

Virtual University Administration (Personnel Management)

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Abstract

Personnel department is service-oriented towards staff and entails day-to-day activities of units some of whose functions overlap and involves recruitment of staff, retirement of staff, termination of appointment, processing of request for sabbatical leave, staff training and development, pension funds administration, health management organization, etc., and will be easier, faster and secure adopting a virtual approach rather than its manual counterpart. This project work will establish the need, importance and usefulness of Electronic Data Interchange, Enterprise Forms Automation, Content Management System, Enterprise Right Management and Identity Management system and how these technologies can be used to reduce universities over dependence on paper. Implementing a virtual system in our university administration will enable us to have much better control over processes, workflow will be faster, less of paper, less tonner for printer will be used and lesser printers are needed, fewer employees are needed, leading to a lesser cost in the overall system. We proposed an Object-Oriented Methodology and developed a software tool based model that keeps track of the existing structure of a paper-based university administration and personnel management system; also, the design and implementation of the new system and the technologies used in the development of the Virtual system. A database with SQL using MySQL server PHPMYADMIN for the administration was developed. The university personnel management system was implemented using Hypertext Markup Language version 5, Cascading Style Sheet version 3, Hypertext Pre-Processor (PHP) version 5, Asynchronous Hypertext and Extensible Markup Language (AJAX) programming language, which was based on traditional three-tier architecture such as presentation, logic and data layer. It also utilizes the concept of JavaScript, Java Query and MYSQL relational database server for communication.

Keywords

Virtual, Extensible Markup Language (XML), Hypertext markup language (HTML), Cascading Style Sheet (CSS), Asynchronous JavaScript And Extensible Markup language (AJAX), SQL (Structured Query Language), MYSQL, PHP (recursive acronym for PHP: Hypertext Preprocessor), JavaScript (JS), System Development Life Circle (SDLC), Organogram, Flow Graph

Introduction

Paper has been the most common medium of documenting information. In our university system, the use of paper-based communication has created some challenges that contribute to make university administration expensive. These challenges include time and paper consumed during processing of personnel files, poor storage and insecurity of the paper files. Paperless office is a work environment in which the use of paper is eliminated or greatly reduced. This is done by converting documents and other papers into digital form.

This project work presents a virtual system that enables all activities involved in a university personnel administration to be carried out without paper.

A. Statement of the Problem

The manual method in administering personnel services in a university is characterized by the following:

- It takes days and sometimes weeks to complete the process of staff recruitment and retirement, resignation and termination of appointment, health management and pension funds administration schemes
- Paper files and personnel records easily get missing due to human negligence and poor manual storage facilities undermine data integrity and security as well as ease of reference.
- The amount of stationery required for typing, printing, photocopying and circulation within personnel services units attracts some overhead cost coupled with the issue of duplication of duties among units through overlapping functions.

B. Objectives

The objectives of this project are:

1. To develop a functional software that would enable user to create and validate account, apply for job, view and update profile, apply for leave, recruit employee, issue appointment letter, record mail and manage staff records.
2. To design and implement software that is capable of storing and processing personnel data in any standard database management system such as MySQL, PostgreSQL, Oracle, etc.
3. To develop software that will reduce the amount of time required for searching, processing and data retrieval to produce a timely report to management.
4. To develop university personnel management software that will enable the records and statistics unit to produce a schedule summary on monthly or annual basis through the web portal.

C. Significance of the Project

Paper-based university administration is very expensive and time consuming. With the help of internal networking and database management software, personnel officers do not have to waste time searching through tons of data in paper files anymore. There is much better control over processes, the workflow is faster, less of paper, less tonner for printer are being used and lesser printers are needed, fewer employee are needed, leading to a lesser overhead and budgetary cost in the overall system.

II. Literature Review

HTML5 was used for describing the contents of our web pages;

CSS3 was used for presentation and styling of page layouts; JavaScript for validation and submission of HTML form elements to MYSQL relational database server for storage of records; PHP5 as the server-side scripting program agent that executes either on local host or web server, processes form elements such as username, password, email address and captcha image files and returns data retrieved from MYSQL database server to the user via the browser as plain HTML; and interestingly, AJAX for construction of the search engine module. Cross Site Scripting (XSS) and SQL injection are not the only forms of attack that hackers direct against information systems to circumvent security and authentication code, but presently, there is an array of modern attacking tools and techniques even as new ones evolve daily. Against this backdrop, the design approach of Model View Controller (MVC) was adopted to provide a model for putting the presentation logic (view), business logic (control) and data objects (model) into different coding segments for structural (architectural) and security purposes.

According to Pankaj [1] Personnel or Human Resource Management (HRM) is the source of achieving competitive advantage. Managing human resources is very challenging as compared to managing technology or capital and for its effective management; organization requires effective personnel management system. Personnel management system should be backed up by sound personnel management practices. HRM practices refer to organizational activities directed at managing the pool of human resources and ensuring that the resources are employed towards the fulfillment of organizational goals. Melone [2] in a 1983 seminal essay "How do people organize their desks?", according to a compilation by Merial Patrick, Sudamih Project, Oxford University Computing Services, titled "Personal Information Management – Literature Review", identifies two key concepts for the organization of paper materials: files and piles, "Files are units where the elements (e.g., individual folders) are explicitly titled and arranged in some systematic order (e.g., alphabetical or chronological). In piles, on the other hand, the individual elements (papers, folders, etc.) are not necessarily titled, and they are not, in general, arranged in any particular order. Furthermore, the piles themselves are not titled and they are not necessarily arranged in any particular order on the desk or table top. Since piles have no systematic order, however, their spatial location is often especially important in finding them." (p. 106.) Khatri [3] believes that people are one of the most important factors providing flexibility and adaptability to organizations. Rundle [4] argues that one needs to bear in mind that people (managers), not the firm, are the adaptive mechanism in determining how the firm will respond to the competitive environment. Barney [5], Lado and Wilson [6] confirm that several scholars have noted that managing people is more difficult than managing technology or capital. However those firms that have learnt how to manage their human resources well would have an edge over others for a long time to come because acquiring and deploying human resources effectively is cumbersome and takes much longer (Wright et al., 1994). Storey [7] defines personnel management as a distinctive approach to employment management which seeks to obtain competitive advantage through the deployment of a highly committed and skilled workforce, using an array of techniques. Koch and McGrath [8] instruct that personnel management can help firms improve organizational behaviour in such areas as staff commitment, competency and flexibility, which in turn leads to improved staff performance. In another study, Redman

and Matthews [9] identify an 'HRM bundle' of key practices which support service organization's quality strategies, these being: (i) Careful recruitment and selection, for example, 'total quality recruitment', 'zero defects recruitment', 'right first time recruitment'. (ii) Extensive remuneration systems, for example, bonuses available for staff willing to be multi-skilled. (iii) Team working and flexible job design, for example, encouraging a sense of cohesiveness and designing empowered jobs. (iv) Training and learning, for example, front line staff having enhanced interpersonal and social skills. (v) Employee involvement, for example, keeping employees informed of key changes in the organization. (iv) Performance appraisals with links to contingent reward systems, for example, gathering customer feedback to recognize the work by employees over and above their expected duties, which in turn is likely to lead to a bonus for staff.

In a related viewpoint, Saxena and Tiwari [10] examined the personnel management practices implemented by leading IT Companies such as TATA, Infosys and Wipro in India. They developed the 3cTERFramework of HRM practices and identified Training and Development, Employer-Employee Relations, Recognition through Rewards; Culture building, Career Development, Compensation and Benefits as important HRM Practices. As quoted by Ozutku and Ozturkler [11], Personnel management practices differ from one country to another and both external and internal factors affect them such as national culture, legislation, technology, organisation's size, organisational structure, business structure, etc. Personnel management practices also affect the level of job satisfaction of the employees. Petrescu and Simmons (2008) examined the relationship between personnel management practices and workers overall job satisfaction and their satisfaction with pay. The result indicated that several personnel management practices raise workers overall job satisfaction. Kane and Palmer [12], on academic and professional influence on personnel management services, asserts that personnel staff are often involved in the decision making process about HR policies and practices. Their knowledge about alternative HR practices may represent important variables in their own right. Vanhala and Ahteela [13] in their study found that employee trust in the whole organization is connected to perceptions of the fairness and functioning of HRM (personnel management) practices. Such practices can therefore be used in order to build the impersonal dimension of Organizational trust. Bailey [14] presented an argument for the application of promoting personnel management services on the grounds that human resources are frequently underutilized. Employees often perform below their potential. Bailey points out that personnel management services may have an influence on employee skills and motivation. Personnel management practices influence employee skills through the acquisition and development of a firm's human capital. Recruiting procedures and selection regimes will have an influence over the quality and type of skills new employees possess. From different stand points of the above literatures reviewed so far, it is safe to summarize that a university requires an effective personnel management department with sound policies and practices to carry out routine services of recruiting qualified staff, catering for their well-being through motivational incentives such as prompt payment of salaries, which will in turn, boost staff performance and help in meeting the common administrative goal of the university. And all these and even more can be achieved with less effort if activities of a university personnel services unit are carried out through paperless means.

III. Methodology

This project work uses Object-Oriented Methodology to analyze the system and a System Development Life Cycle (SDLC) as a tool and technique to address the lapses in the existing manual system through the phases of careful planning, requirement analysis, system design and implementation.

Objects-Oriented Analysis (OOA) looks at the problem domain, with the aim of producing a conceptual model of the information that exists in the area being analyzed. The result of object-oriented analysis is a description of what the system is functionally required to do, in the form of a conceptual model that will typically be presented as a set of use cases.

1. Analysis of the System

The existing manual system at the personnel services unit is paper-

based with the following processes:

- The administrative units of the personnel services unit of the university convey documents from one place to the other by hand.

Some functions are duplicated within the personnel services unit, for example, the Senior Staff Committee processes requests for sabbatical leave, leave of absence, the Records and Statistics unit processes annual leave papers, the Staff Training Development/ Industrial Relations handles study leave with or without pay, the Senior Staff Services and the Junior Staff Services also handle marriage, birth registration & maternity leave. One unit could have designated to handle all matters relating to staff leave requests rather than sharing the same responsibility among various units of the personnel department. Figure 3.1(a) shows the organogram of a personnel services unit.

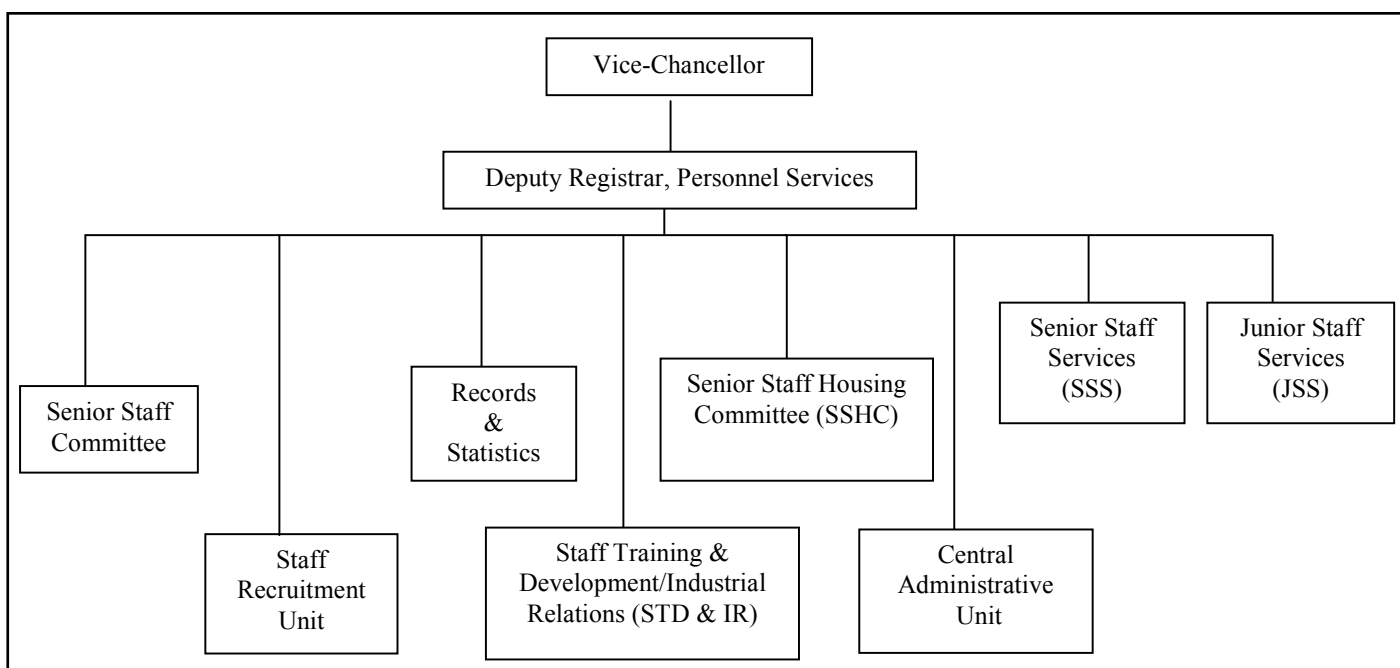


Fig. 3.1(a) Organogram of a personnel services unit

The personnel department is service-oriented because requests made by either the university staff, job applicants, staff of the National Universities Commission (NUC), health scheme managers, or pension funds administrators are serviced by appropriate personnel units as depicted in figure 3.1 below. The diagram also shows that paper files and personnel records are manually stored in a central file cabinet and retrieved from a paper-based archive. Workers at the personnel unit would have to print out hardcopies of documents, address the documents to the recipients with writing pen before dispatching or circulating same through the messengers by hand. From time to time, these same messengers would be directed to keep or bring one file or the other from the central file cabinet, which they may obey, but after bringing kids from school (i.e. school run)! Figure 3.1(b) shows the activities of the existing personnel services unit.

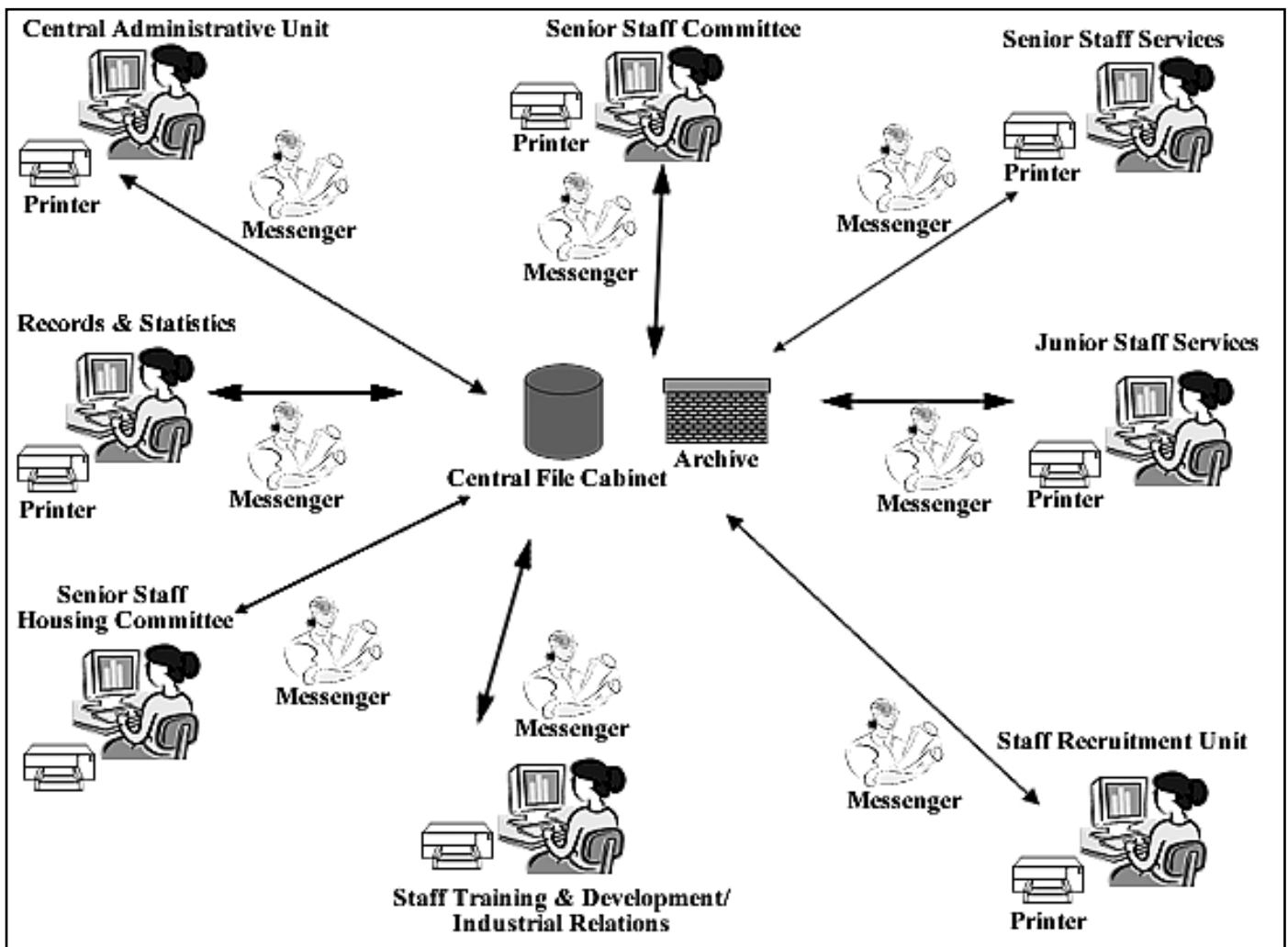


Fig. 3.1(b) Activities of the Existing Personnel Services Unit Still carried out using a Manual Approach

2. Analysis of the Proposed System

The new system titled “VIRTUAL UNIVERSITY ADMINISTRATION (PERSONNEL MANAGEMENT)” was hence proposed to use Flow Graph and implement Personnel Services Unit using System Development Life Cycle (SDLC) technique.

3. Specification of the Proposed System

The proposed system should be able to perform the following operations: Functional Requirement:

- The system should be able to perform registration process of all the users of the system using an instance of new applicant’s registration and job application
- The system should be able to allow the database administrator create the relevant entities and map users to roles as well as all personnel records
- The system should be able to allow personnel records such as salary schedule, recruitment, and personal profile be accessed and updated
- The system should be able to reduce the amount of time required for searching, processing and data retrieval to produce a timely report to management.

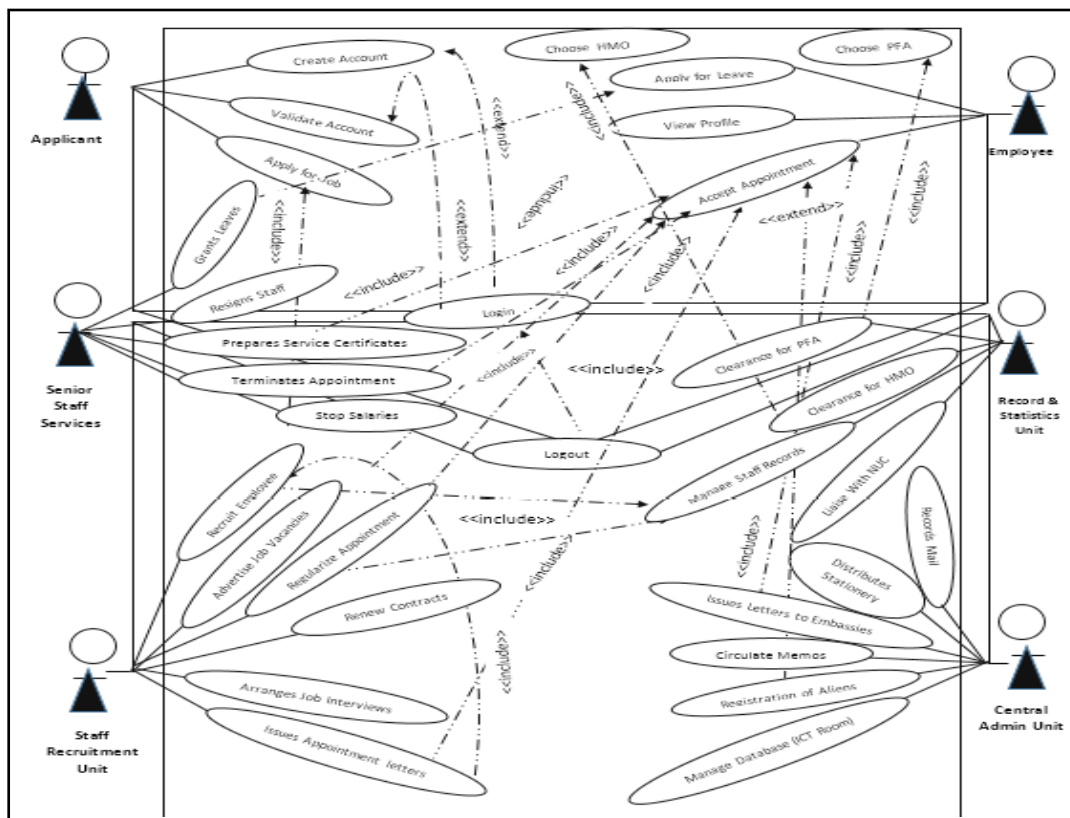


Figure 3.3.1: Use-case diagram of the system

Note: In the above Boundary Diagram, the large rectangle is the system boundary. Everything inside the rectangle is part of the system under development. Outside the rectangle are the actors that act upon the system.

Actors are entities outside the system that provide the stimuli for the system. Typically, they are human users, or other systems. Inside the boundary rectangle are the use cases. These are the ovals with names inside. The lines connect the actors to the use cases that they stimulate.

An <<includes>> relationship indicates that the second use case is always invoked by the first use case.

An <<extends>> relationship indicates that the second use case may optionally invoke the first use case.

4. Object-Oriented Design of the System

Object-Oriented Design (OOD) transforms the conceptual model produced in object-oriented analysis to take account of the constraints imposed by the chosen architecture and any non-functional technological or environmental-constraints, such as transaction throughput, response time, run-time platform, development environment, or programming language.

The concepts in the analysis model are mapped onto implementation classes and interfaces. The result is a model of the solution domain, a detailed description of how the system is to be built. Hence, Unified Modeling Language (UML) class diagram, sequence diagrams, database and deployment diagrams will be used for the design of the system.

IV. Development Environment, Coding and Testing Technique

The university personnel management system was mainly implemented using PHP, JavaScript and MYSQL relational database server. It was designed on Windows Operating System

whereas the integrated development environment is Notepad ++ and then combined together during integration with the prior knowledge of their compatibility.

The entire project comprises of Three-tier architecture: **The Presentation Layer**, also called the Client tier, is responsible for the presentation of data, receiving user events, and controlling the user interface. The user interaction with the system is entirely through this layer. **The Logic layer** is the middleman between the presentation layer and the data layer. This middle tier was introduced to overcome the deployment limitation (whenever the application logic changed, the application had to be redistributed at in each client) in the two-tier architecture. The middle tier provides process management where business logic and rules are executed and can accommodate hundreds of users. **The Data layer** is responsible for data storage. Primarily this tier (layer) consists of one or more relational databases and/or file systems.

The choice of programming languages used for the development of the system are Hypertext Markup Language version 5, Cascading Style Sheet version 3, Hypertext Pre-Processor (PHP) version 5, Asynchronous Hypertext and Extensible Markup Language (AJAX), JavaScript, Java Query and MYSQL relational database server. The database management system (DBMS) used for the administration of MYSQL server is PHPMYADMIN with the help of the Structured Query Language (SQL).

There are different types of tests adopted at different stages. They include;

- I. Unit Testing – Testing each class or unit of the software interface.
- II. Integration Testing – Testing done during the combination of various class and various sub systems for compatibility check.
- III. Sub-System Testing – Testing done when on a subsystem before integration.

- IV. System Testing – Testing after the combination of the various subsystems and the three different components to produce the required software.
- V. Acceptance Testing - In this stage, the researcher choose to invite people who are using similar software to do the eventual users' testing and I also invited other software developers and finally my supervisor to do the acceptance testing.

Two different software testing techniques were adopted as a systematic testing approach and they are:

- A. White Box Testing – This technique focuses on the program control structure which involves close examination of procedure detail. Program statements, internal data structure, loop, logical paths and logical statements are tested. White box testing helps us to test the quality of the construction of the software.
- B. Black Box Testing – This technique tests the quality of the performance of the software and is conducted at the software interface. It tests the functionality of the system.

The aim of the two test techniques conducted was to ensure that the software has the following attributes: Completeness, Correctness, Reliability and Possibility of maintenance.

V. Summary

Putting the entire operations of the university personnel services department online requires a careful analysis of the existing structure. In the course of my research, I discovered that the personnel department is a service-oriented arm of the university administration, in that, a staff can only get served when he or she makes a request such as request for leave, marriage certificate, etc. Another amazing discovery is that some functions of the personnel units overlap and this anomaly creates unnecessary duplication of activities and sheer waste of the university funds in the name of payment of salary! Imagine a situation in which the Senior Services Committee unit processes request for sabbatical leave, leave of absence & secondment; Records and Statistics unit processes request for annual leave; Senior Staff Services processes request for marriage, birth registration & maternity leave, yet, Junior Staff Services processes exactly the same request that its Senior Services unit had already provided, but for junior staff! I see no justification for this duplication of duties and overlapping functions.

A. Suggestion for Further Studies

I recommend that universities in Nigeria should adopt automated software materials developed with internationally-recommended standards like this research project for their day-to-day personnel management duties. This practice will reduce cost, human errors, unnecessary favoritism and duplication or overlapping functions, and at the same time, improve efficiency of university administration.

VI. Conclusion

Thanks to computer programming, and more so, modern web development technologies, all the personnel services units in Nigerian universities can now use this application online to carry out their day-to-day functions simultaneously and remotely. This application has also helped in curbing, to a great extent, some overlap in administrative functions of the university personnel department by restricting users to their specific and primary duties.

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