

Human Resources Management as An On-Line Recruitment System

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Abstract- Globally, technology has been a powerful tool for growth, and the basis for numerous economic and social transformations. New technologies if properly harnessed by exploiting the positive opportunities provided, is capable of bridging the development technology and income divides among and within societies in Nigeria. Human resources management, viz-a viz information technology (IT) is one such new technology that has brought about digital revolution. Unlike industrial revolution, which major goal was to break up works into its major components parts so as to permit mass production, the effect of computer networks in the digital revolution is unification to erase boundaries between Nigerian polytechnics, countries, organizations, communities, companies, businesses, etc.IT, which has remained one of the most powerful tools for entrepreneurship development, 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. Organizations' also have 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, In this paper, we developed an on-line recruitment system which will allow applicants to visit WaziriUmaru Federal Polytechnic, BirninKebbi employment website before they can enter their data. It also, outlines the benefits inherent in web-based human resource management system to streamline processes, outsource administrative activities, improve efficiencies and reduce costs, with its user friendly and technologically advance solution.. (Information Technology, Human Resources Management, Management Information System, Decision Support Systems)

I. INTRODUCTION

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 psychometric 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 worldwide. The psycho-metric test is concerned with the assessment of applicants' personality (Canos and liern, 2004). Also, it was reported 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, (Canos and liern, 2004). 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. The understanding of HRM is important to anyone who works in an organization; and wherever people gather to work, personnel issues become important, such issues like decision making concerning recruitment, compensation, performance evaluation, employee discipline, promotions and transfer are of great and paramount importance. The personnel in HRM department must understand all the rules and regulations guiding the employees of the firms/organizations; this is very important as it will ensure that their everyday personnel actions are consistent with those policies, to do otherwise is to invite serious problems. However, all these functions have been carried out manually using traditional file system although few organizations (Mobil plc, PZ Nig Ltd, Phillips Consulting, etc) in Nigeria have embraced computer in doing so.

According to Akinyokun and Uzoka (2005), 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 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. Organizations' also have 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.

The study developed an on-line recruitment system, which will allow applicants to visit WaziriUmaru Federal Polytechnic, BirninKebbi employment website before they can enter their data. Hence, this research outlines the benefits inherent in web-based human resource management system to streamline processes, outsource administrative activities, improve efficiencies and reduce costs. With its user friendly and technologically advance solution.

II. RELATED WORKS

Akintola, (1995) attempted to solve the limitations associated with manual approach of employment where the personnel department advertises job vacancies and such advertisements are with some shortcomings which includes amongst others; lot of paper works, public awareness for such opportunities may be poor and as such, the potential applicants may not be aware of such opportunities, high risk of accident during the transportation of both applicant and members of interview panel to and fro the venue of the interview, risk of loss of mails between the applicants and prospective employer due to unreliable telecommunication and postal systems, lack of adequate information on job specification, requirement, etc can hinder an applicant from applying for the job. All these aforementioned shortcomings could to a large extent, hinder an organization from unveiling and employing the right quality and quantity of applicants to an open position(s). However, 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 improve on Akintolas' work, Uzoka, (2004) developed a "Knowledge Based System for Matching Applicants to Jobs (KBSMAJ)" in order to assist an employment bureau in the tedious and complicated task of recruitment exercise. It is also to save the applicants the problem of having to search for organizations where there are available vacancies and the anxiety associated with waiting for responses to their applications. Though, it was effective in a way because it assisted the personnel managers and also the applicants in getting the right kind of job on time. However, it has been observed that KBSMAJ cannot be used or accepted in the world of computing today due to the following reasons: the knowledge base cannot be launched on the Internet because it was run on the platform of Microsoft Disk Operating System, there is need for user to have extensive technical knowledge of it and it is prone to error, the applicant will have to come to the employment office before applying, since a lot of commands need to be entered, security issues became a problem, it attracts high maintenance because of its relational structure.

In order to enhance the existing design, Oladipupo *et al.* (2008) developed an expert system tool for selection of qualified job applicants with the aim of minimizing the rigor and subjectivity associated with the tracking and selection process. Though, there was an improvement from the earlier work of Akintola and Uzoka, however, its limitation includes; Database Integrity challenge, lack of proper feedback, improper data validation, high maintenance cost and security. However, all these challenges aforementioned, informed this research.

III. METHODOLOGY/PROPOSED APPROACH

The work focuses on the design of an efficient human resources management that searches and matches a potential applicant to the right job which is based on the following procedure; the procedure includes design of an architectural framework for the

knowledge based system for job procurement which comprises of Knowledge base, Inference engine, Decision support system, etc (fig.1) below. Also, the researcher developed a network model and a communication architecture model for the proposed system (see fig.2, and fig.3, respectively).

3.1 KNOWLEDGE BASE

Basically, a knowledge base of any system normally contains rules and facts. Rule specifies actions a system should initiate when certain triggering conditions occur. Facts define static, true propositions (Mehrabad and Brojeny, 2007). The knowledge base for the proposed system is composed of quantitative (structured) and qualitative (unstructured) knowledge or information and it serve as the information store for the operational data that are to be processed. It contains information about the prospective job applicant and the job requirements as would be sent by W.U.Fed.Poly employing the services of job bureau Web-Based Applicants' Matching and Tracking System, (WBAMTS). However, the knowledge base of the on-line system contains two major inter-related databases, namely: job requirement database, applicant database and other databases.

3.1.1 INFERENCE ENGINE

Inference engine is concerned with piecing together an appropriate line of reasoning which leads to the solution of a problem or the formation of a body of consultative advice. It also, provides reasoning ability that enables expert system to form conclusions from specific facts and rules about the subject provided by the knowledge base (Mehrabad and Brojeny, 2007). On completion, the applications server receives requests/resumes from different applicants and sends them to the corporate server for processing tasks. It is in this module that the actual searching for and matching of applicant's information/qualification against job request would be done. The system would adopt backward chaining method of making inferences. The design will allow the system take a particular request, search at the set of applicants that meet the necessary request requirements, scores the qualified applicants and determine the applicants with the maximum score for the job and in turn sends the

result to the qualified applicant(s) through their e-mail address.

The knowledge about the applicant will be composed of the following; Personal data, Academic and professional qualifications, and Job history, while the knowledge about the job will be composed of; Applicants' registration, Job/Organization requirements, and Job vacancy.

The inferences to be drawn will be broken into phases because of the large number of the decision variables and combinatorial analysis of the decision variables of the corresponding knowledge, such as that of personnel and job requirements to be carried out.

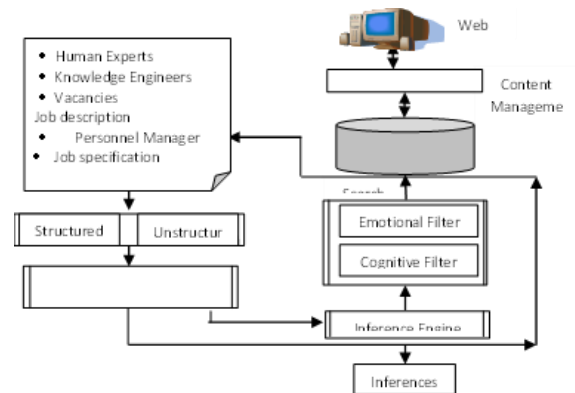


Figure 1: Architecture of the Proposed Knowledge Based System

3.1.2 DECISION SUPPORT SYSTEM

As mentioned earlier, that inference engine would assist in matching decision variables of the personnel knowledge with the corresponding decision variables of the job requirements knowledge and report list of applicants that are selected for some specific job. The Decision Support System will have two sub-systems, namely cognitive and emotional filters (fig.1 above).

Cognitive filter is expected to carry out series of reasoning, which includes the inductive and deductive reasoning, on the information contents of the list of applicants appointable for a given job as will be produced by the inference engine. For example, some steps could be taking in making decisions concerning the most suitable qualification and additional qualifications for a particular job, age limits for the job, working experiences in the areas related to the job, locations of the applicants, gender, status, etc. All

these could form the basis for cognitive filtering of the list of selected applicants as programmed by the system engineer.

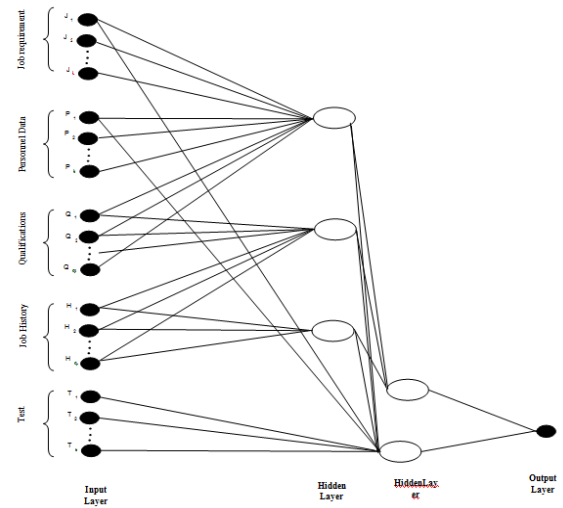
Emotional filter is also, going to carry out series of reasoning, which also include the inductive and deductive reasoning, on the information context of the list of applicants appointable for a given job as would be produced by the inference engine. For example, a candidate could be preferred because of his relationship with the people in the authority; candidate could be disqualified because of bad behavior, a male candidate could be preferred to his female counterpart because of the stress that is going to be involved, candidate might be disqualified on health ground, etc. All these could form the basis for emotional filtering of the list of selected applicants as programmed by the system engineer.

3.2 NETWORK MODEL FOR THE PROPOSED ON-LINE RECRUITMENT SYSTEM

Let J_{it} be the jobs and job requirements applicants p_k applied for; where $i=1,2,\dots,n$ (the job) and $t=1,2,\dots,n$ (job's requirements) and $k=1,2,\dots,n$.

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, gender, etc. personal academic, professional qualifications and personal experience.



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 (fig.3 below), is three-layer Internet architecture for the proposed On-line Recruitment System. The system adopted 'three tier architecture model' for the purpose of communication. Based on the model, at the bottom 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. The web server is WampServer 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 Hypertext Markup Language (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, Hypertext Transfer Protocol (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.

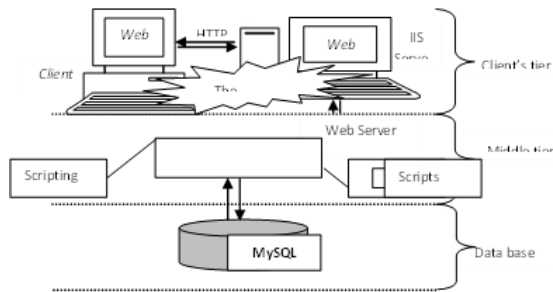


Fig.3: On-line Recruitment System Communication Architecture Model

IV. SYSTEM IMPLEMENTATION/REQUIREMENTS

The proposed system was successfully implemented with the following software and hardware requirements:

4.1 Software Requirements

The basic software requirement for the system are WampServer, MySQL and PHP, which are the open software running on Windows Operating System, Internet Explorer version?, Windows Note pads and Micro Media Dream Weaver for editing HTML pages.

4.1.2 Hardware Requirements

A computer system that is comfortably fast and robust with the followingas the minimum configuration:

- (1) Pentium IV processor,(2) 128MB RAM, (3) 40GB Hard Disk,
- (4) CD-Writer, (5) Internet and Multimedia, (6)SVGA Monitor,
- (7) UPS and Stabilizer, (8) A simple local area network with a server and a client machines, (9) Client side may use a system with lower configuration than this. However, a single computer system may also serve as a server and a client.

4.2 THE USER INTERFACE

The implementation of the new system supports a user interface based on the interactive web browser known as internet explorer. 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 (Inference Engine). Meanwhile, the Administrator is expected to feed in certain information to the knowledge base of the system, i.e certain parameters that will be set for a particular job or vacancy. All these will be used by the system to reason and make decision when it comes to selection of the qualified candidates.

4.3. INTERFACE FORMS

The interface is designed in such a way that it enables the applicant to submit his/her resume. This process makes use of the model in chapter three, (fig.2) for its matching.

4.3.1 Home Page

This is the control center that provides link to all other pages in the site. The page gives a brief introductory message to the applicants about WUFP online recruitment systems as depicted below in fig.4.



Figure 4: Homepage

4.3.2 Applicant Registration Form

This form (fig.5) is used to capture the full details of the applicant, such as personal data, academic qualifications, job history if any, etc. The main purpose of this form is to keep accurate record of the applicants that visit and apply through the website. However, on completion of this form, it links to the next page (fig.6) that validates the information entered. Upon validation, a reference number will be automatically generated from the system. This reference number serves as the applicants ID. Through this page (fig.6), the applicant can select job of interest, upload passport and originals of academic qualifications claimed, which will be stored at the database. This form is very vital for the application processing.



Figure 5: Applicants Registration Form

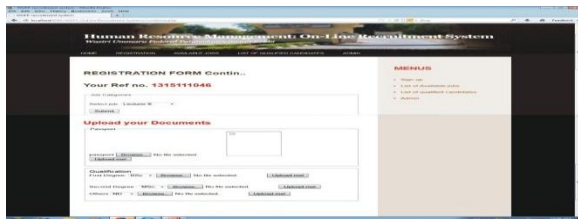


Figure 6: Applicants Registration Form Cont'd....

4.3.3 WUFP List of Available Jobs

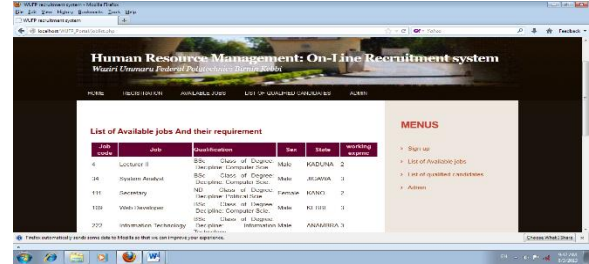


Figure 7: Organization's List vacancies Form

This page gives the full list of vacancies in WUFP organization. The applicants visit this page to get update of vacancies available. It also gives details of WUFP's job description, job code, number of vacancies, academic qualification required, gender, catchment state, and minimum years of experience.

4.3.4 Admin Login



Figure 8: Admin Login Form

After the user name and the password has been supplied by the administrator, the user clicks 'Login' button and the Admin Login menu appears (Fig.9) below.



Figure 9: Admin Login Menu Form

In this menu above, the following submenus explained below are available: Update Vacancy/Setup criteria, Upload Test Score, Set Test Percentage Requirement, and Authenticate Credentials.

Update Vacancy/Setup criteria

This contains information about the available job vacancy and its respective requirements. The requirements are used by the system as criteria for selecting applicant e.g. minimum year of experience,

academic qualification, Discipline, Age limit, etc. It is important to note that all these criteria will be set and updated by the administrator of WUFPoly, Birninkebbi from time to time.

Upload Test Score

This accepts the applicants test scores for selected applicants. The categories of the test are physical test, intelligence test and aptitude test. The average test scores serve as a vital parameter for selection of qualified applicant.

Set Test Percentage Requirement

The administrator is expected to communicate to the knowledge base of the system the required percentage (cut off) that would be expected from each applicant. That is, if the average test percentage score of each applicant is below the set test percentage, then the applicant will be disqualified. However, if the average test percentage is above the set test percentage and other criteria set fulfilled, then the applicant is qualified.

Authenticate Credentials.

Through this process, the credentials of all applicants uploaded in the system, are verified using the applicants reference code generated by the system for each applicant.

Through this menu WUFPoly, Birninkebbi through the administrator, can setup the grade point for each job requirement parameters.

List of Successful Applicants



The screenshot shows a web browser window with the address bar displaying 'http://localhost:8080/joomla1.5.12/administrator/'. The Joomla! administrator interface is visible, featuring a top navigation bar with 'Joomla! 1.5.12 - Administrator' and a sidebar with 'Joomla! 1.5.12 - Administrator' and 'Joomla! 1.5.12 - Administrator'. The main content area displays a table of Joomla! components.

Component Name	Version	Author	License	Compatible Joomla! Version
Content Manager	1.5.12	Joomla! Team	GPL	1.5.12
Media Manager	1.5.12	Joomla! Team	GPL	1.5.12
Template Manager	1.5.12	Joomla! Team	GPL	1.5.12
Extension Manager	1.5.12	Joomla! Team	GPL	1.5.12
System	1.5.12	Joomla! Team	GPL	1.5.12
Users	1.5.12	Joomla! Team	GPL	1.5.12
Menus	1.5.12	Joomla! Team	GPL	1.5.12
Plugins	1.5.12	Joomla! Team	GPL	1.5.12
Fields	1.5.12	Joomla! Team	GPL	1.5.12
Help	1.5.12	Joomla! Team	GPL	1.5.12
Search	1.5.12	Joomla! Team	GPL	1.5.12
Calendar	1.5.12	Joomla! Team	GPL	1.5.12
Comments	1.5.12	Joomla! Team	GPL	1.5.12
Form	1.5.12	Joomla! Team	GPL	1.5.12
Image	1.5.12	Joomla! Team	GPL	1.5.12
Text	1.5.12	Joomla! Team	GPL	1.5.12
Table	1.5.12	Joomla! Team	GPL	1.5.12
Form	1.5.12	Joomla! Team	GPL	1.5.12
Image	1.5.12	Joomla! Team	GPL	1.5.12
Text	1.5.12	Joomla! Team	GPL	1.5.12
Table	1.5.12	Joomla! Team	GPL	1.5.12

Figure 10: List of Successful Applicants

Before the lists of successful applicants are generated, the main module takes each applicant and matches him/her for the job applied for, based on the model in (fig.2). During the process, the applicants that scored minimum total points and above are generated for the management before emotional and cognitive filtering are performed. These two decisions are subject to

management wish before taking final action of communicating the qualified applicants.

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 research would enable the main objective of this system not only in assisting the human resources department of Waziri Umaru Federal Polytechnic, Birnin Kebbi in procuring staff without necessarily going through the rigors and problems associated with the conventional manual method of procuring staff, but also to select the right person for an open position.

The researcher developed an On-Line system model that has solved some of the problems associated with the past researchers especially, Akintola, Uzoka, and Oladipupoet *al.*

Finally, this system, 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.

5.1 RECOMMENDATIONS 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 of, for optimum realization 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, on, 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 tertiary institutions to 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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