his paper addressed the issue of data loss, particularly when data is not backed up on a regular basis. To address the issue, the author created a user-friendly employee leave database management system that allows personnel information to be accessed throughout the business organization for decision-making purposes. The software was created by automating the submission of leave requests and approvals. In addition, the system's data was gathered through interviews, questionnaires, and observations. The system was developed using Entity Relationship Diagram, Data Flow Diagram, and context diagram with a distributed based architecture and a centralized database utilizing MS-SQL server. The system was developed using ASP.net web technologies after following through the steps of the water fall model; and tested with a systematic testing methodology that included exercising all internal data structures to ensure validity. According to the findings of the research. The study concluded that the organization's decision-making process was considerably aided by speedy information processing, as data collecting from computer-based information takes much less time than a manual system.

[4] addressed the delay in the manual filling of leave form and waiting to get higher officials' signature. To automate the LMS, which is central to the organization activities, the authors presented a "MOBILE HRM LMS". The Mobile HRM LMS is an intranet-based application that was developed to improve the leaves segment and can be accessed throughout the organization or a department. The

main aim of building the mobile HRM LMS is to reduce time spent on leave processing. The proposed system was designed using Data Flow Diagrams (DFD) and implemented using PHP programming. The result showed that there is no necessity for manual filling of leave form and wait to get approvals. The result indicated that the application developed allows the staff of the organization to view the previous leave applied by them and its ease of use thereby, reducing time.

[20] investigated the flaws in the organization's usage of a traditional way of personnel records management and administration. The authors presented a web-based Staff Management System (SMS) to bring about transparency, organizational accountability, and allow accurate audits by creating and ensuring SMS records as solid proof as established by [1] and maintains a database of employment status, educational background, staff information, event records, sick and vacation leave credits, and also a database of employee performance [21].

The proposed system is a web-based application developed using the K-means clustering approach. MySQL was used as the database tool, written in PHP and developed using web technology tools such as HTML, JavaScript, CSS, JSP on a LUNA Eclipse Integrated Development Environment with the Tomcat 7.0 Server and implemented using Java programming language. The result indicated that the developed automated system helps in reducing various costs such as manpower, staff information, and work scheduling and performance analysis.

[22] examined the time loss in applying for leave and search for employees' records, management system or personnel information. The authors used the iterative technique as a development process. Similarly, issues about the existing system were discovered, and interviews and consultations with users of the existing system were conducted in order to offer a thorough examination of the system's current operations and structure. The authors identified the requirements for constructing the leave management system in order to handle the challenge, and the system was designed using Data Flow Diagrams (DFD) and Entity Relationship Diagrams (ERD). The designed system was implemented using PHP programming language for user interface design and Structured Query Language for database design. The developed system was tested and evaluated. The outcome of the system indicated that there was less downtime or delay in the leave request and approval process. The study concluded that developing a leave management system decreases paperwork and time spent processing files, resulting in increased efficiency and effectiveness.

[23] documents an internship report on leave management system. However only a few features of the system were given due to time constraints, organizational data confidentiality, and resource constraints. [24] created an intranet-based leave management system that can be used by employees within a company. The system can be used to request, authorize, and produce leave reports, but only for intranet-based activities. [25] created a leave and pay roll management system that allows for leave request submission, history viewing, and approval/rejection.

[26] developed an android-based leave management system to handle employee leave requests and approval/rejection in an effective and efficient manner. Although the system is capable of correctly handling

employee leave, it is only compatible with Android. As a result, the platform is not suitable for usage as a web application [27] developed a cloud-based staff management information system prototype for African small and medium-sized businesses. The system consists of four key components: leave management, payroll management, employee appraisal, and record management. Despite the fact that the system was supposed to cover every aspect of human resources in African small and medium businesses, only a prototype of the proposed system was produced at the time of this study.

[28] developed an intranet-based student leave management system that automates leave request acceptance and denial. Furthermore, [29] created an algorithm for scheduling leave for academic personnel for the Nigerian university system. The system calculates the personnel mix by rank and the lecture-to-student ratio before providing services.

[30] investigated the difficulty involved in the management of information concerning staff, and the student leaves using the common manual method of leave requests and approvals. The authors developed an android-based Leave management system using software methodology and an Android Software Kit with a user interface module to overcome the prevailing challenges and ensure efficiency and overall performance. The system was built on a three-tier web framework, which included a mobile device, a web server, and a database (also known as presentation, application, and storage) respectively. As a result, an optimal solution for staff and student leave requests, approval, and tracking was created. The authors concluded that the Leave management system application was created to address the issue of time-consuming manual leave applications. It also aided workers and students in applying for leave using the app and receiving approval from higher officials, as well as notifying higher officials when leave is applied for and informing the individual user of their leave status.

[31, 32] developed a simple Employee leave management system for managing staff leave in Higher Education Institutions (HEI). Adamu planned and developed the system by utilizing web-based technologies such as CSS, JS, HTML, and MySQL, and implemented using a three-tier architecture software model. In a similar vein, [32] used the widely known USSD System for Employee Leave Monitoring and Management in Higher Educational Institutions using the same three tier software architecture model employed by Adamu (2020). The system is built with PHP for general programming, MySQL for database management, and the Adobe Dreamweaver CS3 IDE for development on the Windows 7 operating system. The system was hosted locally using the Apache TOMCAT webserver. The result revealed that the two system have 94% convenience and success rate of usage. The system improves staff management, maintains accuracy, and openness, and emphasizes the need for advanced technology to be integrated into employee records and welfare management in higher education. Employees in academic institutions can seek and track their leave at their leisure and in a timely manner using the developed system.

Despite this, the public agency known as African Regional Centre for Space Science and Technology Education in English (ARCSSTEE) implements most leave types available in the public service rule [33]. The leave management system of ARCSSTEE is more less a manual

system that uses a book register to monitor leave application process yet not implemented. Here, leave applications are approved by two authorities at the centre: the Head of Department (HOD) and the Director. Leave applications only get approved when they are around, else all leave applications wait till they return which results to unexpected delays in granting leave approvals. Figure 1 and 2 provides a conceptual framework and the flowchart for the leave process that normally occurs when an officer plans to apply for leave. The process starts with the officer

and proceeds to the head of department for recommendation. The application needs the director approval before the officer is allowed to proceed on leave. Thereafter, the human resource department conveys the leave approval letter to the applying officer. Yet, the major drawback of the existing systems is that they all focused on information dissipation mainly. None of the existing works explored the use of internet as a tool for ubiquitous data creation, assess, update or deletion.

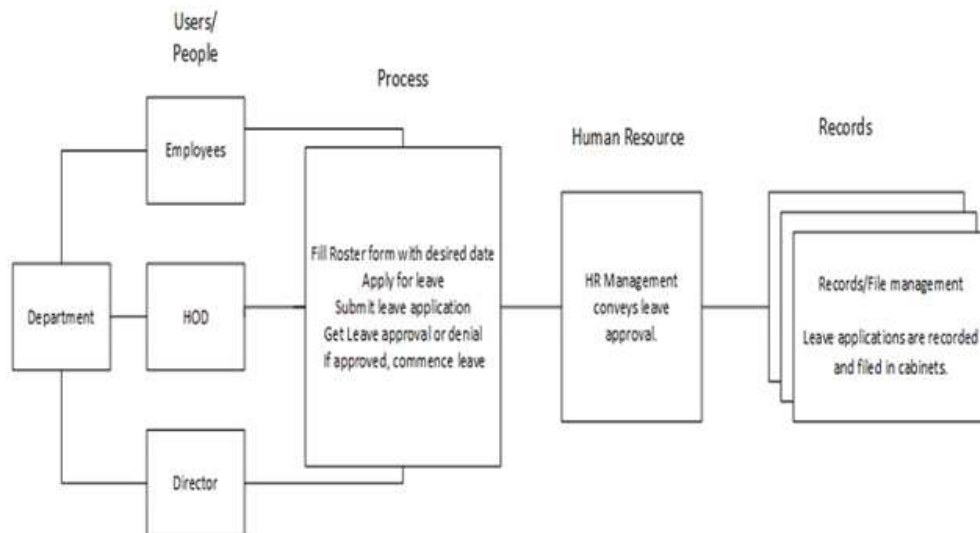


Figure1: Conceptual Design of the existing ARCSSTEE leave system

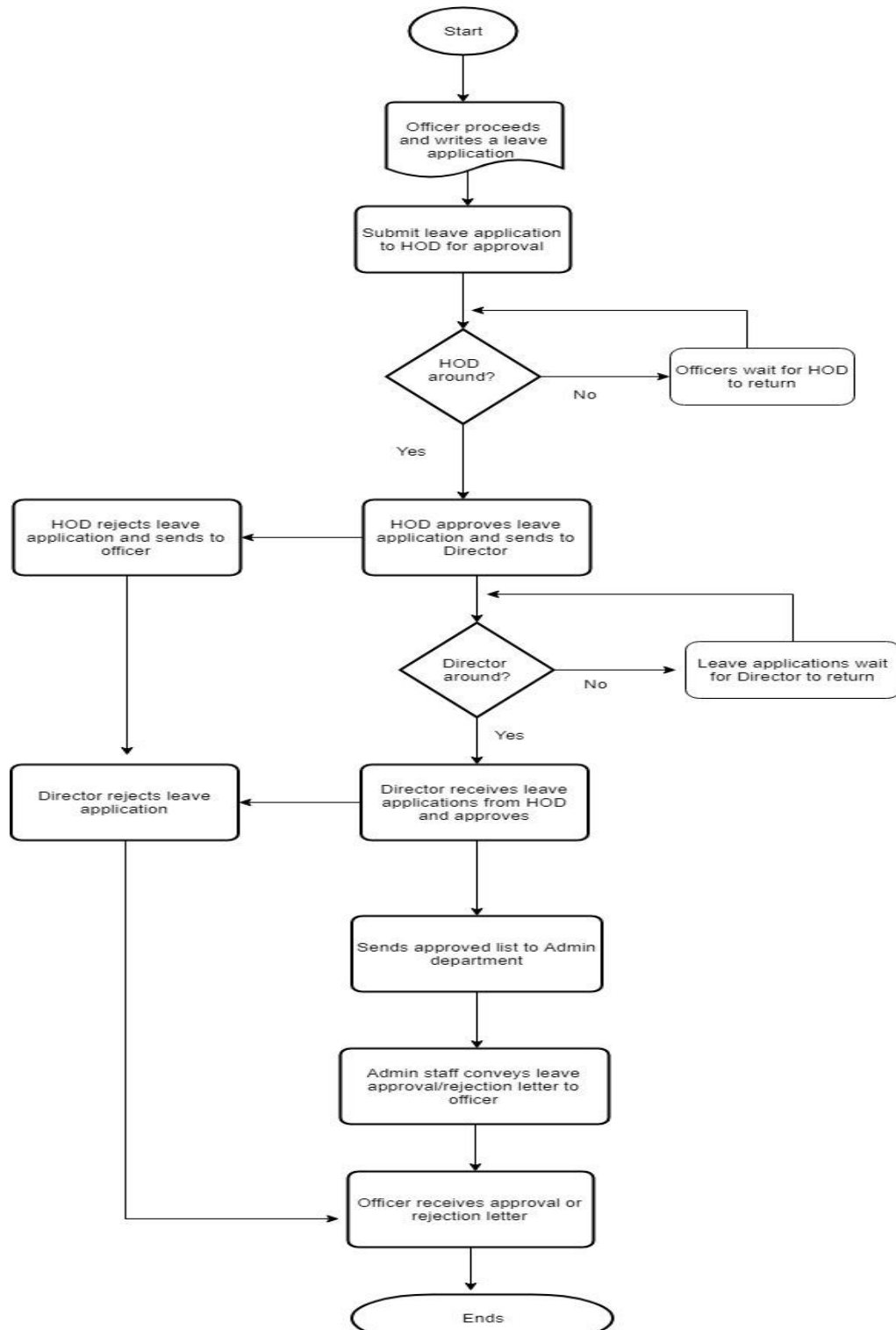


Figure 2. Flowchart describing the leave application process at the public organization

3. METHODOLOGY

The proposed Leave Management system was developed using the Object-Oriented Analysis and Design Methodology (OOADM), which is an approach for designing high-quality Information Systems that combine information technology, people, and data to satisfy business requirements.

The system architecture was designed to give the ideal representation that describes the structure and views of the system as shown in Figure 3 and 4. The requirements for the system were specified using Use case as depicted in Table 1. The System specifications were designed using Unified Modelling Language (UML) tools namely Use case, Class diagram, Activity diagram, Sequence diagram illustrating the design of the proposed system as shown in Figures 5, 6, 7 and 8 respectively. The use case diagram

describes the system, its corresponding actors that is, the employee, HOD, Director, HR and the Administrator, and the roles the actors perform such as request for leave and granting approvals.

Figure 6 describes the different activities that a user can perform when he logs into a system. The activities include leave request application, views leave history, submit leave application to HOD, HOD approves or declines employee leave applications, HR management consent and approval, and reports generation. The class diagram illustrated in figure 7 presents the different object and classes containing its attributes and methods. The classes represented in the diagram are Leave Request, Employee, Login, HOD, Employee Leave history, HR Administrator and Department. The class diagram provides two visibility types namely public and private. While Figure 8 depict system dynamics by showing the participating objects (classes, components, etc.) in the interaction and the sequence of messages exchanged

The Re-engineered system designed in [33] was implemented using a Python Programming Language with its Web Framework called Django. Django framework uses a Model View Controller (MVC) framework in defining the web applications structure. The Model represent the database model, the View acts as the controller that handles all the functions and what (objects) gets viewed on the front-end and lastly the Template as the static files that

is viewed by the user through the user interface. It consists of the client interface, a computer software that offer service to software application (middleware) and database. The graphical user interfaces (front side) was designed and developed using HTML, CSS and JavaScript, while the middleware was designed based on the WSGI web server and the back-end was the SQLite database system. The web browsers present and process the web site, which is the interface for the middleware and data access layer.

The leave management system of the case-study employed the use of a qualitative research approach to gain insights and familiarity with what exist to allow further study. Interviews, scenario-generation from stakeholders and participant's experiential narratives and the analysis of current processes and structures were carried out. The system requirements were specified for the proposed system. The proposed system application requirements were gathered through the interview method with the Human Resource (HR) officer to highlight the features and specifications of the desired system. Ten (10) users and stakeholders of the existing system from the government agency were used as respondents. Likewise, ten (10) staffs selected randomly from each department were also interviewed to know what their challenges and expectations are for such a system.

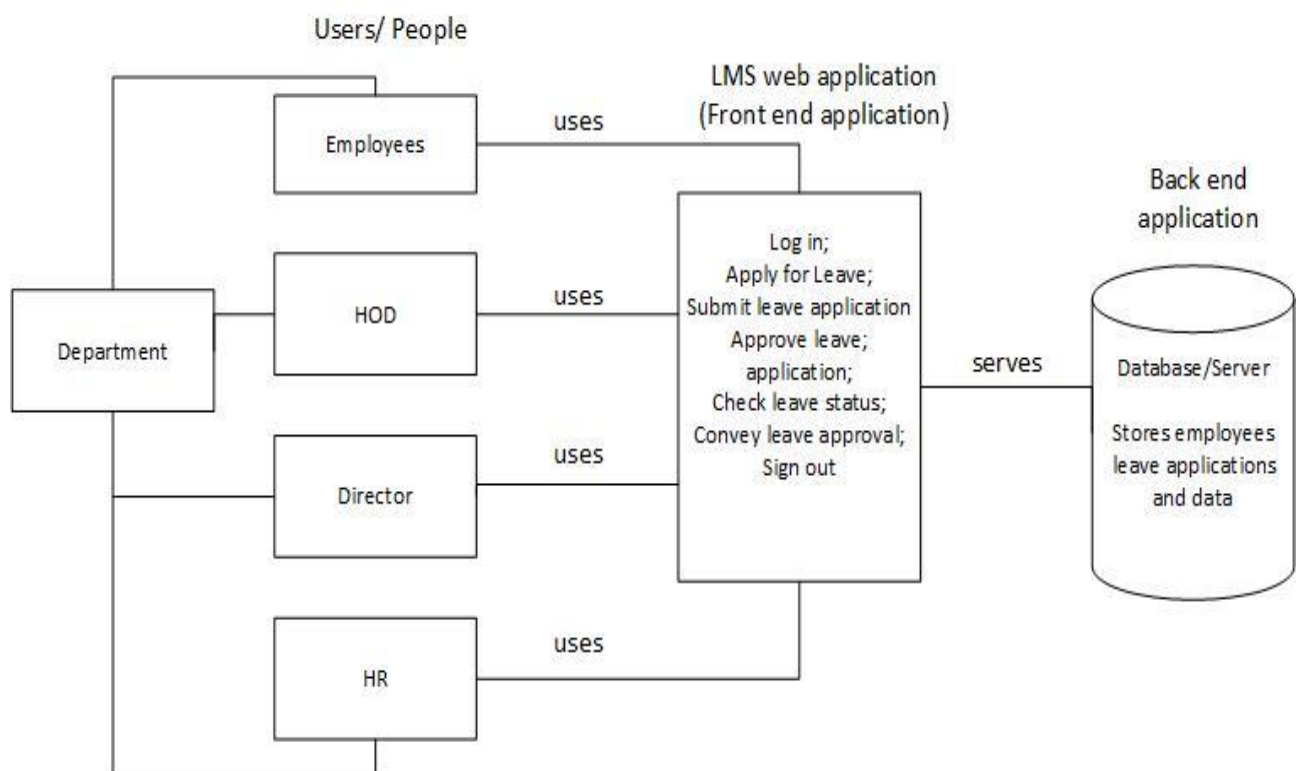


Figure 3. Proposed Design Framework

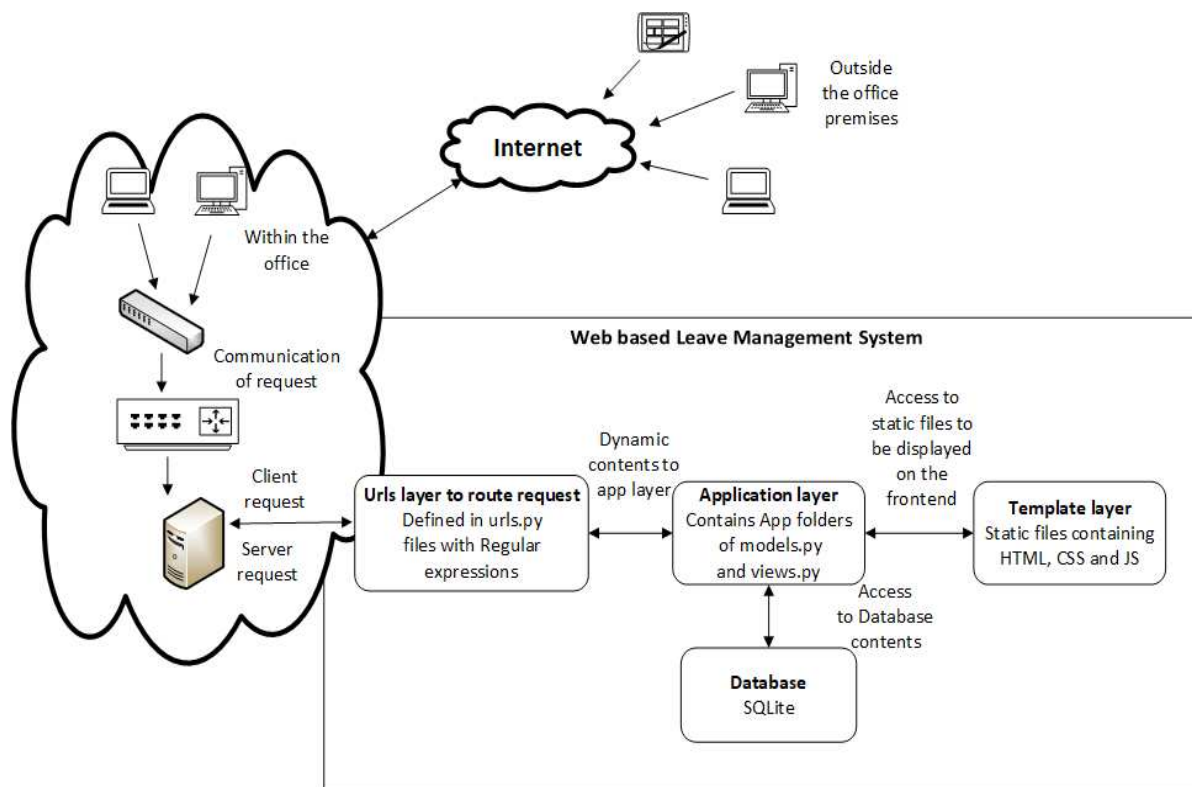


Figure 4: System Architecture for the Leave Management System

Table1: Sample Use Case Specification Table for the proposed Leave management System

S/N	Use Case name	Use Case Description	Participating Role
1	Log in.	The staff logs in to the system using a username and password to gain authorized access.	Employee, HOD, Director, HR Admin
2	Edit Profile.	The staff is allowed to update his/her profile e.g. home address, contact number, etc.	Employee, HOD
3	Request for Leave.	The staff selects a type of leave and submits his leave application for approval.	Employee, HOD
4	View Leave History.	The staff can view their previous leave applications that were approved or declined.	Employee, HOD

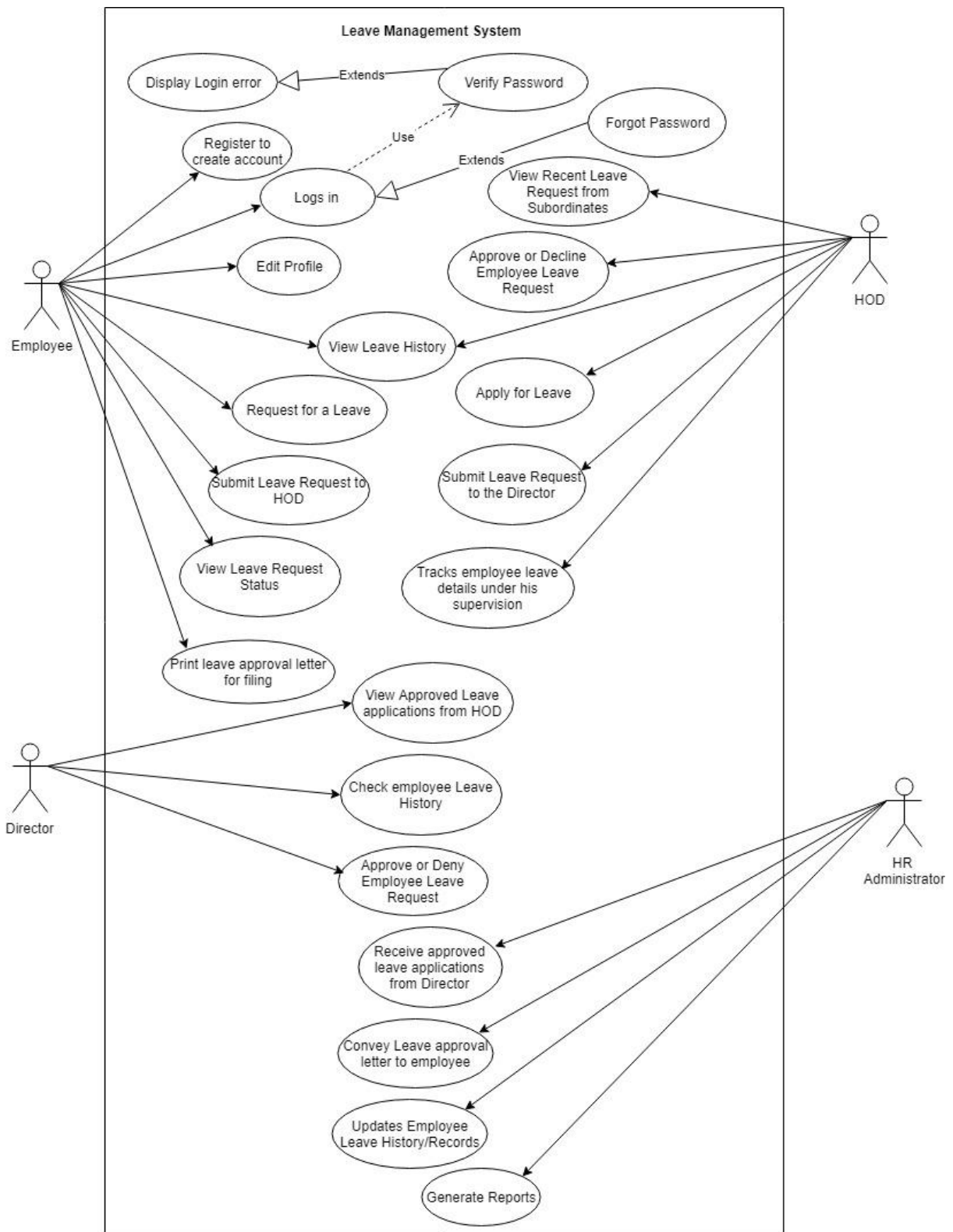


Figure 5: The Use Case Diagram of the Proposed Leave Management System

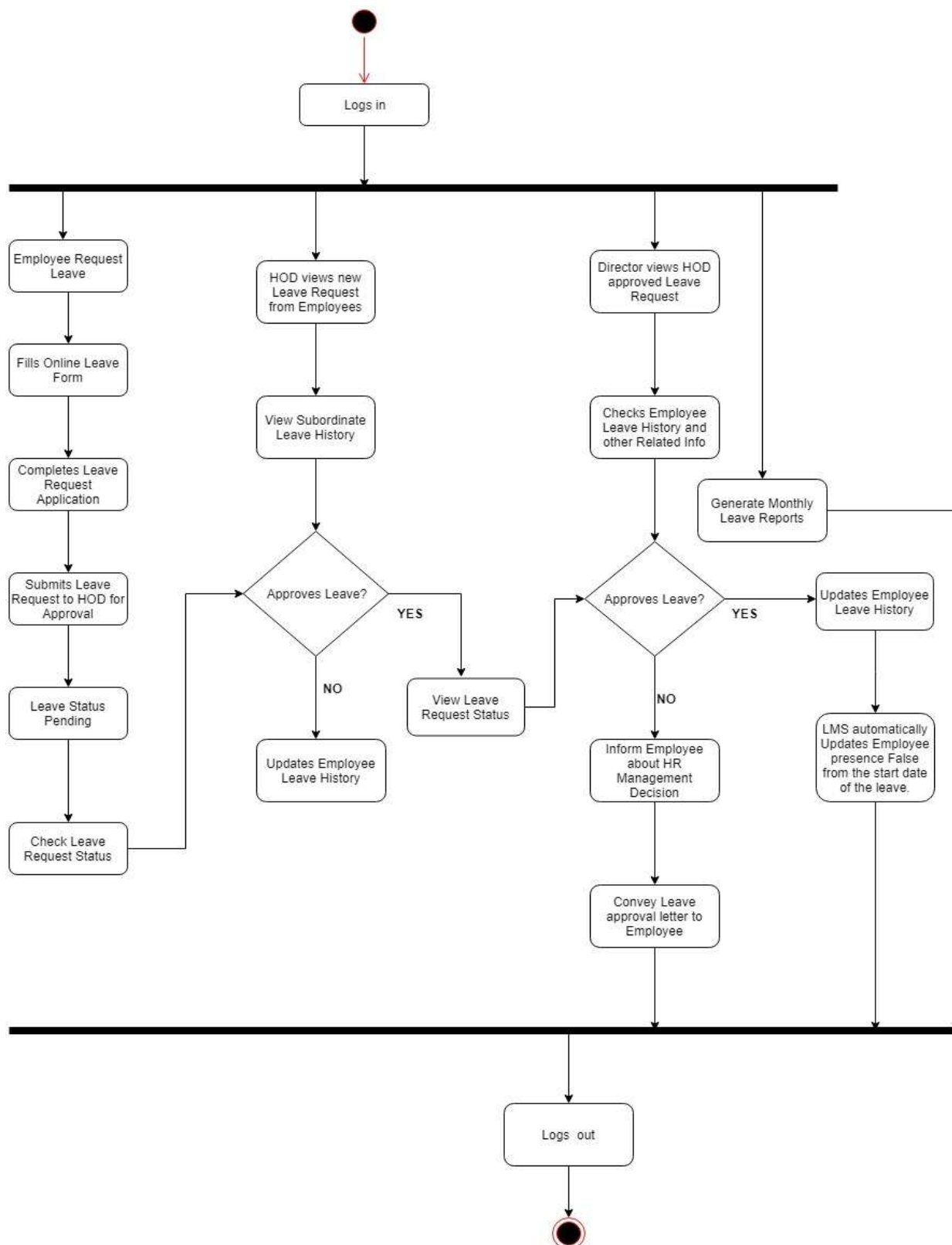


Figure 6. Activity diagram for the Leave Management System

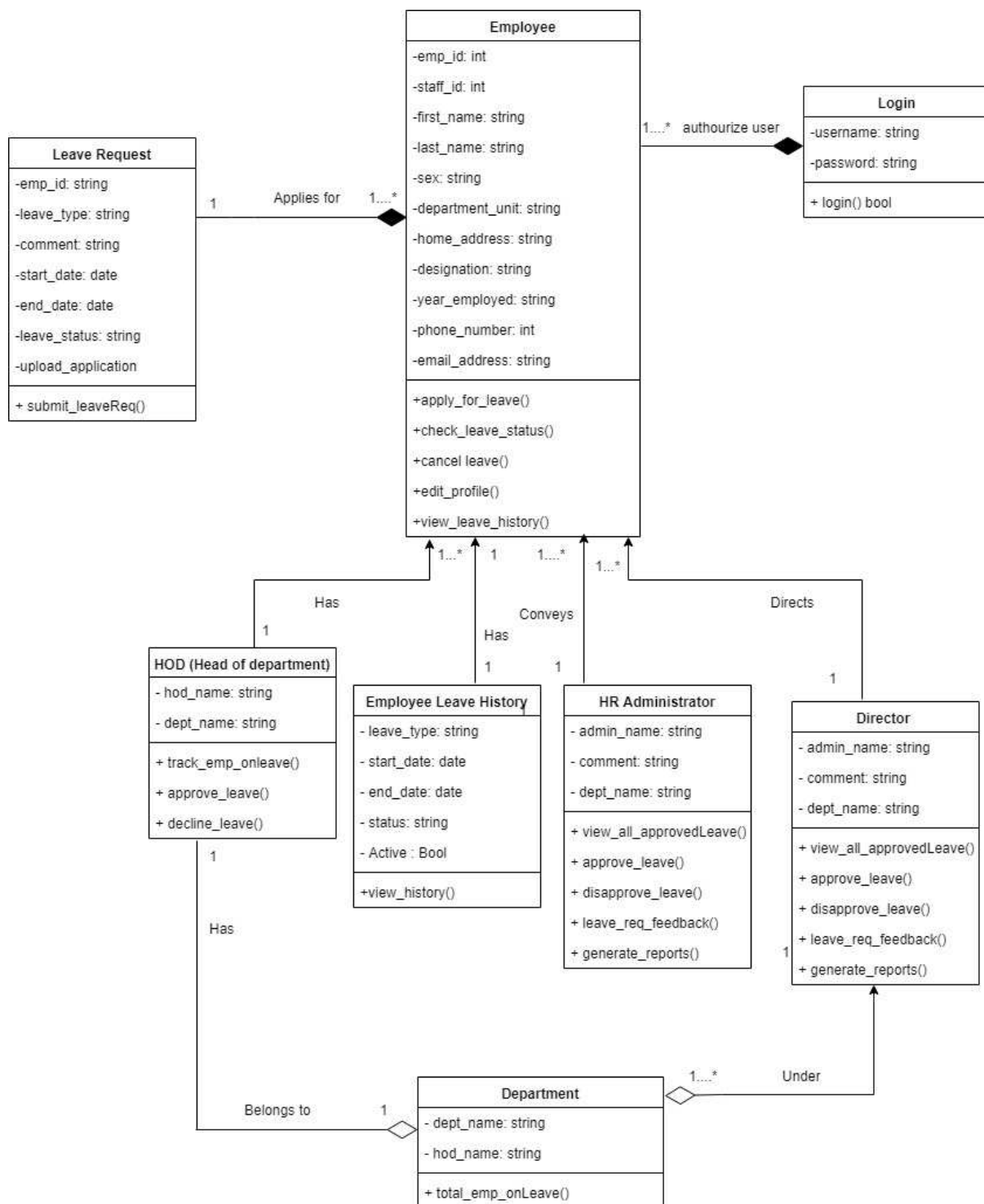


Figure 7. Class Diagram for the Leave Management System

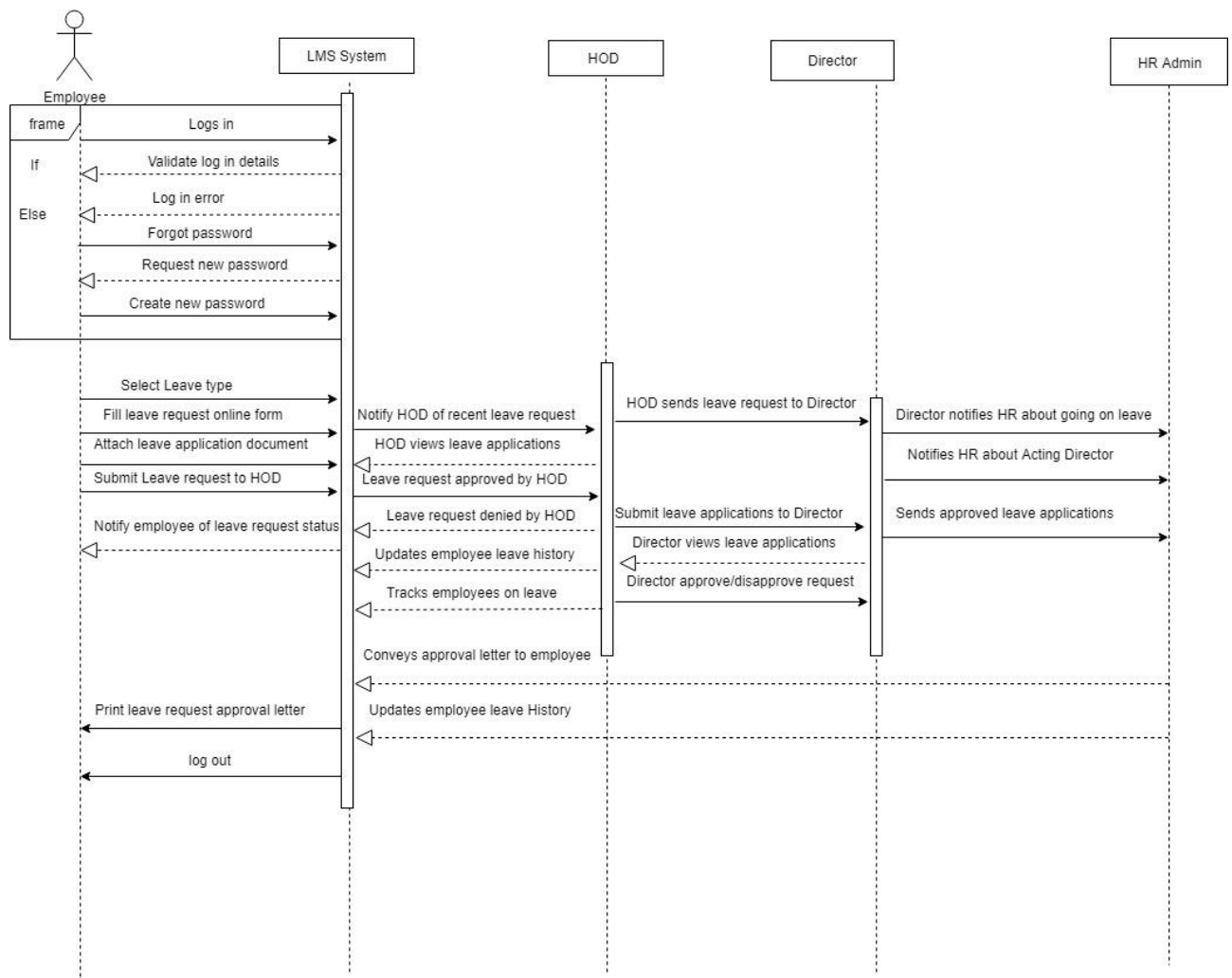


Figure 8. Sequence Diagram for the Leave Management System

Figure 9 shows the Entity Relationship Model diagram for the proposed LMS. The Entity Relationship Diagram (ERD) is a familiar diagram which presents the database structure of the proposed system in a Conceptualized form. Database design is built by the analysis of the problems then extract relational database schema. In addition, the ERD demonstrates that the real world is made up of a collection of entities, their relationships, and the attributes that define the entities. The entities represent the tables that will store posted data inputs from the users. The entities are:

- i. Login table: To contain authenticated user information
- ii. Employee table: This table contains the employee details
- iii. General Employees table: This table contains all the employees leave details pertaining to a pending leave request.
- iv. Employee Leave History table: This table contains previous employee leave applications submitted and other related information.

- v. HOD table: The HOD table displays the Head of Department details in regards to leave applications and approvals.
- vi. Super User table: The Super user table contains the HR administrator details. The HR administrator is responsible for granting employee leave approvals by management.
- vii. Leave Request table: This table contains all the employee leave request applications submitted and pending for approval.
- viii. Department table: This table contains all the names departments and their HODs that are within an organization.
- ix. Approved table: This table contains employee leave applications listed for approvals by the HOD and the HR administrator.

The UML Component diagram illustrated in Figure 10 displays components provided and required interfaces, ports, and interactions between them in a UML Component design. It depicts a system's high-level design and gives a

physical representation of the system. The system component diagram depicts all software dependencies for the following components: Leave Request, Notification, Approve Leave, Track Leave, Leave History, and Report Generator. The diagram depicts the web-based Leave

Management System's Service-Oriented Architecture (SOA).

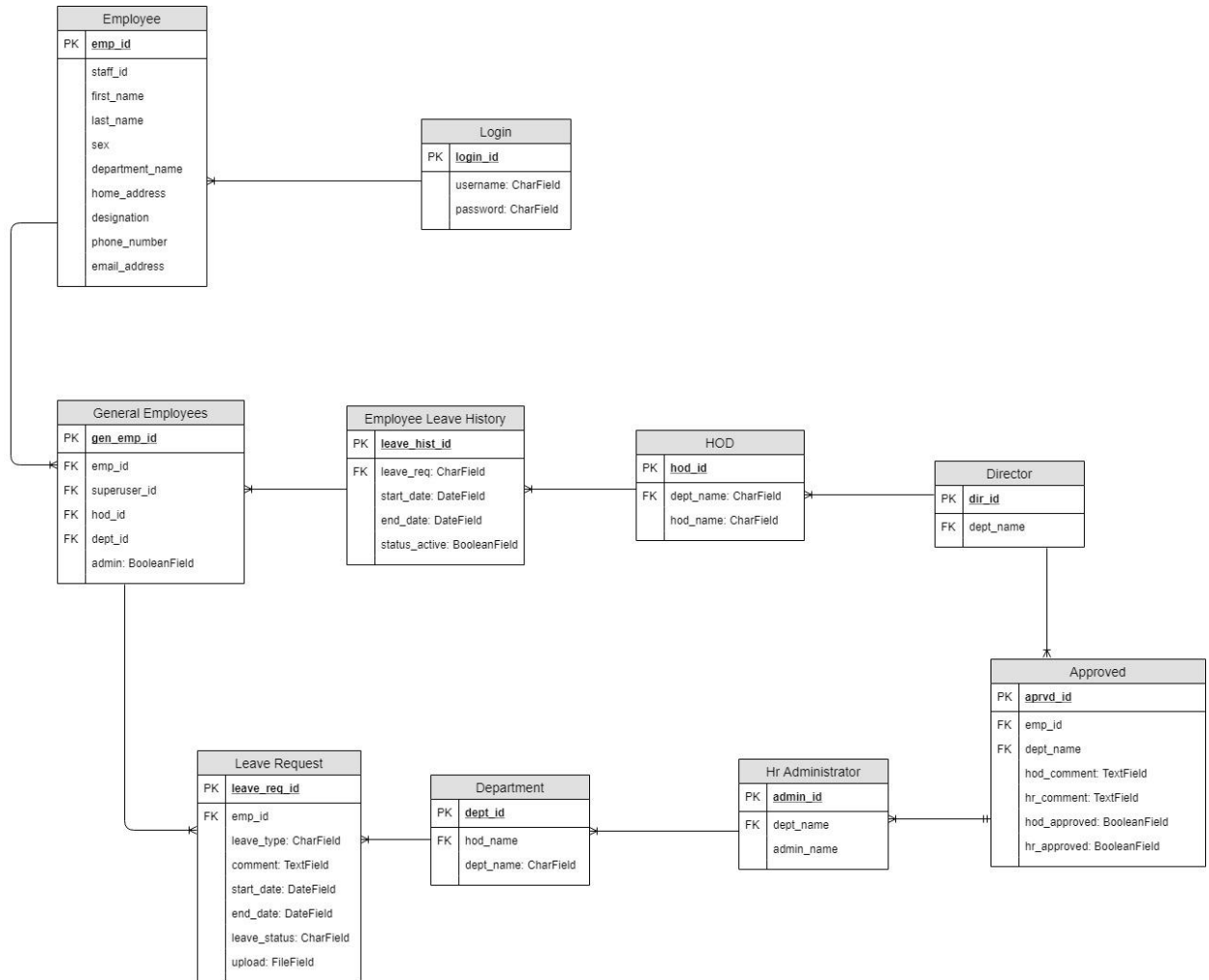


Figure 9. Entity Relationship Diagram for Leave management System.

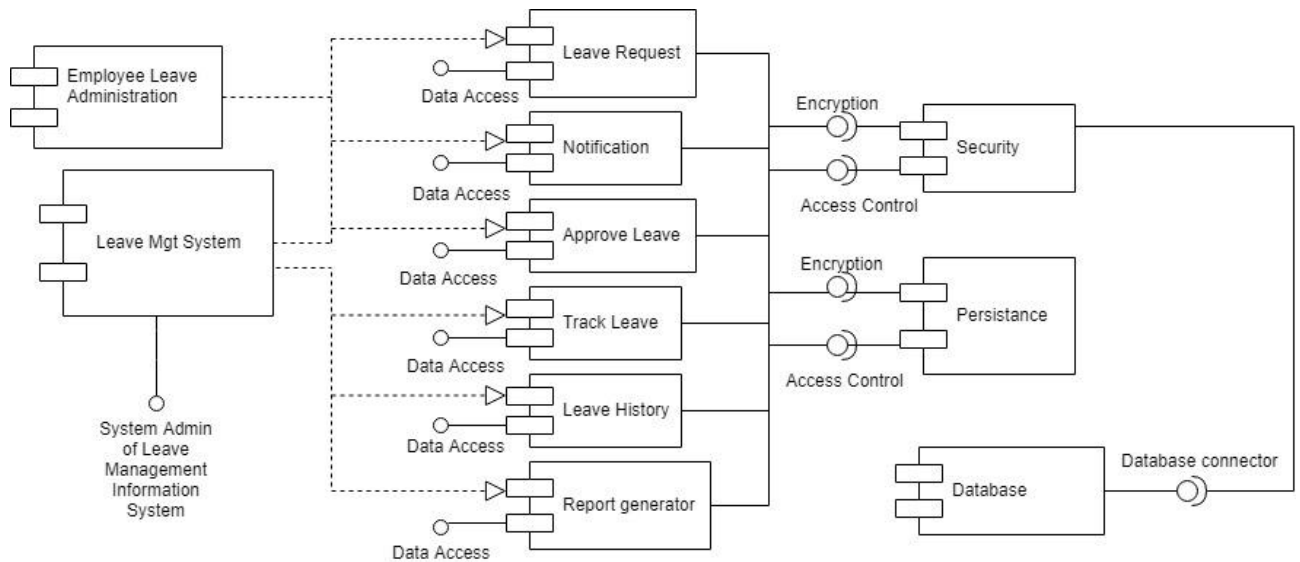


Figure 10. Screenshot of the Component diagram of the System

SQLite database management tool was used to design and implement the database aspect of the system. The use of the database tool was motivated by its availability, accessibility, simplicity and adaptive to the implementation language tool that was used in the development of the web-based system. Python programming language was used to implement the web-based automated leave management system application. The leave management system was implemented using web technologies, while McLean and Deleon information system (IS) theory was used to evaluate the developed system.

This was subsequently followed by a quantitative method using a statistical approach (descriptive approach) to provide both detail and generalized analysis, which serves as the basis for result presentation.

3.1 PROTOTYPE IMPLEMENTATION

The system design interface will be discussed here and results of the proposed system will be provided using sample data to test the system result output. This was designed to be captured and viewed by the different users. The system was designed to capture four different users

Employee, HOD, Director and the HR Administrator. The implementation result is aimed at developing a prototype of the desired system specific for Public Parastatal Organizations. The following features define what the different interfaces delivers in line with the system requirements. The features of the web-based leave management system are;

3.1.1 The Home Page form

The Home Page form as depicted in figure 11 shows the landing page of the web application. The home page serves as the first contact page that all users will access to navigate and view other relevant features of the system. Every user visits the home page before logging into their personal leave account; while other features available on this interface is the login option and sign-up option. Figure 12 displays the Login page of the leave web application. The system will authenticate using the staff username and password before gaining authorized access to the his/her dashboard. Figure 13 shows the home page of the staff dashboard when he/she is logged in. On the dashboard, there are a number of functions that the staff can perform.

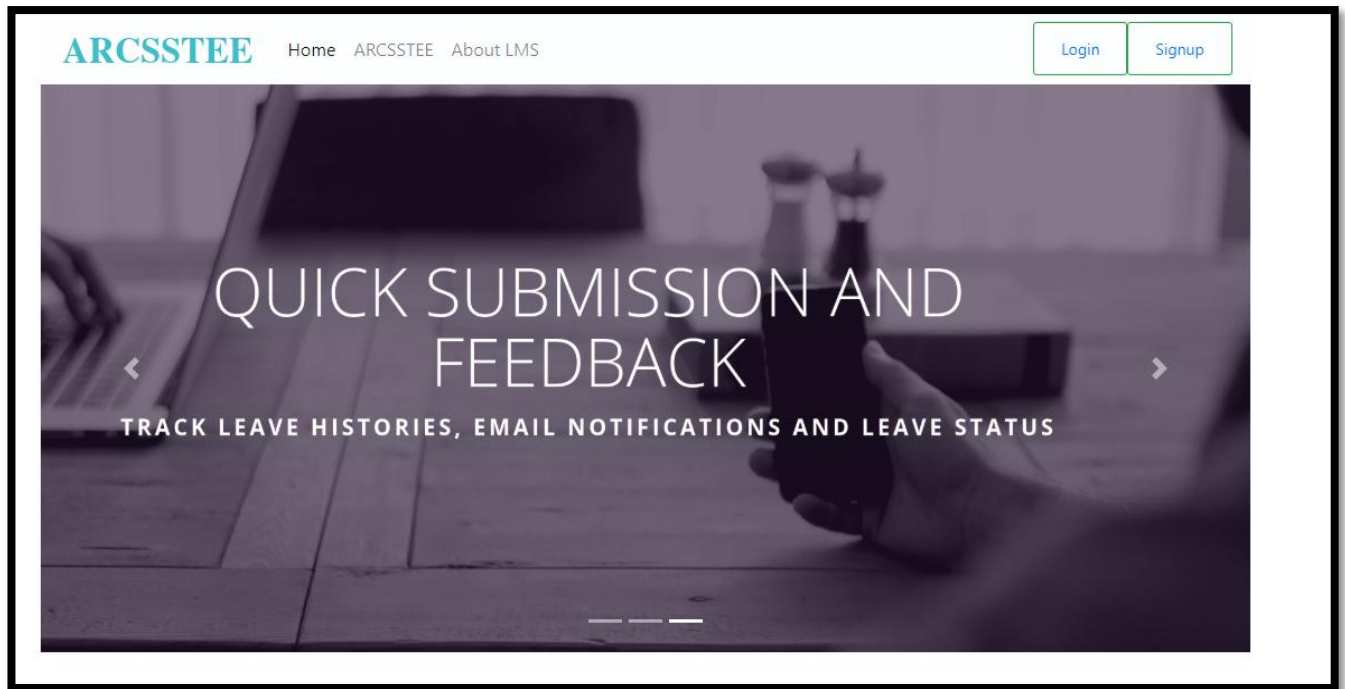


Figure 11. Web Based Leave Management System Home Page

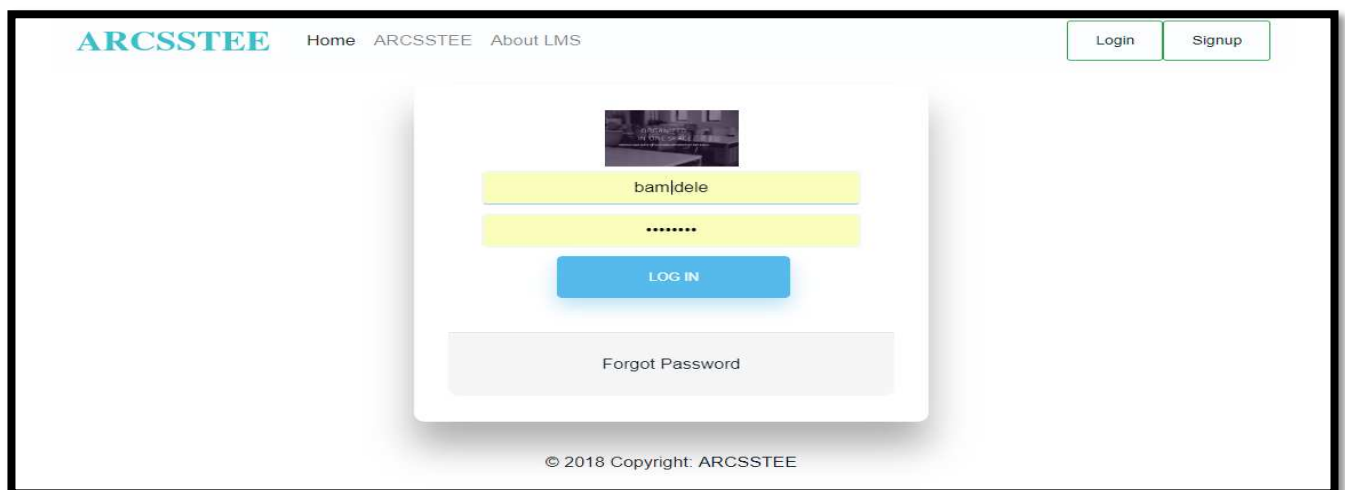


Figure 12. Web based Leave Management System Login Interface

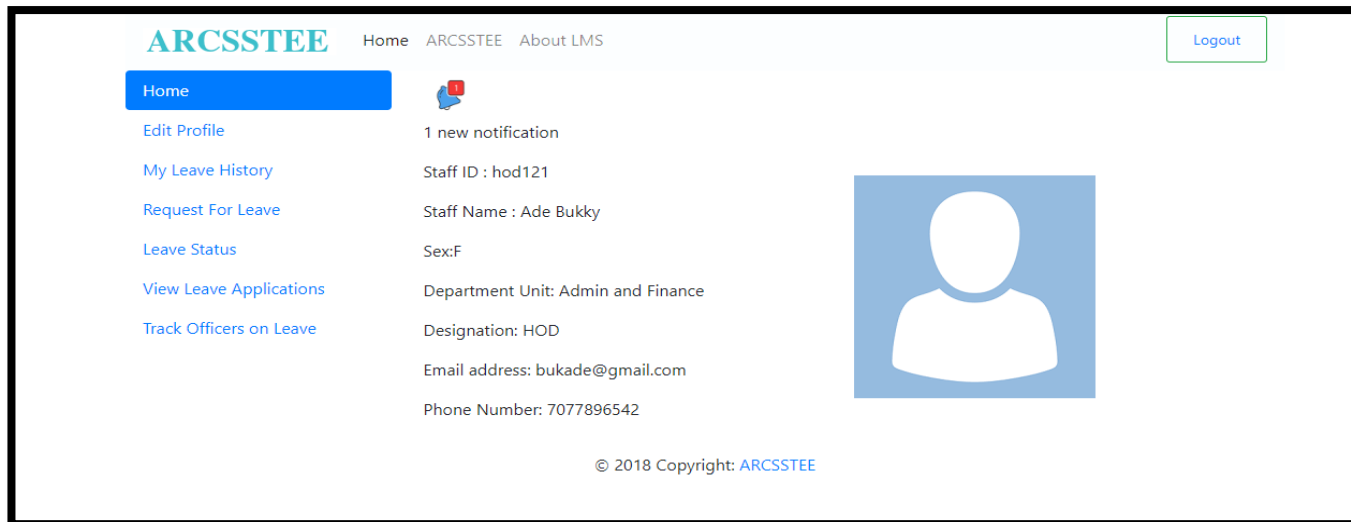


Figure 13. Screenshot of the Home Page of the Staff HOD

3.1.2 Staff Profile Form View

This is another feature of the new system. The form view is sectioned into 5 categories: edit profile page, my leave history, request for leave, leave status and leave application form. Figure 14 displays the edit profile page that permits staff to easily edit their previous information easily at the comfort of their workstations. Some of the features available for editing are their names, email address, home address, etc. In addition, My Leave History View as depicted in Figure 15 presents the leave history of all previous leave application approved or rejected via the Leave management system. It shows a table listing the leave type, application date, leave status, start date, end date and attached documents. Figure 16 displays the leave request application form where the staff will need to fill his

leave intension before submitting it for the Director's approval. The staff is required to provide the leave type, start date, end date, and reason for leave request. While figures 17 and 18 display the status of the staff leave application which will be initially pending. Here, the staff would subsequently check the submitted application is approved or rejected, displays a list of all staff leave applications submitted for the HOD's recommendation and assists the HOD to easily track employees currently on leave under his supervision easily. In the situation where the HOD needs to make a quick decision, he can easily track the leave information of his subordinates currently on leave

Figure 14. Screenshot of the Edit profile page for the staff HOD

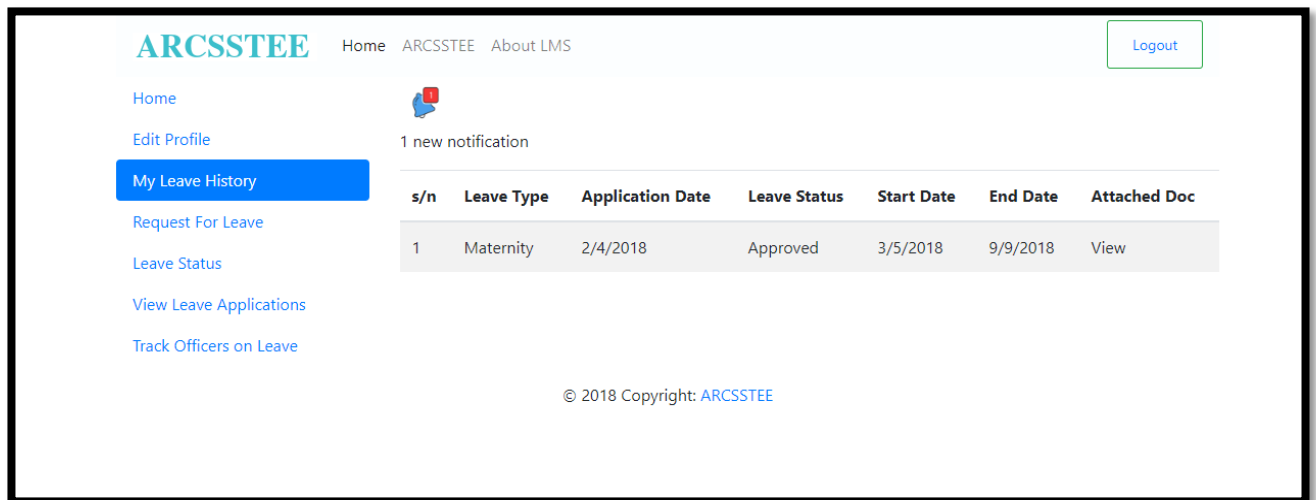


Figure 15. Screenshot of Leave History View

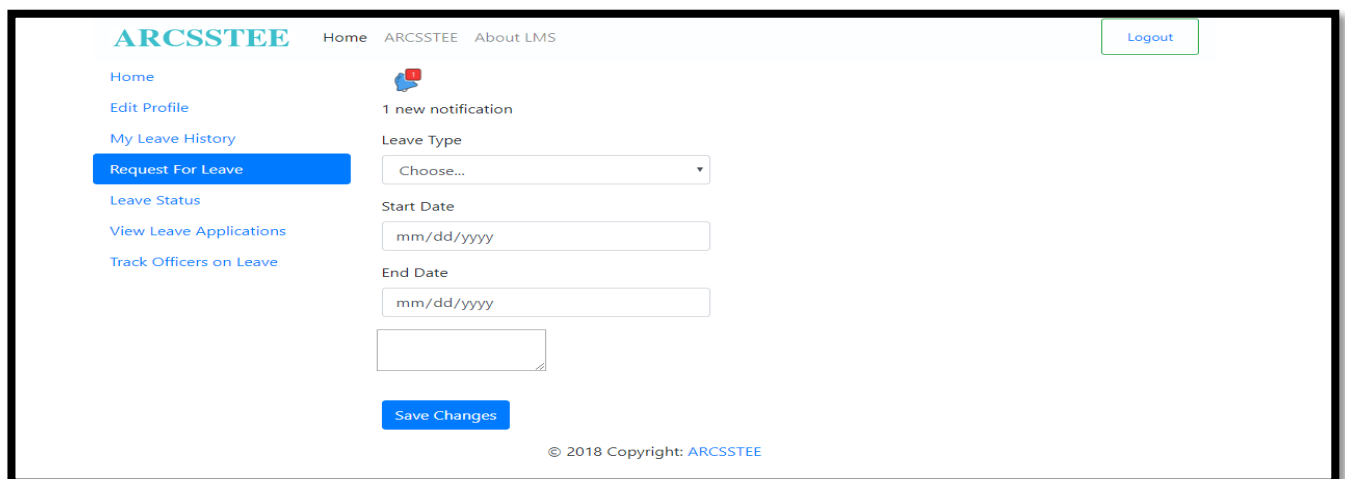


Figure 16. Screenshot showing Application Request.

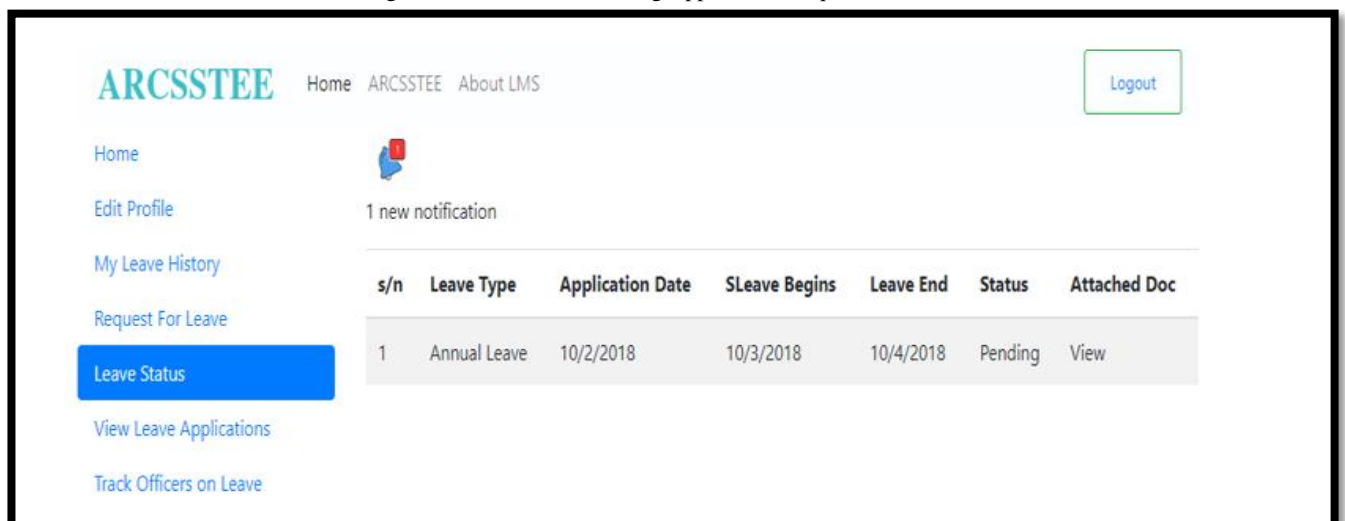


Figure 17. Screenshot Showing Leave Status for the staff HOD

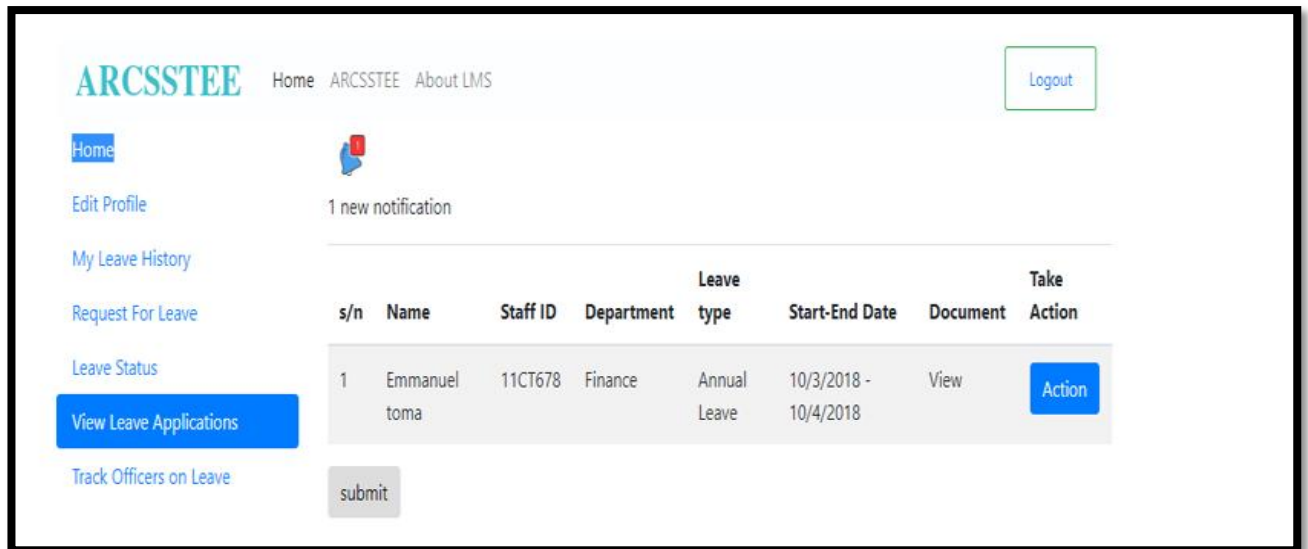


Figure 18. Screenshot Showing View Leave Applications

4. RESULT AND DISCUSSION

4.1 System Evaluation

The system was evaluated for performance based on DeLeon and McLean's information system theory. The system checks for performance accuracy and effectiveness using metrics such as information quality, service quality, user satisfaction, and net benefit through the use of the Decision Analysis Spreadsheet (DAS) tool. The DAS is a subjective evaluation analysis technique that measures the

score or rate of the different categories of a parameter used in the assessment of the developed system. DAS is expressed as a single number in the range 1 to 5, where 1 refers to the lowest perceived quality and 5 is the highest perceived shown in Table 2. The responses received from respondents are presented in Table 3.

No.	Weight	Quality
1.	5	Excellent
2.	4	Good
3.	3	Poor
4.	2	Fair
5.	1	Bad

Table 2. Table showing the Rating Scheme

The parameters were rated by the respondents in the order of their score on the Nigeria computing system. As presented in Table 3, which is meant for substantiating each opinion and attitude of respondents relating to the quality of the developed system. The frequency of the parameters reveals the extent of the system quality as assessed by the respondents. Table 4 revealed that seven (7) respondents constituting about 70% have excellent usage with 30% of respondents have good use of the system. However, no respondent gave scores based on the other rating.

Nonetheless, 78.33% of the total respondent have good intention of use in terms of using the Leave Management system. 73.33% of the respondents accessed the system and gave the reliability score of the system, which produces consistent results time after time. The percentage availability of 83.33% obtained from the assessment shows that the system developed is available for use. Upon the use of the system developed, the response from respondents yielded 76.67%. This is indicative of the fact that when users (junior and senior staff) use the leave system, it was considered acceptable and good enough to achieve or meet the requirement specified.

Table 3. Table showing the System Evaluation Rating of the System Quality

Parameter	Excellent	Good	Fair	Poor	Bad	SoR	SoP	Avg	CWP
	5	4	3	2	1				
Usability	7	3	—	—	—	10	47	4.70	78.33%
Reliability	4	6	—	—	—	10	44	4.40	73.33%
Availability	10	—	—	—	—	10	50	5.00	83.33%
Response Time	8	1	—	—	—	10	47	4.70	78.33%
Adaptability	2	8	—	—	—	10	42	4.20	70.00%
Satisfaction	6	4	—	—	—	10	46	4.60	76.67%

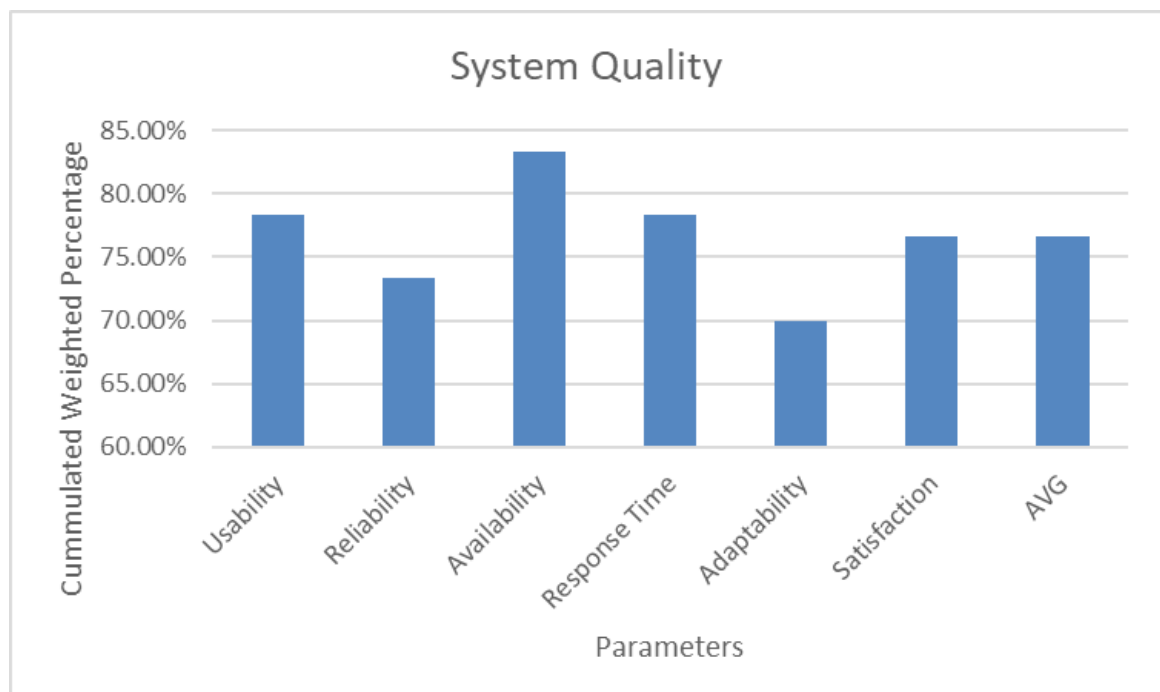


Figure 6: Graph showing the System Quality Rating

Similarly, 78.33% response rate obtained from the use of the system indicated that the leave request and approval is better compared to when manual or conventional method is applied. On the average, In conclusion, the average respondent rating on the quality of the LMS produced 76.67%. This shows that the system developed was able to meet standard conditions and requirements. In the same context, the graph of the Cumulative Weighted Percentage (CWP) against the rating parameters is shown in Figure 6. The frequency of the parameters reveals the extent of the system quality as assessed by the respondents.

Based on the evaluation model, the information quality measures the content issue such that the web-based application system developed be personalized, complete,

relevant, easy to understand, accurate and secured. The result obtained from the evaluation of the developed system in terms of the quality of information is shown in Table 4. The table of score is illustrated for substantiating each individual opinion and attitude of respondents relating to the quality of information contained in the system developed. Based on the use of the developed system, the accuracy of the content (i.e., the ability to give precise outcome) gave 81.67% and having every necessary part of the requirement specified (completeness) produced 68.33% and 81.67% for ease of understanding the processes and procedures of use. Figure 7 depicts quality rating of the developed leave management system in a graphical form.

Table 4: Table showing the System Evaluation Rating of the Information Quality

Parameter	Excellent 5	Good 4	Fair 3	Poor 2	Bad 1	SoR	SoP	Avg	CWP
Accuracy	7	2	1	–	–	10	49	4.9	81.67%
Timeliness	8	2	–	–	–	10	46	4.6	76.67%
Trustworthiness	8	2	–	–	–	10	48	4.8	80.00%
Completeness	1	9	–	–	–	10	41	4.1	68.38%
Easy to Understand	9	1	–	–	–	10	47	4.9	81.67%
Relevance	8	2	–	–	–	10	48	4.8	80.00%
Avg	5.67	2.83	0.17	–	–	10	46.83	4.68	78.05%

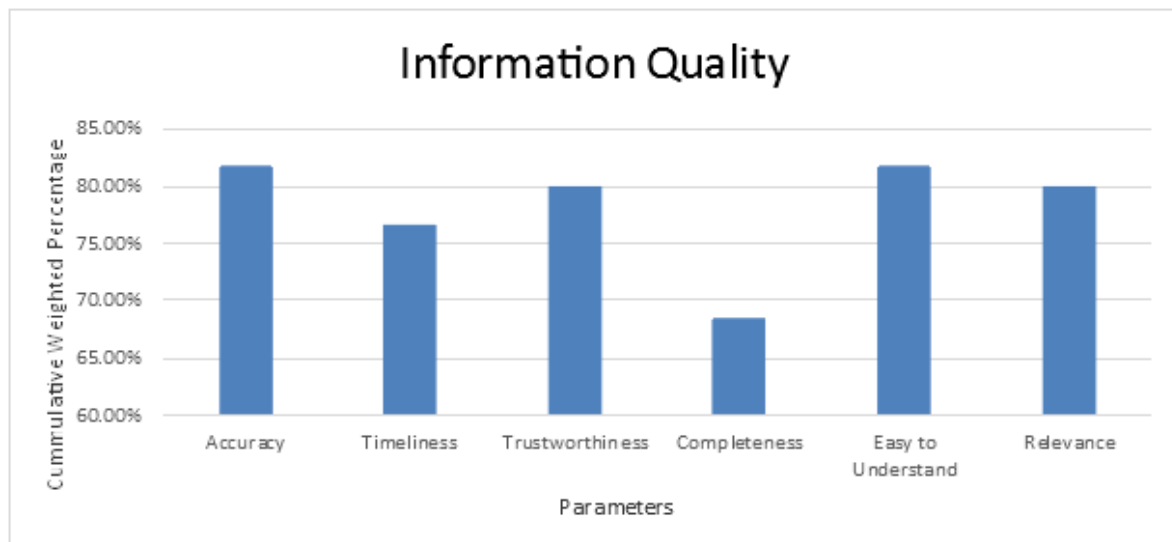


Figure 7: Graph showing the Information Quality Rating

Table 5: Table showing the System Evaluation Rating of the Usage

Parameter	Excellent 5	Good 4	Fair 3	Poor 2	Bad 1	SoR	SoP	Avg	CWP
Ease of Retrieval	8	1	1	–	–	10	47	4.70	94%
Ease of Navigate	9	1	–	–	–	10	49	4.90	98%
Nature of Use	7	3	–	–	–	10	47	4.70	94%
Number of Transaction	7	3	–	–	–	10	47	4.70	94%
Responsive	9	1	–	–	–	10	49	4.90	94%
Avg	7.80	1.80	0.20	–	–	10	47.40	4.74	94.8%

The System quality, Information quality singly or jointly affect the Usage and User Satisfaction of the system. The

extent of use of the developed system gives 94.80% as shown in Table 5, which is a process that shows the

adaptation of the proposed LMS by the organization in need is excellent. However, the respondent's use of the system yields the system rating of 78.05% which is also significant. This is indicative of the fact that the system quality influences the usage. Consequently, the extent use of the LMS is closely related to user satisfaction as shown in Figure 6. In addition, the positive experience as shown from the result obtained using the system yielded 94.80%. The high evaluation rate leads to a significant user satisfaction rating thereby, showing that the user is good with the system functionalities and operations. Similarly, the use and user satisfaction influence the net benefit in such a way that it will reduce the time used in processing leave applications thus giving a cost-effective system when compared with paper-based leave filing system.

5. CONCLUSION

In this paper, web technologies have been used to develop a web-based leave management system for the public service organization. The application of information systems for leave management systems in human resource management provides a solution to the problem of data loss, delay and downtime which is inherent in the current leave management systems. As shown in the results, web or online approaches was used for resource management in organizations and agencies. This will produce a better approach towards the management of resource, processes, and requests in public service organizations. The use of the

7. REFERENCES.

- [1] Griffin, A., Hoyle, M., Bastin, K., Kinyeki, C., Makhura, M., Suderman, J., ... & Wamukoya, J. 2009. Managing Personnel Records in an Electronic Environment.
- [2] Mukherjee, A. N., Bhattacharyya, S., & Bera, R. 2014. Role of information technology in human resource management of SME: A study on the use of applicant tracking system. *IBMRD's Journal of Management & Research*, 3(1), 1-22
- [3] Rohilla, J. 2017. Role of Information Technology in Human Resources Management. *International Journal of Advance Research, Ideas and Innovations in Technology*, 3(2):566-569.
- [4] MohanaPriya1, A., Shyamala, G., Dharshini, R. 2017. Mobile HRM for Online Leave Management System. *International Journal of Computer Science and Mobile Computing*, 6 (2)17-29. Available Online at https://www.ijcsmc.com/docs/papers/February2017/V6I22_01708.pdf
- [5] Ehlinger, E. P. 2015. White Paper on Paid Leave and Health. Minnesota Department of Health. Advancing Health Equity in Minnesota. Available at http://www.health.state.mn.us/divs/chs/healthequity/ahle_report_020414.pdf.
- [6] Halawi, L., and McCarthy, R. 2006. Which Theory Applies: Which Theory Applies: An Analysis of Information Systems Research. *Issues in Information*

HRMIS in form of LMS will enhance employee productivity and management communication, help the management make better and well-informed managerial decisions thereby reducing the delay in leave approval, saves time and resolve most problems encountered during the use of existing systems. The use of mail notification will greatly improve the documentation, data management and quick approval of leave requests. When implemented, it affords the management to see the records of leaves approved for each employee or staff as well as check the leaves arrears through the Web application, removing time-consuming requests from the Human Resources Department using a regular Web browser, where Human Resource administrators can examine, update, and approve employee time and leave from any location. The aspect of leave application management is a fundamental aspect of human resources and therefore, essential that delays are reduced when processing a leave application. Leave matters however can be handled more effectively if public organizations begin to appreciate the solutions that Information Technology offers as an effective supporting tool.

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Systems, 7(2), 252-256. Retrieved from <https://commons.erau.edu/publication/317>

[7] Lerner, V. S. (2004). Introduction to information systems theory: concepts, formalism and applications. *International Journal of Systems Science*, Taylor & Francis, 35(7), 405-424. Retrieved from <https://scholar.googleusercontent.com>

[8] O'Brien, J.A. and Marakas, G.M., 1997. Introduction to information systems.

[9] Al-Mamary, Y.H., Shamsuddin, A. and Aziati, N., 2014. The role of different types of information systems in business organizations: A review. *International Journal of Research*, 1(7),333-339.

[10] Heeks, R., 1998. Information technology and public sector corruption. *Information systems for public sector management working paper*, (4), 1-21

[11] Valcik, N.A., Sabharwal, M. and Benavides, T.J., 2021. *Human Resources Information Systems*. Springer International Publishing, 65-79.

[12] Osibanjo, A. O., & Damagum, Y. U. M. (2011). Factors Affecting Application of ICT by Managers in the Nigerian Public Sector. *Economic Sciences Series Petroleum-Gas University of Ploiesti BULLETIN*, 63(1), 37-44.

[13] Ojeifo, A., and Alegbeleye, G. I. 2015. Improving Performance of the Nigerian Civil Service through the New Public Management. *Singaporean Journal of Business, Economics and Management Studies*, National Library Singapore,51(2479),1-12. Retrieved from [https://www.singaporeanjbem.com/pdfs/SGVOL_4\(6\)/4.pdf](https://www.singaporeanjbem.com/pdfs/SGVOL_4(6)/4.pdf)

- [14] Fatile, J. O., and Adejuwon, K. D. (2010). Public sector reform in Africa: issues, lessons and future directions. *Journal of Sustainable Development in Africa*, 12(8), 145-157. Clarion University of Pennsylvania, Clarion, Pennsylvania, USA
- [15] Akindele, O. S. (2006), An Analysis of Public Sector Performance in Nigeria, *Journal of Public Administration*, 2(3), 161-178.
- [16] Mahajan, K., Shukla, S. and Soni, N., 2015. A Review of Computerized Payroll System. *International Journal of Advanced Research in Computer and Communication Engineering* 4(1), 67-70. Retrieved from <https://doi.org/10.17148/IJARCCCE.2015.4113>
- [17] Soni, G., Nagar, K., Fumakiya, M., Raghuvanshi, N., and Kadam, K. 2016. Study Paper on Student Leave Management Application. *International Journal of Engineering Sciences & Research Technology (IJESRT) India*, pp572-575. Retrieved from <http://www.ijesrt.com>.
- [18] Singh, M., Singh, P., Singh, R., Singh, S. And Gupta, S. 2016. Leave and Payroll Management System. *IOSR Journal of Computer Engineering (IOSR-JCE)*, International conference on computing and virtualization (ICCCV-17), 62-66. Retrieved from <http://www.iosrjournals.org>.
- [19] Asong, K. K. 2016. Development of Employees Leave Database Management System, *Dama International Journal of Researchers (DJR)*, 1(5), 20-38.
- [20] Dalke, M. S. P., Deshmukh, M. S. A., Dalave, M. J. G., Sasane, M. V. N., and Dhule, M. P. K. 2017. Web Based Staff Management System. *International Journal of Science Technology & Engineering (IJSTE)*, 3(09), 271-276. Retrieved from <http://www.ijste.org>
- [21] Olumoye, M. Y. 2013. Impact of Information Systems on Management Decision-Making in the Nigerian Insurance Sector. *International Journal of Scientific & Technology Research*, 2(12), 123-128.
- [22] Ansari, M., Qureshi, R., Halima, S. M. K., Shenaz, M.B.R., and Balashree, Y.P.R. 2017. Leave Management System. Bachelor of Engineering Dissertation Submitted to School of Computer Engineering and Technology Anjuman-I-Islam's Kalsekar Technical Campus Mumbai, India.
- [23] Afsana, H., 2018. Employee leave management system in MetLife Bangladesh. An Intership Report on Meltlife.
- [24] Mishal, R., Prity, S., Prachir, C. and Arhant, C., 2017. Employee Leave Management System. *International Journal of Advance Research and Innovative Ideas in Education*, 3(05).
- [25] Manish, S., Prachi, S., Rohil, Shubham, S. and Shiwani, S. 2015. Leave and Payroll Management System. *International Conference on Computing and Virtualization*, Thakur, India.
- [26] Rushitha, E., Preethi, G., Harshita, N.M., Manisha, R.R. and Veena, M., 2019. Android Leave Management System. *International Research Journal of Computer Science*, 6(6)
- [27] Oduh, I.U., Misra, S., Damaševičius, R. and Maskeliūnas, R., 2018, January. Cloud based simple employee management information system: a model for african small and medium enterprises. In *International Conference on Information Technology & Systems* (pp. 115-128). Springer, Cham
- [28] Vikrant, K.K., Arjun, K.G., Ashish, K., and Abhishek, P. 2017. Student Leave Management System. *International Journal of Advance Research and Innovative Ideas in Education*. 03(05), 124.
- [29] Stephen, B.U., Chukwudebe, G.A., Dike, D.O. and Chukwuchekwa, N., 2018. Improved leave scheduling algorithm for improved service delivery in the Nigerian university system. *Nigerian Journal of Technology*, 37(4), pp.1039-1048.
- [30] Reddy, E. R., Preethi, G., Murthy, H. N., Reddy, M. R. and Veena, G. 2019. Android Based Leave Management System. *International Research Journal of Computer Science (IRJCS)* ISSN: 2393-9842, 6(6).
- [31] Adamu, A. (2020). Employee Leave Management System. *FUDMA Journal of Sciences*, 4(2), 86-91. <https://doi.org/10.33003/fjs-2020-0402-162>.
- [32] Abubakar, A., Mishra, A., Badeggi, A.Y. and Abdulkadir, A., 2022. USSD System for Monitoring and Management of Employee Leave in Higher Educational Institution. *International Journal of Information Engineering & Electronic Business*, 14(1), 37-45.
- [33] Ikono R. N., Olaiya B.O., Alade S. M., and Gambo I. P. 2019. Re-engineering of a Web-based Leave Management System: Development Perspective. *Proceedings of the 13th International Multi-Conference on ICT Applications of Information and Communications Technology to Teaching, Research and Administration (A I C T T R A)* 12, 33-40.