Computer Engineering and Intelligent Systems
ISSN 2222-1719 (Paper) ISSN 2222-2863 (Online)
Vol.4, No.5, 2013

A Web-Based Applicants' Matching System (WBAMS)

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ABSTRACT

Considered in this study is the matching of suitable applicants to appropriate jobs, looking at the difficulty in solving problems associated with procurement in Federal College of Chemical and Leather Technology, (CHELTECH) especially where straight forward enumeration of solution possibilities tends to be explosive. For this reason, a system is developed to replace the old manual method of recruiting exercise and to solve the problems associated with it. The new system includes: data collection from the applicants and matching of suitable applicants to appropriate jobs. The technological approach to the system is based on open source solution. The results from the study are very promising and are recommended for implementation in other government and business organizations.

INTRODUCTION

The task of managing applicants' records and processing is quite an arduous one. This is mainly because of 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 used to address the problems associated with recruiting applicants.

Recruitment is described as "the set of activities and processes used to legally obtain a sufficient number of qualified people at the right place and time so that the people and the organization can select each other in their own best short and long term interests (Schuler, 1987).

The World has become a global village where the farthest place is accessible at the touch of a few buttons on a computer. The conventional uses of (CIT) have made very powerful impacts on human activities to the point that they have become virtually indispensable to human existence and development. The Internet has however, tremendously boosted the impact of computers to human activities and the society in general.

As it stands now, the internet is an international network of computers connecting several millions of people around the world. Government organizations, businesses, private citizens, institutions, etc, use the Internet every day for communication, education, advertisements and commerce. The Internet has in fact become the most versatile and cheapest medium of communication and interaction among people, organizations, applicants and businesses worldwide. The Internet facilitates interaction between entities without geographical, cultural or demographic limitations. It is now possible to sit at one's home or office and access information about organizations, businesses, etc. anywhere in the world, once there is Internet. It does not really matter whether one is in Nigeria and the information needed about an organization or an applicant is in Japan, Australia or Botswana. Such information becomes accessible at the touch of few keys on the computer.

Human Resources Management (HRM) is a network of inter-related processes. In the past years, the personnel recruitment in corporate organizations has been based largely, on the traditional unstructured interview method. The psycho-analytical or psycho-metric test method which provides the ground for the assessment of the knowledge acquired by both study and experience of applicants for jobs is currently being adopted by corporate organizations world wide. The psycho-metric test is concerned with the assessment of applicants' personality.

On the whole, HRM professionals continue to perform many of the same activities that they did decades ago e.g. training, recruiting, managing, retaining and paying employees. The Internet, however, has had a significant impact on the way the HRM professionals accomplish these tasks today, where in the past, HRM activities were largely paper-intensive and highly manual, the function/process today has been transformed into a sophisticated

computer-based process. Technological improvements have allowed HRM professionals to spend less time on administrative tasks and more time with employees or employee candidates. It is therefore, not uncommon today, to find some organizations, most especially in developed countries, employing the use of computing system for their personnel recruitment and to an extent, selection exercises. With such a system, the applicant just feed his resumes into the computer wherever he is, by responding to questions on the screen by typing his/her answer on the keyboard and receives his employment information. Straightaway, the resumes are fed into the organization's central data bank, where they can be quickly processed. HRM is an exciting and dynamic field, even in this age of high information technology; people are still the most important asset to an organization.

Human Resources Management is to support the organizations mission, goals and strategies. The organizations mission is to the purpose to which it is dedicated. For example, the mission of an educational institution is to create and disseminate knowledge. The organization's goals and objectives state what it wants to achieve. To accomplish the organization's goals and support its strategies, human resources objectives and strategies must also be developed.

MOTIVATIONAL FACTORS

Improvement on the productivity of corporate organisation in the area of recruiting a suitable applicant to a suitable post lies on their understanding of the importance of Human Resources Management.

Globally, advertisement or job vacancies are normally done by the personnel department, which is characterised by a lot of shortcomings. These shortcomings are the motivational factors, stirring up the study of this research work. Some of these shortcomings are as follows:

a. lot of paper works
b. public awareness for such opportunities may be poor and as such, the potential applicants may not be aware of such opportunities.
c. high risk of accident during the transportation of both applicant and members of interview panel to and from the venue of the interview.
d. risk of lost of mails between the applicants and prospective employer due to unreliable telecommunication and postal systems.
e. lack of adequate information on job specification, requirement, etc can hinder an applicant from applying for the job.

All the aforementioned shortcomings can hinder an organization from unveiling and employing the right quality and quantity of applicants to an open position(s).

Akintola (1995) attempted to solve the shortcomings associated with manual approach of employment where the personnel department advertises job vacancies and such advertisements are with some shortcomings. In his attempt, his knowledge based application for matching applicants to job could not survive the test of time due to the fact that, the program was Microsoft Disk Operating System based and a single user system that could not be used in a networking environment.

In an attempt to solve the aforementioned shortcomings, Uzoka (1998) in his work titled "Knowledge Based System for Matching Applicants to Job (KBSMAJ) developed a software, which solve the problem to an extent but still with limitations that could not meet the global needs. The limitations are as follows:

a. It cannot be launched on the Internet because it was run on the platform of Microsoft Disk Operating System (MSDOS)
b. There is need for the users to have extensive technical knowledge of it.
c. It is not user friendly because it is command driven.
d. It attracts high maintenance because of its relational structure.

To this end, a Web-based Applicants' Matching and Tracking System was proposed for an effective recruitment process in NILEST (Nigerian Institute of Leather and Science Technology) by using the established criteria through Human Resources Agency (Applicants Matching and Tracking System). The proposed system will show how well an applicant matches up with the requirements for the job, short lists and finally selects the right applicants for the open position(s). The proposed system will have a databank of job opportunities existing from NILEST and a corresponding bank of potential applicants' information obtained through the web. With the newly proposed system for matching applicants to job, both NILEST and applicants will be saved from a lot of headaches.

OBJECTIVES

This research work plans and aims at unveiling applicants matching and tracking system that will better help recruiters to be more effective in evaluating the applicants down to a manageable number much more quickly and

pick the right person for an open position. In order words, organizations are able to get the right quality and quantity of employees at the right time and at a reduced cost. The major objectives of this research are outlined below:

a. quick evaluation of applicants down to a manageable number.
b. identification of the right applicants for the vacancy within a short period of time.
c. enhancing the productivity of the Human Resources Personnel (HRP), thereby improving the productivity of the NILEST as an organization.

EXPECTED CONTRIBUTION TO KNOWLEDGE

Development of a software tool that is flexible, reliable, fast and efficient, low cost, user friendly and reduced bottleneck; which affords the applicants to apply online and NILEST getting qualified applicants in good time, would have been a great contribution to knowledge at the end of this research. These contributions include:

a. Provision of a time-efficient, detailed and unbiased automated procedure for selecting the most qualified applicants for the right job.
b. Cheaper cost of information dissemination and publicity.
c. Provision of up to the minute information.
d. Provision of quick and efficient means of contact between NILEST (the employer) and applicants and vice versa.
e. Meeting the needs of applicants and organizations/recruiters.
f. Augmentation of traditional advertising/publicity.
g. Opening up of relationship between the organization (NILEST)/recruiters and the applicants.

The above represent some of the immense benefits the proposed system will contribute.

LITERATURE REVIEW

According to Encarta (2006), it was reported that businesses rely on effective Human Resources Management (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 for filling newly created positions.

According to Akinyokun and Uzoka (1998), 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 organisation. It was added that, the role of the HR strategist is now squarely focused on mechanisms to streamline the Human Resources Management (HRM) function in order to contribute to the overall organisation'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. Thus, it is not uncommon to find computers being applied in almost every human activity. Presently, a new wave of awareness exists in people as it concerns the use of computers in administrative and qualitative information; it was also confirmed that organisations adopted the use of Management Information System (MIS) and Decision Support Systems (DSS) in their decision process and this has advanced to a web-based human resource management system on the platform of Internet.

FRAMEWORK FOR WEB-BASED HUMAN RESOURCE MANAGEMENT SYSTEM (WBHRMS) PERSONNEL PROCUREMENT.

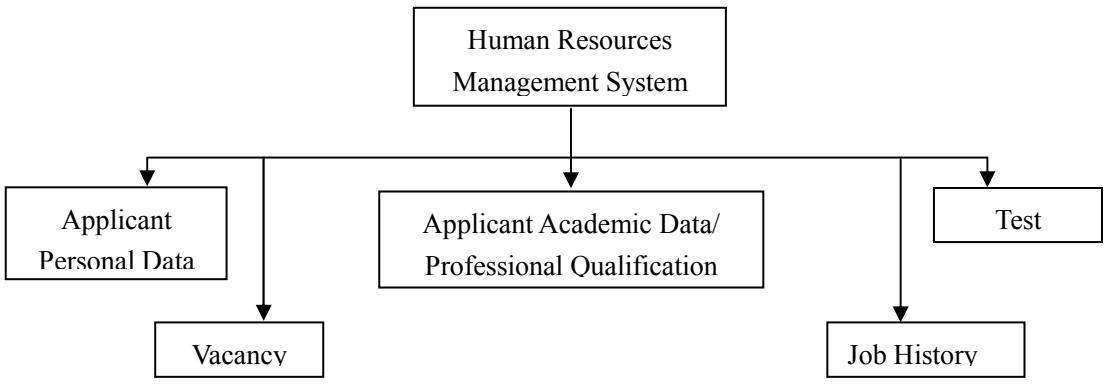


Figure 1: Global chart of the database design

SYSTEM ANALYSIS AND DESIGN

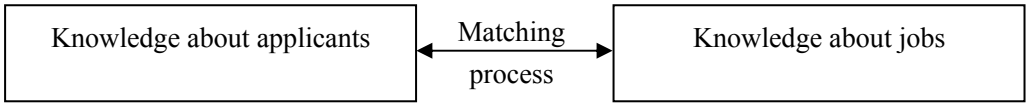
This section focuses on the analysis of operation and design of efficient human resources management that will search and match a potential applicant to the right job which will be based on logical procedure. The system design aims at efficient Human Resources Management on the Internet.

System analysis is a problem-solving technique that decomposes a system in to its component pieces for the purpose of studying how well those component parts work and interacts to accomplish the purpose and the objectives of the system (Jeffrey, et al 2004).

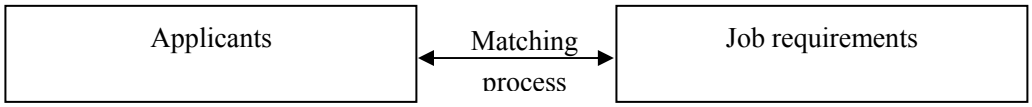
The illustrative architecture framework of the proposed knowledge based system for job procurement is conceptualized in figure 3 below. The framework is majorly composed of:

a. Knowledge base
b. Inference engine
c. Decision support system.

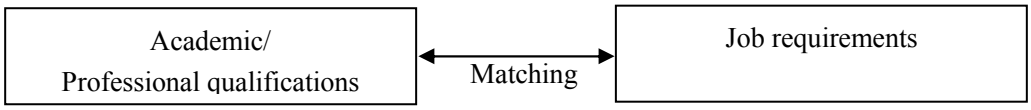
In each of the phases below, the inferences drawn will lead to the matching of another phase. See figure 2 below:



Phase I: The system studies applicants and jobs



Phase II: Matching of applicants to job requirement.



Phase III: Matching of Academic/Professional qualifications with job requirement.

Figure 2: Illustration of the Architecture for the Matching System

Network Model for the Proposed WBAMTS

Let Ji(t) be the jobs and job requirements applicants p_k applied for; where i=1,2,…,n (the job) and t = 1,2,…,n (job's requirements) and k = 1,2,…,n. Let Q_m and H_n be the applicant p_k academic and professional qualifications and experiences respectively.

The personal data is split into personal data such as personal identity, age, sex, etc, personal academic and professional qualifications and personal experience.

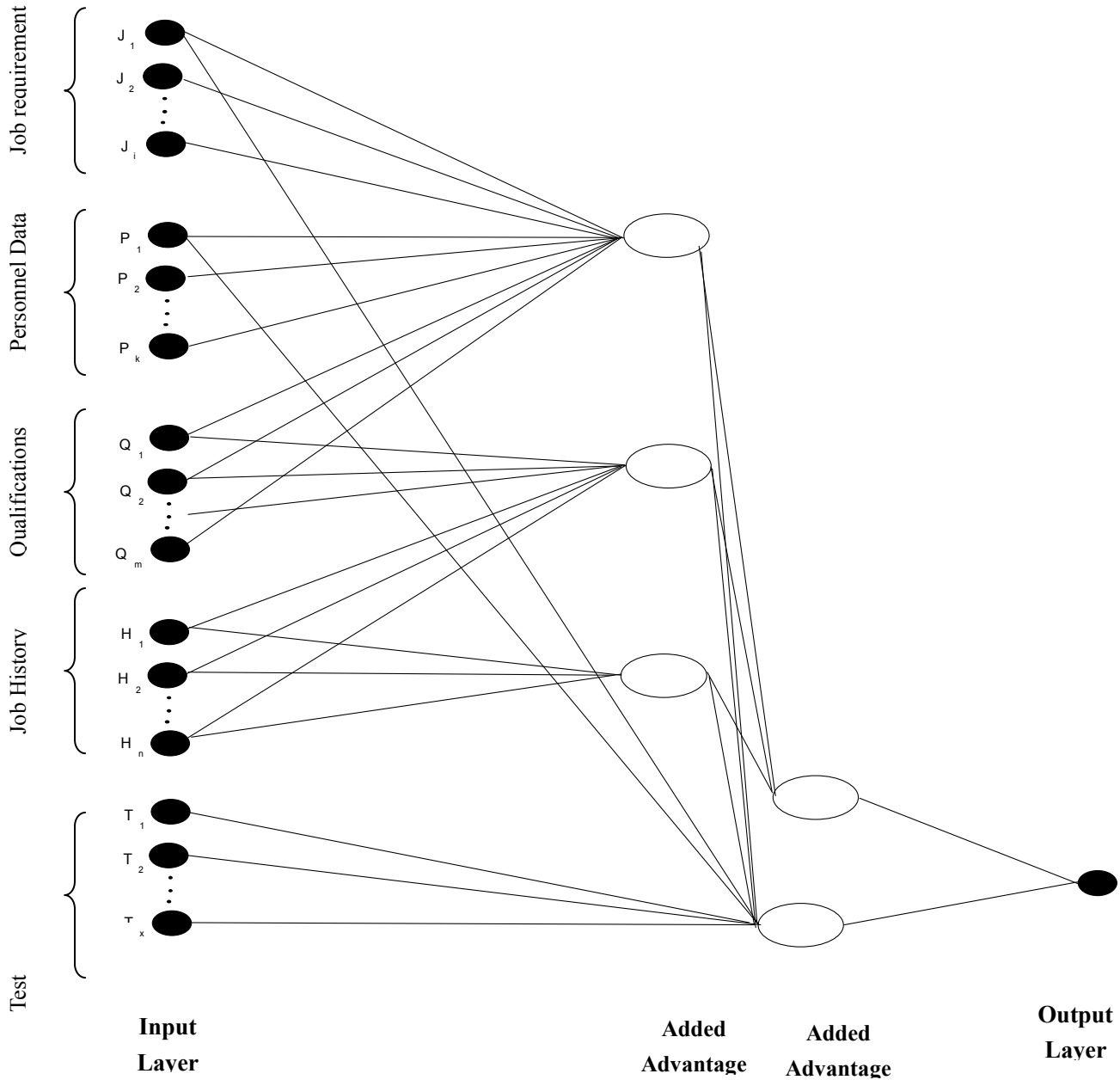


Figure 3: Network Model for the Proposed WBAMTS

Mathematical Model for the Proposed WBAMTS

Boolean algebra, which is the algebra of logic, is applied to design the proposed system. A Boolean expression is nothing more than a description of the input conditions necessary to get the desired output.

The model will be expressed with a truth table, which is a good way to show the function of logic. It shows the output states for every possible combination of input states. The symbols 0 (false) and 1(true) are usually used in truth tables. The table below shows the inputs (applicant qualifications and job requirements) and outputs

(matched for shortlisting) using an AND operator known as Conjunction, which states that the output S is true if input P, input Q and input H are all true: S = P AND Q AND H as illustrated in the tables below:

P → Personal data, Q → Qualification, H → Job History

Short Listing

Table 1.1:Short Listing

P	Q	H	-P	-Q	-H	S=P^Q^H
1	1	1	0	0	0	1
1	1	0	0	0	1	0
1	0	1	0	1	0	0
1	0	0	0	1	1	0
0	1	1	1	0	0	0
0	1	0	1	0	1	0
0	0	1	1	1	0	0
0	0	0	1	1	1	0

Shortlisted iff s = 1 otherwise, dropped

Final selection

Table 1.2:Final Selection

T	S=P^Q^H	F=T^S
1	1	1
0	0	0
1	0	0
0	1	0

Selected iff f =1, otherwise dropped.

Communication Architecture Model for the Proposed WBAMTS

Nearly 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, 2004).

The diagram in figure 4 below is a three-layer Internet architecture for the proposed WBAMTS. The proposed system adopted 'three tier architecture model' for the purpose of communication. According to the model, at the bottom of the application is the database tier, consisting 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. The web server is Apache and it runs under Windows XP 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 PHP scripts coordinate all the procedures in the system.

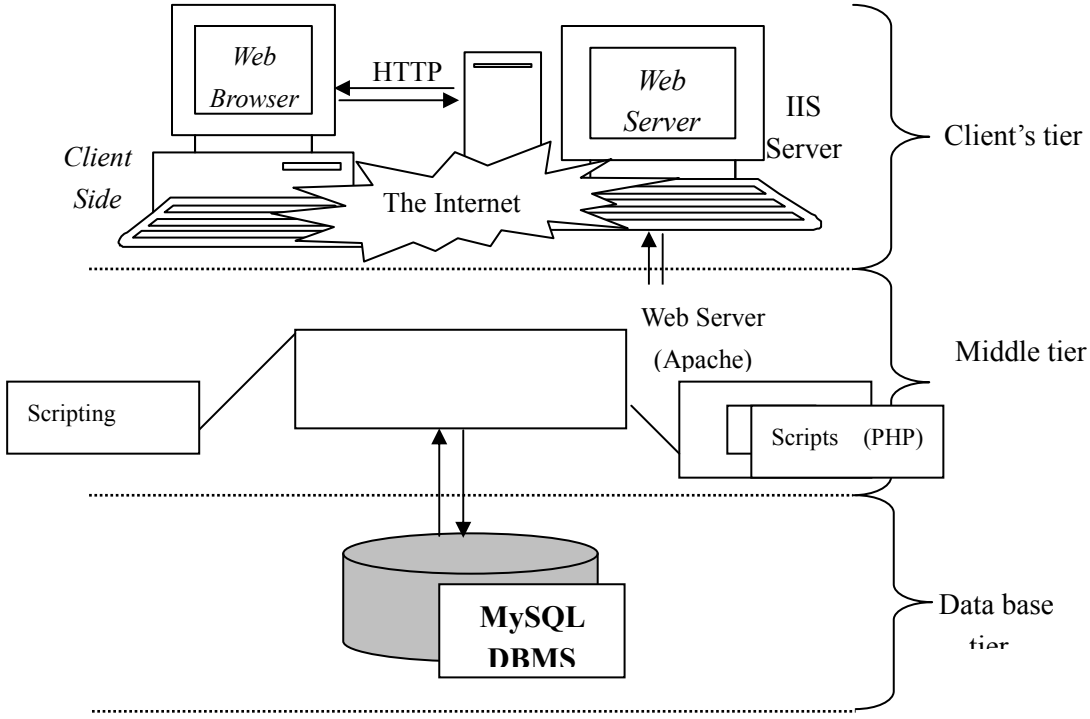


Figure 4: WBAMTS Communication Architecture Model

The use of Internet has moved from the old static view and download of information to more sophisticated dynamic use, such as e-commerce, e-government and e-business. Any functioning site contains clients connected to server via network resources. The clients contain the browser, which display any information downloaded from the server. In addition, through the clients, information/data are uploaded to server for appropriate processing. In this regard, a website that could assist any organization to receive its applicant's data via internet is being developed. With this website, the applicants can search for organizations with vacancies and their addresses. Having gotten any appropriate firm of interest, employment forms are made available for them to fill and submit, which are in turn uploaded to the organizations' server computers. Through an application developed in Internet

Information Server, individual firm can then get connected to their server computers and retrieve the applicant data for processing.

Due to large flexibility of information delivery over the Internet, 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.

USER INTERFACE AS ITS BASIC COMPONENTS.

The user interface of the new system supports a user interface based on the interactive web browser known as internet explorer and access is gained by supplying username and password both of which aid the control of access to the website. The selection of each main menu leads to other sub-menus, which calls on inference procedure associated with that menu. The inference procedure is interactive and it guides intelligently to supply appropriate information. On selection of any of the menus, alternative matching decisions and reasoning behind the decisions will be presented to the expert. Finally, the system administrators will have the choice of applicants to match and recommendations will be made to human resource department of NILEST.

IMPLEMENTATION OF THE PROPOSED SYSTEM

The technological approach adopted for the development of the WBAMTS is an integration of web technology, database technology and programming technology, using open source solution (Apache, MySQL and PHP) running on Windows XP operating system. The technological tools are chosen because of their enormous advantages over other platforms as attested by Naramore et al (2005), that open source programs are better because: they are free, they are cross platform and 'technology neutral', they must not restrict other software, they embrace diversity.

The version of Apache used for the system is 2.0.50, with features for password-protected pages for a multiple of users, customized error pages, virtual hosting for different IP addresses mapped to the same server, directory index directive to multiple files and many more. According to Netcraft web site (www.netcraft.com), it is a popular choice because of its flexibility, power and price.

PHP 5.0 is the version used for development of the system. It is a server-side scripting language that makes our web site to be truly dynamic. It contains numerous built-in functions with flexibility and relatively small learning curve, making it one of the most popular scripting languages around. It is now preferred as an alternative to Microsoft ASP language and Perl. Naramore et al (2005).

MySQL is the version used for the development of the system. It is the database construct that enables PHP and Apache to work together to access and display data in a readable format to browser. MySQL according to Elizabeth is the perfect choice for providing data via the internet because of its ability to handle heavy loads and its advanced security measures.

CONCLUSION

Considering the numerous benefits and potentials in establishing a system that can assist human experts in solving problems associated to job procurement is of great importance. It has definitely replaced the traditionally manual components of background investigation by providing an automated data retrieval process in order to make effective and timely decisions. The knowledge engineer uses the knowledge obtained from human experts to design the system package and draw inferences based on some rules concerning the static and dynamic data contained in the data bank. A successful implementation of this paper would enable the main objective of this system not only to assist the human resources department of NILEST in procuring staff without necessarily going through the rigours and problems associated with the conventional manual method of procuring staff, to be achieved, but also to pick the right person for an open position.

The research developed a Web-based Applicant Matching and Tracking System (WBAMTS) Model that has solved some of the problems associated with the past researchers especially, Uzoka (1998) and Ogunwale, (2005). Finally, this system (WBAMTS), which addresses performance, based on aptitude and intelligence tests, that would show how well an applicant matches up with the requirements for the job is a promising one. "The cool part is no one is even excluded from a job".

REOMMENDATIONS AND FUTURE RESEARCH

There is no doubt that there are a lot of benefits to derive from technological advancements in information/communication, however, the following general challenges facing information and communication technology in Nigeria have to be taken care for optimum realisation of the objectives of this research:

a. Computer Security: techniques should be developed to safeguard information and information systems stored on computers. Potential threats include the destruction of computer hardware and software and the loss, modification, theft, unauthorized use, observation, or disclosure of computer data. Therefore to prevent intrusion over the networks, it must be protected from both internal and external attacks.

A variety of simple techniques can help prevent computer crimes. Increasingly, however, more sophisticated methods are needed to prevent computer crimes. These include using encryption techniques, establishing software usage permissions, mandating passwords, and installing firewalls and intrusion detection systems. In addition, controls within application systems and disaster recovery plans are also necessary.

b. Power Supply Problems: The current unreliable nature of electricity supply in Nigeria calls for an alternative provision of power supply to ensure uninterrupted service.

c. Computer Literacy: the level of computer literacy particularly at the university and other tertiary institutions be stepped up if adequate advantage of on-line access to information about job vacancies and procurement will be maximized.

d. All organizations should be internet connected so as to be able to implement this web application.

e. Further research could be carried out to accommodate employment planning, which could be sent to the government periodically to facilitate evaluation, monitoring and control. Other aspects of Human Resources Management could be addressed, especially Human Resources wages and salary. A system could be developed, such that the financial constraints in human resources wages and salary are taken into consideration. This will aid planning based on fund availability and need. Further research could be done in the areas of training and development also.

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