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Human Resources Management: An Online Recruitment System

Nwoji Jude Oguejiofor[1], Mohammed Aminu[2], And Satyakam Rahul[3]
[1]*Department Of Computer Science, Waziri Umaru Federal Polytechnic, Birnin Kebbi, Kebbi State*
[2]*Department Of Computer Science, Usmanu Danfodiyo University, Sokoto, Sokoto State.*
[3]*Department Of Computer Science, Kebbi State University Of Science And Technology, Alero.*

Abstract: As organizations' activities/operations are rapidly increasing globally, there is the need for a robost human resource management in order to ensure that the organizations hire and keep good employees. The advent of internet has facilitated greater access to Human Resources Personnel (HRP)'s needs. Currently, there exists some developed systems for online job recruitment purposes. However, these systems are more suitable to universities and some research institutes and cannot be effectively adopted to other organizations such as the polytechnics due to the difference in structures and organizational setup from the university settings. The research provides quick assessment of the selected applicants through online based test, and addresses limitations with the existing systems. The system is developed using Object Oriented Approach and the modeling scheme adopted is Unified Modeling Language. The system is tested on a Local Area Network environment and results obtained demonstrate the practical use of the system and good enough to arouse the confidence of the HRP in its ultimate and realistic use. All these were achieved through the automated data retrieval process of the system and bottlenecks associated with the difference in structures and organizational setups from the university settings have been eliminated.

Keywords: Human resource management, Human Resources Personnel, Object Oriented Approach, Unified Modeling language.

I. BACKGROUND OF THE STUDY

The task of managing applicants' records and processing is quite an arduous one due to the high data turnover, strenuous processing operations and requirements for speed and accuracy in matching a potential applicant to the right job. The increasing complexity and highly dynamic nature of applicants' records management processes has made it necessary to embrace the use of Computer and Information Technology (CIT) to facilitate the process. By applying computers to these functions, the strength and versatility of the computer will be effectively utilized to address the problems associated with recruiting applicants (Patrick, 2004).

Human Resources Management (HRM) is concerned with the effective use of people in order to attain organizational goals and enhance the personal dignity, satisfaction, and wellbeing of employees, thus making it a network of inter-related processes (Daramola & Akinyede, 2013). The understanding of HRM is important to anyone who works in an organization; and wherever people gather to work, personnel issues become important, such as decision making concerning recruitment, retirement, resignation, death, compensation, performance evaluation, employee discipline, promotions and transfer are of great and paramount importance.

In the past years, the personnel recruitment in corporate organizations has been based largely on the traditional unstructured interview method. The conventional recruitment exercise method involves a process, which starts with a requisition from the head of each department of an organization who is charged with the responsibility of evaluating, monitoring and controlling his departmental budget. The requisition is passed onto the personnel department, whose duty is to schedule appropriate recruitment, selection, placement and training programmes as shown in Figure 1

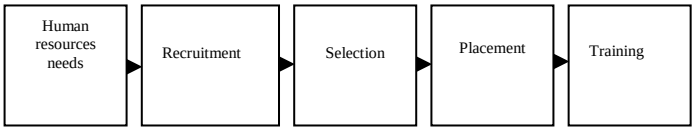

Figure1: Human resources model

It was reported (Canon & liern, 2004) that businesses rely on effective HRM to ensure that they hire and keep good employees and that they are able to respond to conflicts between workers and management. HRM specialists initially determine the number and type of employees that a business will need over its first few years of operation. They are then responsible for recruiting new employees to replace those who leave and also placement of applicants to newly created positions.

In addition, Drigas *et al.* (2004) also reported that HRM involves the use of both quantitative (structural) and qualitative (unstructured) information. Decisions are largely based on the organization's principles and experience. Now that the effort is to build intelligence into computing system, whereby the computer can be used to process large volumes of quantitative and qualitative information for decision making is becoming a reality. Product innovations can be duplicated, but the synergy of a firm's workforce cannot be replicated. Therefore, HRM is a critical input in enhancing the business results.

According to Daramola and Akinyede (2013), recruitment exercise involves hiring of people in an organization. They also, reported that personnel recruitment's role has changed greatly from one that has been based, largely, on the traditional unstructured interview method to one that is recognized as highly strategic and imperative to the overall success of the organization. It was added that, the role of the Human Resource (HR) strategist is now squarely focused on mechanisms to streamline the HRM function in order to contribute to the overall organization's success. Computer, which has remained one of the most powerful tools, has served as an aid to decision making in recent years, mostly because of its efficiency in terms of speed, accuracy, reliability, mass processing, cost and security, among others. These technological advancements have allowed HRM professionals to spend less time on administrative tasks and more time with employees or employing candidates. It is therefore, not uncommon today, to find some organizations (Mobil Plc, PZ Nig Ltd, Philips Consulting, etc) in Nigeria and most especially in developed countries, employing the use of computing system for their personnel recruitment and selection exercises. With such a system, the applicant just feed his resumes into the computer wherever he/she is, by responding to questions on the screen via the keyboard and receives employment information. Straightaway, the resumes are fed into the organization's central data bank, where they can be quickly processed.

Hence, this study focuses on an Online recruitment System, which will allow applicants to visit Waziri Umaru Federal Polytechnic (WUFP) Birnin Kebbi employment portal before they can enter their data. It outlines the benefits inherent in online recruitment system to streamline processes, outsource administrative activities, improve efficiencies, and also user friendly system.

Furthermore, in an attempt to solve some of the shortcomings associated with manual system of recruitment, which includes amongst others; lot of paper works, lack of adequate information on job specifications and requirements, etc, that hindered applicants from applying for the job. Several efforts (Patrick, 2004, Oladipupo, *et al*., 2009, Daramola & Akinyede, 2013) have developed different online recruitment systems, which addressed some of the problems associated with the conventional system of recruitment.

However, most of these efforts were knowledge based and the successful applicants were further subjected to manual examination. Also, the system is more suitable to universities and some research institutes and cannot be effectively adopted to other organization (i.e polytechnics) due to difference in structures and organizational setup from the university settings.

Thus, the need for an On-line Recruitment System, that is flexible, easy to understand and will be able to suit polytechnic structures taking WUFP Birnin Kebbi as the case study.

The aim of this research is to develop an online recruitment system and the following are the research objectives:

- **i.** Develop a more user friendly system for implementing online recruitment using Object Oriented Approach.
- **ii.** Provide efficient selection and placement of candidates to job applied.
- **iii.** To provide quick assessment of the selected applicants through online based test.

This research develops an employee recruitment system using an approach called Unified Modeling Language (UML). This approach fully document the system and later implemented as a software tool that is flexible, reliable, user friendly and reduces bottleneck associated with other existing methods. Since the system is client-server activities, it is built on the World Wide Web (WWW) framework. WWW provides a cost effective way of advertising goods, services and vacancies. The research work was carried out by an extensive review of related literature. A thorough study of the current method of recruiting applicants was carried out, and hence, understanding the inadequacies. Afterwards many organizations were visited where personal interviews with staff were conducted. The design of the system was done using Hypertext Markup Language (HTML) for authoring web pages and MySQL Database management system for the design of the database tables. Actives server pages (ASP) running on internet information server was employed for the production and editing HMTL pages. CorelDraw and Corel photo paint were employed for the production and editing of pictures and images. A browser, internet Explorer was used at the client side to interpret contents got from the web server; the browser processes the HTML and displays the web pages. The web designs runs on Windows platform as the network operating system. Real life data were used to test the system so as to ensure that the design goals were met.

The rest of the paper is structured as follows:- Section 2 presents an overview of the related work in the area of study. Section 3 and 4, focuses on the model, requirement analysis, and system design. Section 5 gave the system implementation and testing, while section 6 presents the conclusion.

II. REVIEW OF RELATED WORK

It has always been the wish of most corporate organization to employ the most suitable candidate into appropriate job. However, to achieve this, it requires the organization to understand the scope and policies therein. The organization through the personnel department advertises job vacancies and such advertisements are with some shortcomings, which includes amongst others; Lots of paper work, public awareness for job opportunities are usually poor and as such, the potential applicants may not be aware of such opportunities, etc. These shortcomings created situation whereby organization fails to get right candidate into the available vacancy.

In an attempt to solve the shortcomings associated with manual approach of employment, Patrick (2004) developed a "Knowledge Based System for Selection and Placement of Applicants to Jobs (KBSSAJ)". The KBSSAJ could not survive the taste of time due to the fact that: The system cannot be launched on the Internet because it was run on the platform of Microsoft Disk Operating System, it is stand-alone system and there is need for user to have extensive technical knowledge of it, the applicant will have to come to the employment office before applying, since a lot of commands need to be entered, it also, attracts high maintenance because of its relational structure. Furthermore, to improve on Patricks' work, Oladipupo *et al*.(2009) developed "Fussy Expert System tool for Online Personnel Recruitment". There was an improvement from the earlier work of Patrick (2004); which includes amongst others; It is an Online based system and does not require any special technical knowledge. However, it has database Integrity challenge, lack of proper feedback, improper data validation, high maintenance cost and security. In order to enhance the existing design, Daramola and Akinyede (2013) developed a web based system titled "Neural Network Web Based Human Resources Management System (NNWBHRMS)". This developed system to a large extent addressed most of the drawbacks highlighted in the existing systems. However, the system has its own peculiarity which may not fit into our organizational settings. One of the major drawbacks of the developed system is that the system is more suitable to universities. Hence, cannot be effectively adopted to other organization (i.e polytechnics) due to difference in structures and organizational setup from the university settings. Also, the system is knowledge based and more complex to understand. In addition, it did not address the assessment (examination) of selected candidates.

From the limitations highlighted from reviewed researchers improvements has been proposed. The main improvement over reviewed work is to develop a system that will adapt object oriented approach, instead of neural networks which is less complex and more understandable. Also to make the system adopt to other organization (i.e polytechnics), with regards to structural differences and organizational setup from the university settings. In addition, the proposed system after selection, will adopt quick assessment of candidates through Computer based test.

Thus, the need for an On-line Recruitment System that is flexible, easy to understand and will be able to suit polytechnic structures was proposed.

III. MODEL

Requirement Analysis

Whitten *et al*. (2001) defined system requirement analysis as the study of a business problem domain to recommend improvements and specify the business requirements for the solution. It is a technique that decomposes a system into its component pieces for the purpose of studying how well those components work and interact to accomplish their purpose. In this study, requirements analysis starts with the problem definition: user statement of requirements. Defining the requirements for the proposed system includes both *fact-finding* about how is the problem solved in the current practice as well as *envisioning* how the proposed system might work. System requirements make explicit the characteristics of the system that is to be developed.

The statements of requirements are gotten from the business rule of the organization. These requirements include the following:

REQ1: The candidates should be able to apply for recruitment online. The form to be submitted should contain application number, username and password and so on, so that candidate can login and know the progress of their application up to employment.

REQ2: The system should allow admin to add vacancies, update vacancies and view vacancies list.

REQ3: The system should allow admin to generate pins and view pins list.

REQ4: The system should allow admin to set application deadline, test parameters and time for exam.

REQ5: The system should allow admin to validate applicants, view qualified candidates, general view of applicants and upload test score.

After the requirements are gathered then object oriented analysis techniques such as use case diagram would be used in the design to graphically represent the use scenario of the proposed system.

IV. SYSTEM DESIGN

A system design is an activity of proceeding from an identified set of requirement, and it is concerned with the designing of a new system (Kyung-Soo, & Jung-Woong, 2013). The stages are an offshoot of the findings in the investigations phase. However, during system design, the problems to be solved would properly be defined using the output of the system analysis. As requirements are gathered as part of what reviled from the organization business rule, then set of scenarios are created that identify a thread of usage for the system to be constructed. The scenarios, often called *use-cases* (Jacobson, 1992), provide a description of how the proposed online recruitment system will be used in the preliminary design. This study detailed both the preliminary and structural design.

Preliminary design

The logical design of a system pertains to an abstract representation of the data flows, inputs and outputs of the system. This is often conducted via modeling, using graphical model of the actual system, such as use-cases and class diagram.

Use-cases

To create the proposed online recruitment system use-case, different type of people (or devices) must be identified that use the system. These *actors* actually represent roles that users (or devices) play as the online recruitment system operates. The proposed system defines three actors: the candidate, the admin, and the online recruitment system. Based on the statement of requirements the candidate actor interacts with the system in a number of different ways: Apply for recruitment online, Login to allow all other interactions, Write test, and check recruitment status. The admin actor interacts with the system also in a number of different ways: login to allow all other interactions, manage vacancies, create vacancy lists, generate pins, create pins lists, manage main system setting including: application deadline, test parameters and time for exam, and manage applicants by validating applicants, view qualified candidates, view applicants upload test score

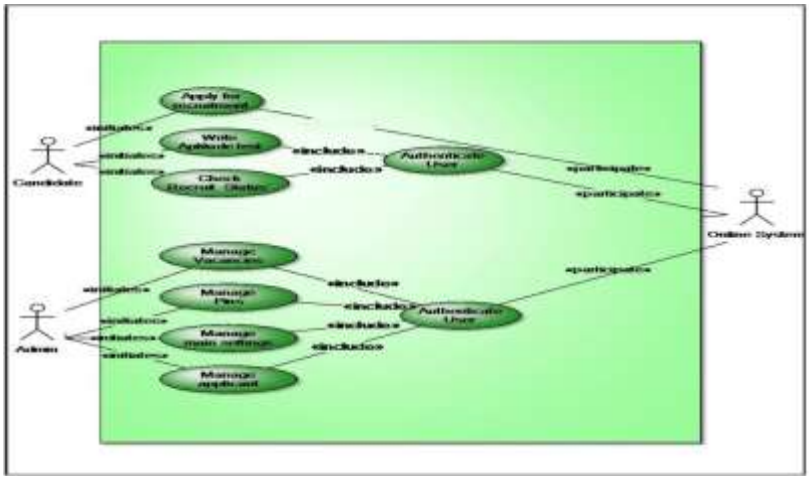

Figure 2: UML use case diagram

The UML use case diagram for the online recruitment system is shown in figure 2. We then design a class diagram for the proposed system in other to easily specify all the classes for the proposed system. These can be directly converted into an object oriented program.

Class Diagram

The class diagram describes the types of objects in the proposed online recruitment system and the various kinds of static relationships that exist among them (Bruegge & Dutoit, 2000). In UML, a class is represented by a rectangle with one or more horizontal compartments. The upper compartment holds the name of the class. The name of the class is the only required field in a class diagram. By convention, the class name starts with a capital letter. Examples of classes in the proposed system are candidate, admin, recruitment, etc. The (optional) center compartment of the class rectangle holds the list of the class attributes/data members, and the (optional) lower compartment holds the list of operations/methods. There are two principle types of static relationships between classes: inheritance and association. The relationships between proposed online recruitment system classes are

drawn on class diagram by various lines and arrows. Inheritance (termed "*generalization*" for class diagrams) is represented with an empty arrow, pointing from the subclass to the superclass, as shown in figure 3. In figure 3, Recruitment inherits from Candidate (i.e Recruitment "is-a" specialized version of a Candidate). The subclass (Recruitment) inherits all the methods and attributes of the superclass (Candidate) and may override inherited methods. An association represents a relationship between two instances of classes. An association between two classes is shown by a line joining the two classes. Association indicates that one class utilizes an attribute or methods of another class. If there is no arrow on the line, the association is taken to be bi-directional, that is, both classes hold information about the other class. A unidirectional association is indicated by an arrow pointing from the object which holds to the object that is held. There are two different specialized types of association relationships: aggregation, and composition. If the association conveys the information that one object is part of another object, but their lifetimes are independent (they could exist independently), this relationship is called *aggregation*. For example, we may say that "a Settings contains a set of Recruitment." Where generalization can be thought of as an "is-a" relationship, aggregation is often thought of as a "has-a" relationship – "a Vacancy 'has-a' Recruitment." Aggregation is implemented by means of one class having an attribute whose type is in included class (the Recruitment class has an attribute whose type is Vacancy). Aggregation is stronger than association due to the special nature of the "has-a" relationship. Aggregation is unidirectional: there is a container and one or more contained objects. An aggregation relationship is indicated by placing a white diamond at the end of the association next to the aggregate class, as shown between Settings and Recruitment in figure 3. Even stronger than aggregation is *composition.* There is composition when an object is contained in another object, and it can exist only as long as the container exists and it only exists for the benefit of the container. Examples of composition are the relationship Vacancy, and Recruitment. Recruitment can exist only for vacancy. Any deletion of the whole (Vacancy) is considered to cascade to all the parts (the Recruitment for the vacancy are deleted). Composition is shown by a black diamond on the end of association next to the composite class, as shown between Vacancy and Recruitment in figure 3. Associations have a cardinality that indicates how many objects of each class can legitimately be involved in a given relationship. Cardinality is expressed by the "*n..m*" symbol put near to the association line, close to the class whose cardinality in the association we want to show. Here "*n*" refers to the minimum number of class instances that may be involved in the association, and "*m*" to the maximum number of such instances. If $n = m$, only an "*n*" is shown. An optional relationship is expressed by writing "0" as the minimum number.

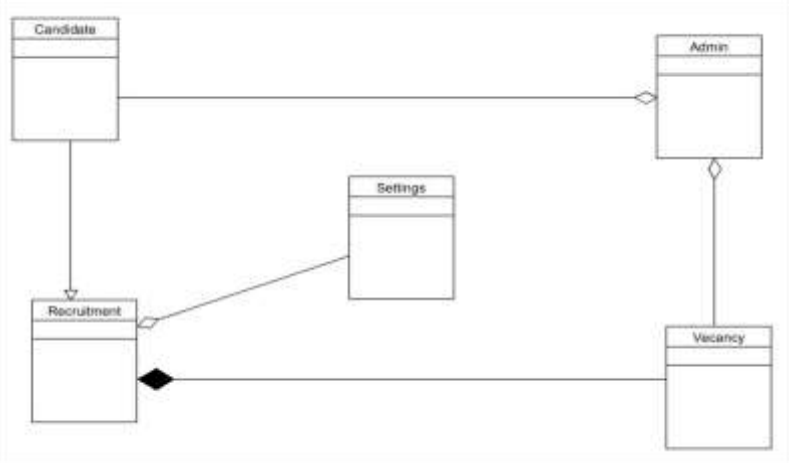

Figure 3: UML class diagram for online recruitment system

Structural Design

The structural design is modeled using data model. According to Pagan (1991), "A data model is a way of finding tool for both business and IT professionals, which uses a set of symbols and text to precisely explain a subset of real information to improve communication within the organization and thereby lead to a more flexible and stable application environment." Typical applications of data models include *database models*, design of information systems, and enabling exchange of data.

Conceptual Data Model

A conceptual data model identifies the highest-level relationships between the different entities. In this research the entities are 15 but are refined in to 5, after undergoing a normalization processes:

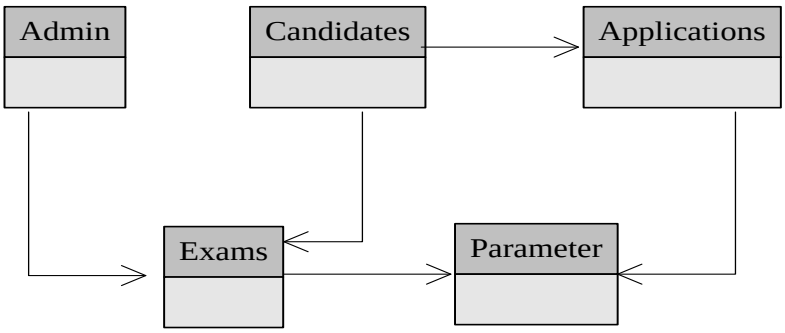

Figure 4: Conceptual diagram for online recruitment system

In figure 4, we observed that the only information shown via the conceptual data model is the entities and the relationships between those entities.

Data Model

Physical data model represents how the model will be built in the database. A physical database model (figure 5) shows all table structures, including column name, column data type, column constraints, primary key, foreign key, and relationships between tables.

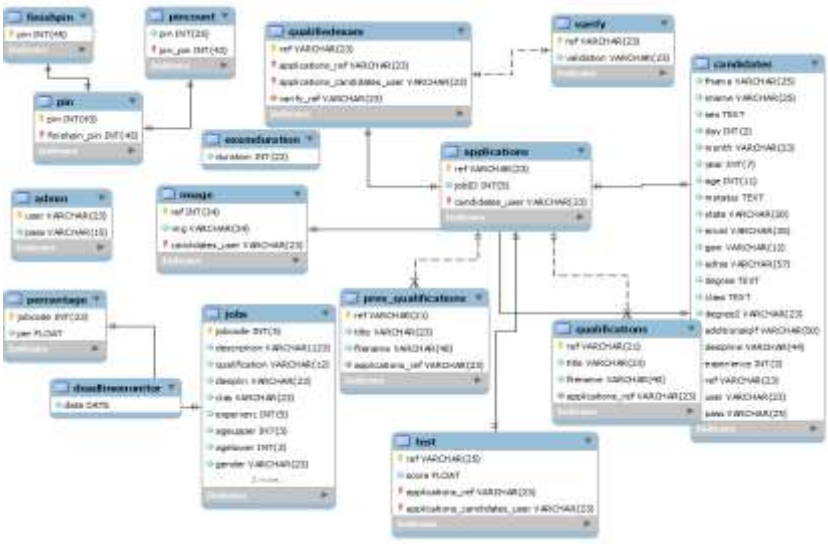

Figure 5: Physical model diagram

V. SYSTEM IMPLEMENTATION AND TESTING

Internet applications has greatly moved from the old static view and download of information to more sophisticated dynamic use, such as e-commerce, and e-government. Any functioning site contains clients connected to server via network resources. The clients contain the browser, which display information downloaded from the server. Furthermore, through the clients, information/data could be uploaded to server for appropriate processing. In this regard, an online system that could assist polytechnics to receive its applicant's data via internet is being developed. With this system, the applicants can search for vacancies, employment forms are made available for them to fill and submit online, which are in turn uploaded to the organizations' server computers. However, the developed system was implemented before being subjected to various tests. The system is implemented as a standard web-based application. The applicant side requires no more than standard Internet browser installed on the local machine which the main application functionality is assured by the server side. The basic component of the system infrastructure is presented in figure 6. Virtually, all Web-based systems are designed around one or two communication models of computing namely the peer-to-peer and the client-server models (Thomas, 2010). Figure 6, is three-layer Internet architecture for the proposed On-line Recruitment System. The system adopted 'three tier architecture model' for the purpose of communication. At the base of the application is the database tier, consisting of the database manager that maintains the database containing the data which users create, modify and query with MySQL used to provide the required

functionality? The middle tier contains most of the application logic which is built on top of the database tier and communicates data between the other tiers.

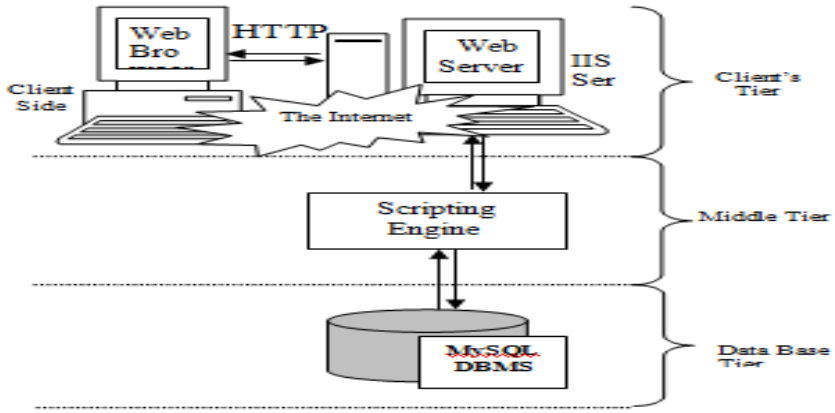

Figure 6: Communication Architecture Model

The server runs under Windows Operating System specifically chosen to achieve fast, secured and efficient client-server communication with features for remote administration and minimal hardware requirement. The scripting engine communicates with the database using server-side PHP functions. The coordination of all the procedures in the system is implemented using PHP scripting language. PHP handles data which are passed from the

HTML forms in the way that structured query language formed is sent to the database and then the results of the queries are processed and passed in an HTML format.

On top is the client tier usually web browser software that interacts with the application. Adewale (2006) adduced that the formality of describing most web database applications as three-tier architectures hides the reality that the applications must bring together different protocols and software. The term web according to him refers to three major, distinct standards with HTML, HTTP and the TCP/IP networking protocol suite as the tools based on these standards. Complete communications of the web-based system is ensured by the HTML structuring and presenting information using a web browser application, HTTP ensuring data transfer in specified format and TCP/IP transferring data between applications over the internet.

The system dynamically creates and returns an HTML page with the results of operation specified by the user to the browser.

Figure 7, shows the data flow diagram, which includes one static HTML for homepage (with forms for login to the system), and two CGI programs for performing authentication, and database accessing definitions. This diagram also serves as the web delivery design diagram.

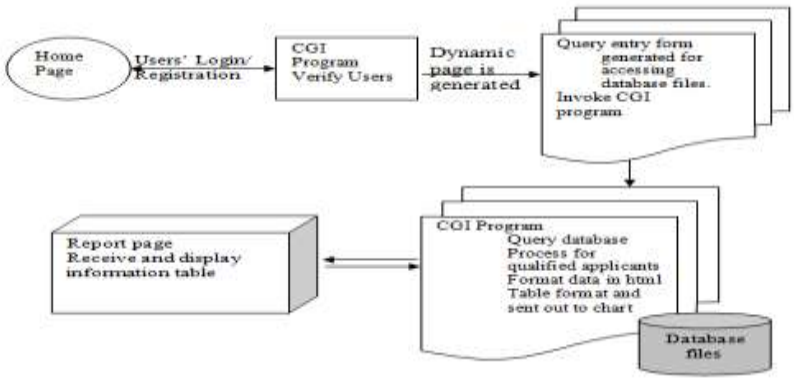

Figure 7: Program Flow Diagram

System Testing

System testing is a critical element of software quality assurance and represents the ultimate review of specification, design and code generation (Rosenberg & Scott, 1995). The prototype is developed and tested in a Local Area Network (LAN) environment characterized by a Compaq Proliant as the server machine, eight Compaq systems as workstations and Microsoft NT Backup as the distributed operating system. The software packages used for development of the system is MySql as the dbase, PHP serving the scripting language and

Dreamweaver development environment. The environment is characterized by user friendly, menu driven, interactive and intelligent features. However, the results obtained demonstrate the practical use of the prototype and good enough to arouse the confidence of the HRP in its ultimate and realistic use.

VI. SECURITY

The proposed system must be carefully secured from abuse and facilities must be put in place to ensure the security of the system against unauthorized use. In order to ensure that unauthorized transactions are prevented the system will not allow any transaction or enquiry unless a user has logged on and entered the correct username and a password. Access will be denied to unauthorized users, who will be logged out after a predetermined number of trails. There should be adequate programmed controls on the facilities for system maintenance, and this will only be done by authorized user.

VII. CONCLUSION

This system would be of great importance in assisting organizations (i.e. Polytechnics) in solving problems associated to job procurement. It has definitely replaced the conventional manual components of background investigation by providing an automated data retrieval process in order to make effective and timely decisions. The system is developed using Object Oriented Approach and the modeling scheme adopted is Unified Modeling Language because it is easy, flexible and evolutionary system which can adapt to changes. This would enable the main objective of the site which is to build a web-based system that will assist the human resources department in procuring staff without necessarily going through the rigors and problems associated with the conventional manual method of procuring staff to be achieved. This research developed an online recruitment system that is clearer, simply understandable and adapts very well to polytechnic setting taking cognizance of the organizational structures in the polytechnics other than the one used by the past researchers.
Finally, this system, which addresses performance, based on assessment of applicants through computer based aptitude test shows how well an applicant matches up with the requirements for the job, is a promising one.

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