Advancement in E Recruitment Towards Expert Recruitment System (ERS)

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Abstract – The inspiration drawn from e-recruitment is in making the process to become more creative, formidable and as well to be cost effective. We are desirous of achieving a lot more attraction than it is currently in order to sustain the process. Before now, we have some existing systems which were traditional methods like employment agencies, doing adverts through the print media. This process was relatively very slow and stressful. In this work, we have developed a remolded ERS based on our former work to hire applicants by accepting applications online and conduction Test and interview through the expert systems knowledge base until the candidate is eventually hired. The expert system is of a recruitment process model where applicants don't actually have direct interaction with the employers but with the expert system that makes decision. The system provides response to applicant request and also provides procedure for recruitment from start to finishing stage, when the job seeker is now called successful employee. We implored Water fall model in our design. In this model, each stage essentially completes before the next phase can activate so that there will be no overlapping in the phases.

Keywords – ERS, Recruitment, Human Resources, Knowledge base, Fuzzy System.

I. INTRODUCTION

In ER the execution of task requirement of finding, attracting, testing, assembling and hiring new employees is done online.

In the world today, many institutions use the Internet as a platform for recruiting new staff. This is done via advertisement of job postings through the internet. The applicants who are searching for jobs with eligible qualifications are required to apply online.

This is very simple method of e-recruitment. This is very similar to the ERS. More opportunities are derivable from the use of technologies towards employment and job creation. However, technology as well comes with certain risk. Meaning that some person's job will be overtaken by the development of technology for instance. ERS will automatically replace the job and functions of some individuals in given HR department. According to [1] there are clear fact of digital job opportunities. The inspiration drawn from e-recruitment is in making the process to become more creative and formidable and as well to be cost effective. We are desirous of achieving a lot more attraction than it is

currently in order to sustain the process. Before now, we have some existing systems which were traditional methods like employment agencies, doing adverts through the print media. This process was relatively very slow and stressful. With the invention of internet, Job seekers rely majorly on the internet job portal.

However, a review of the given traditional methods gives us the following disadvantages:

- Longer processing time
- Stressful activities
- Sentimental involvement

We had created an ERS in the past paper that handled the following: selection of candidates appropriate suitable for Jobs via skills and experience [2], but in this work we will be implementing the recommendation of [2] by implementing a solution to handle an automatic switch of invitation to candidates for interview and also generate that that will be able to adapt to any can of online testing. Also this work will compare the advancement in ER and explore more on ERS.

II. LITERATURE REVIEW

2.1 Background of Study

A simple look at some of the existing web based system shows that they may be well articulated but not expert in operation. Most of them will eventually post jobs to the subscribers but does not have the ability to do selection test and eventually complete the recruitment with much interference of human expert.

It is important to examine the benefits of technology on recruitment at large in order further understand the place of expert recruitment. The appreciation of ERS will be greatly understood with a measure of input of technology with relationship to trends and advancement.

We say that technology is rapidly reshaping the world's labor force and would be labor force and the available employment facilities. It is also important to note that every recruitment system will be on a device such as smart phones, tablets and other computer machineries.

In the past twenty years, Smart Technologies have experienced a most important advancement [3].

The frequent topic and talk of the now is on the basis of replacement of human beings by automation, AI devices and technologies, Ray Kurzweil [4].

Human workers of all stripes including recruitment officers are in great argument that they are irreplaceable by technology, yes? Meanwhile in America, corporation and investors are spending billions on AI and robotics towards making human jobs replaceable. This is simply because they believe man reasons to that according to

(Bryan D Wright, Los Angelis Times, 2016) [4].

A recent report on the possible financial and automation looked at robots and its rules to implication of unemployment [5].

Mickinsey found through study that computerization is growing so rapidly. It is very true that it has likely replaced some human bank Tellers but we are in 2018 and most banks still retain the services of Tellers as well. One can always get money whenever and wherever you want it at all times. It is also very true that one can as well open account and transfer money at the comfort of your phone. This technologies and features has not stopped us from walking into the banks and experiencing the services of bank staff who are positioned to assist us in banks because we believe traditionally that money keeping and handling requires professional human touch, psychology but true. As well when it comes to medicine, even though there are machines that assist our doctors, we expect to keep mediating with human beings and not just human being but highly educated persons to that fact. We also have technological replacement for restaurant wait staff with the use of I pads, smart phones with memo. A restaurant in the Fransisco has replaced people out of their jobs; no human person is required in placement of your food order. Generally there are people whose positions as customers will require having him attended to by human experience and touch.

Same operation goes for Uber services. We have driverless cars in cars services. Some customers enjoy talking with a driver while on motion. Technological advancement is taking a lead in diverse aspects of human work force and work place including Human resources. Recruitment is a major role of the human resources as mentioned before. Technology allows the automated sourcing and gathering of candidates' information, in some cases even the interview process can be automated with video conferencing interviews and performance based hiring using different kinds of factors to determine cultural and best fit candidates. Up to the stage of hiring and after hiring, the special software are employed for taking care of everything from orientation, signing of documents and setting up payment details which result to saving of money and time for organizations. Technological advancement has also led to the thought and conception design of ERS.

2.1 Related Works

[6] Defines Artificial Intelligence (AI) as a manager of comprehensive issues in system automation. Refer to figure 2.1 and an Expert System (ES) is an AI software that routines facts which is stored in a knowledge base to solve problems that customarily entail a human professional thereby preserving a human expert's knowledge in its knowledge base. Refer to figure 2.2
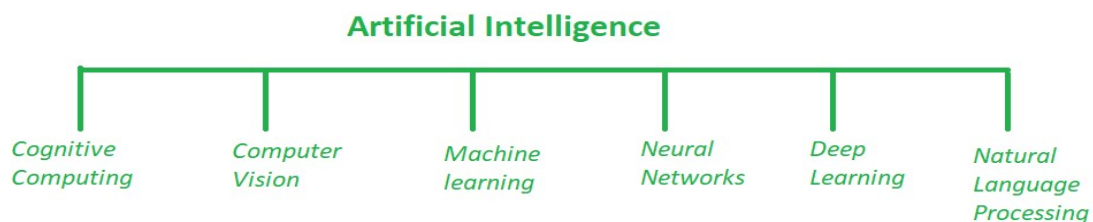

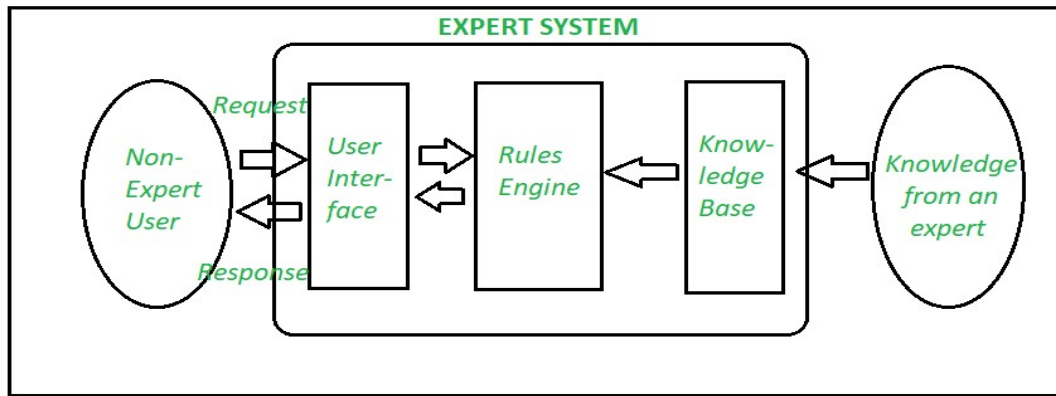Figure 2.1 Diagrammatical representation of Artificial Intelligence (AI)

Figure 2.2 Diagrammatical representation of Expert System

[7] This revision is to modify an earlier work and custom it to scrutinize the impact of web-based exercise and testing apparatuses on scholars. [8] Murphy et al in their work showed these tools are effective for determining guarantee of learning standards.

[9] Describes the combined use of software technologies: both mathematical and statistical methods.

[10] In this study, Boolean is swapped with fuzzy logic.

[11] This study epitomized the concept of ES, the situation and predetermined every possible detail into a database. According to [12] the concept of an expert system is attractive. It has connotations of helping those who cannot afford legal advice; of improving the legal process; and of making valuable products available.

In [13] multi-variable fuzzy estimating using image fuzzy clustering and picture fuzzy rule interpolation techniques was suggested, the proposed archetypal is the broad view of the intuitionistic fuzzy clustering model and basically, picture fuzzy sets based models may be adequate in situations when we face human opinions involving more answers of type: yes, or no. Refining guessing exactness is one major focus.

[14] Examined and reported that the cost of expert and knowledgeable software developers are high, and looked at methods to minimizing the reliance on such costly personnel. Also it proposed the automation of all forms of software development tasks. They leveraged on knowledge-bearing data, the latest advances in AI and hardware to create knowledge warehouses and expert systems for the software development domain. Refer to figure 2.3 for further understanding.
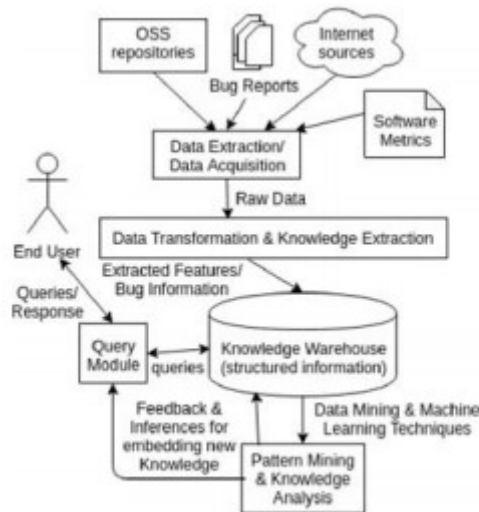

Figure 2.3 Semantic diagram of process automation [14]

[15] Looked at automated grid management systems for distribution of renewable energy sources (RESs) also distributed energy technologies.

[16] This research presents the status of the Human Resources (HR) recruitment and selection, an aspect of HR management, concerning incorporating artificial intelligence (AI) solutions. [17] The work is to generate program that allows for an automated assessment of the knowledge of nursing staff on the prevention of hand hygiene in the performance of professional duties. The software helped to survey 817 paramedical medical personnel of medical institutions of the Kharkiv region. Results are statistically form. The work established Dependencies of knowledge and skills of medical personnel.

[18] This paper proposed a framework of Intelligent HR Information System applying Intelligent Decision Support System along with Knowledge Discovery in Database to improve structured, especially semi-structured and unstructured HR decision making process. This is an improved Human Resource Information System used in most Human resource Management.

[19] This study recognized an ES based on Fuzzy Analysis and Fuzzy Inference System in order to evaluate the condition of patients who are being observed for heart diseases. The Fuzzy AHP is used to calculate weights for different criteria that impact developing heart diseases, and the Fuzzy Inference System is used to assess and evaluate the likelihood of developing heart diseases in a patient. The results show effectiveness and exactness of the developed approach.

[20] This work seeks to use (ITSB) a tutoring system Builder which is designed to improve and help teachers in building intelligent tutoring coordination in many fields. The work displays an instance and an assessment presented in building an intelligent tutoring system for teaching TOEFL using ITSB tool. See figure 2.4.
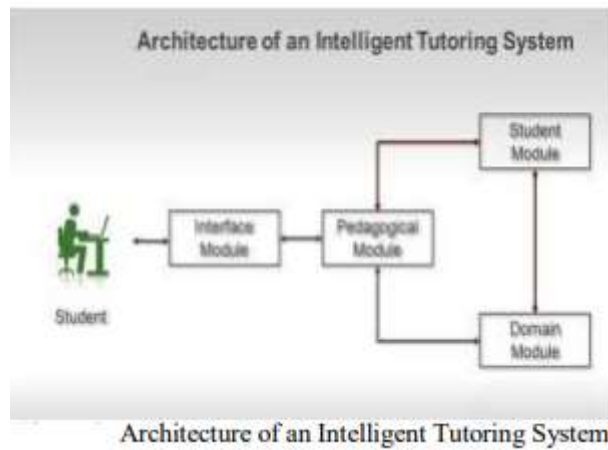

Figure 2.4 Adapted from [20]

III. ANALYSIS OF THE EXISTING ERS

The existing system has the capacity to filter job positions by skills, then checks for candidates who have the skill or closely related (in spelling) to the skills. If found other skills are checked as well. The more skills the match to a job,c the greater the degree of membership. In performing the recruitment and hiring process, the ERS is required to perform this task using the statistical information analysis for the recruitment and hiring functions.

For all candidates who have at least one skill match, the system goes through their CV for a job-position match. If there is a job position match, then the candidate is fully a member of the set. The system returns a list of the candidates and their years of experience with degree of membership.

3.1 Design of Our New Solution

This system will not only match candidates jobs and experience but will have an automatic switch to invite them for interviews and test them online irrespective of their fields by a learning algorithm.

Use case expert system

The decision are made automatically and require little or no human assistance. The diagram below describe an ERS.
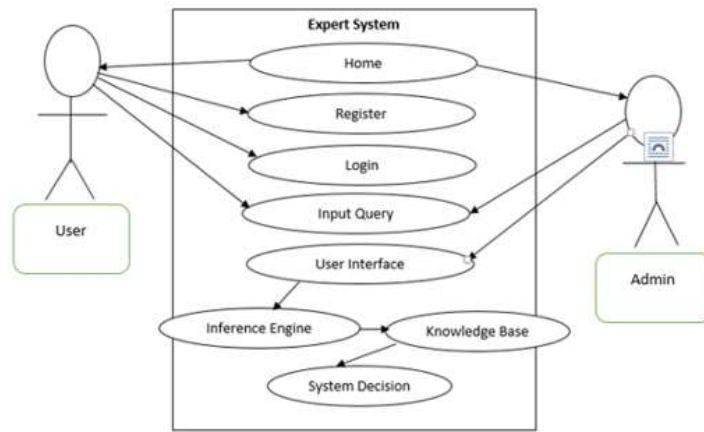
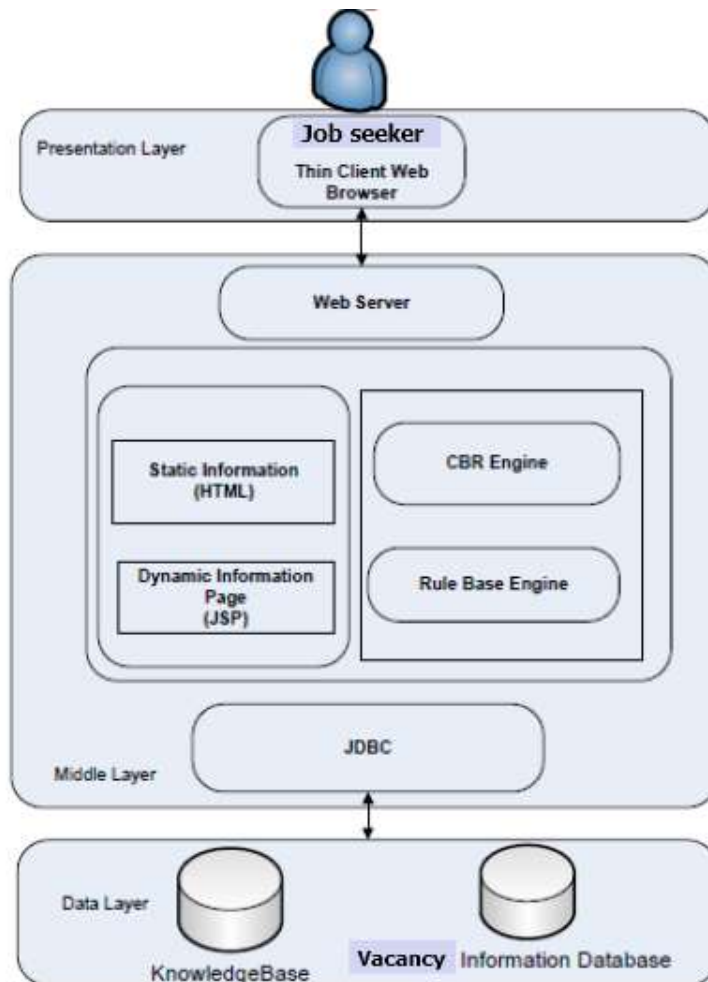*Figure 3.1 User Case Diagram of Expert Recruitment System*

Figure 3.2 ERS Tier architecture

The knowledge base is the center of ESs and the comprehensiveness of this database play a significant role in the capabilities of the expert system [21].

Illustrates the architecture of the proposed ES which is based on a 3-tier architecture. The Data Layer, middle layer and Presentation Layer. In the middle layer the most important component, the RBR engine implemented using Java Expert System Shell (JESS) [22], the CBR engine, and a web server with intrinsic capabilities to execute Java servlets and support JSP components.
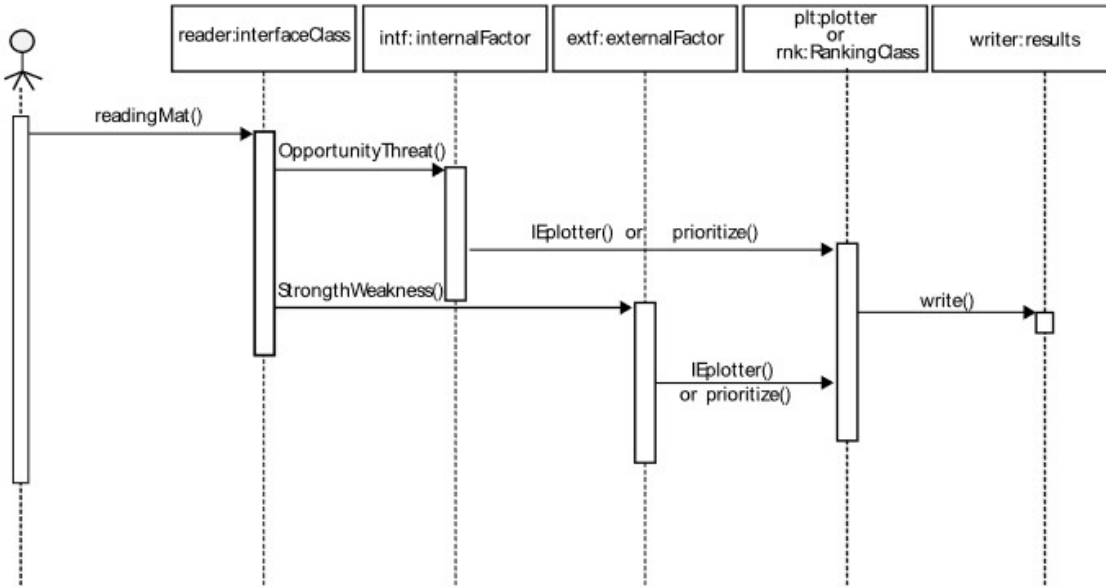
ERS Sequence Diagram

Figure 3.3 Sequence diagram of the ERS.

3.2 Design Methodologies
3.2.1 Database Diagram non-expert recruitment system

The non-expert recruitment as shown in figure 3.1 is bi-functional system where decision for employing an applicant is a decision from both application system and decision are made by human resource management, that to say, applicant and candidate document are submitted online and selections are actually done manually.
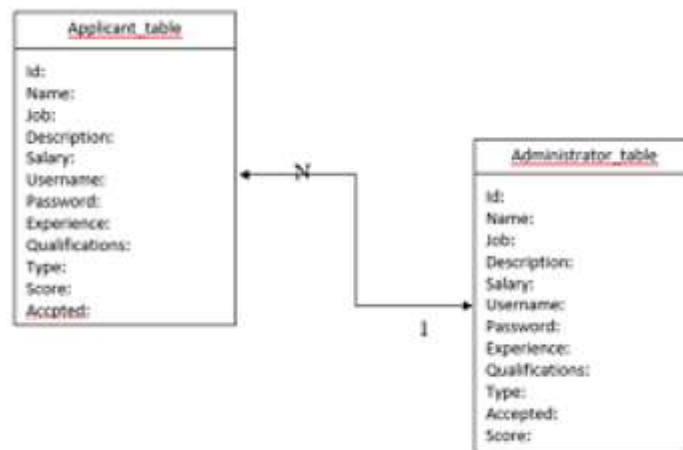

Figure 3.4 Database Diagram non-expert recruitment system

Algorithm for non-expert recruitment system

Application Form; database schema table store applicant name, job details, job type: part-time/fulltime, application details and login/registration detail.

Administrator; database schema table store applicant information, view applicant application etc., manual evaluation by human resource management, applicant accepted or rejected. Still has a hand of the human agent.

3.2.2 Database Diagram a new model ERS

In this methodology, we will implore waterfall model and this will be discussed in the result there after. The database diagram refer to figure 3.2 of an expert recruitment is system designed to take decision over recruitment process. The expert system has a classified function like with its database schema;
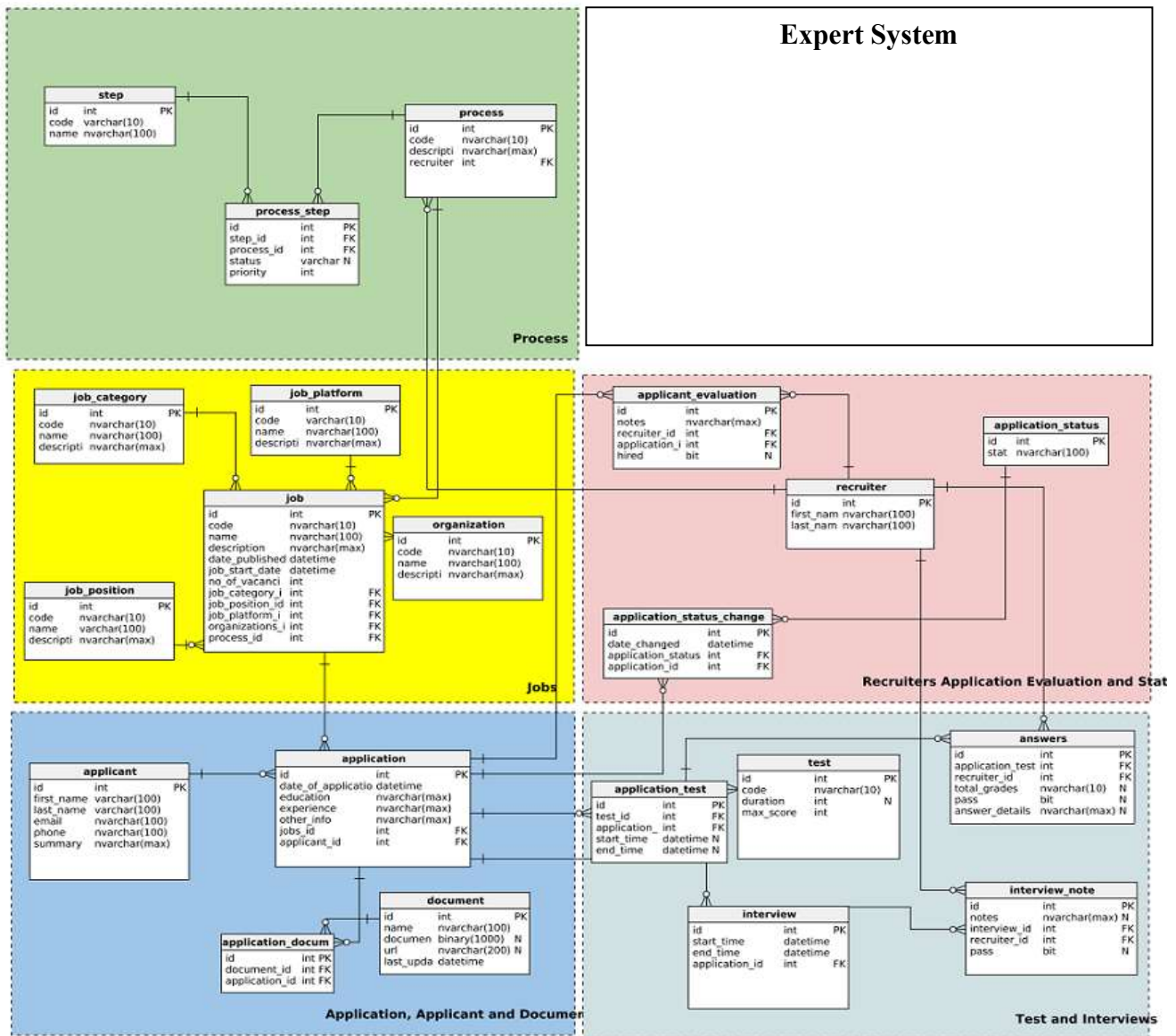
Process, **Jobs, Application, Applicant, and Documents**, **Test and Interviews**, **Recruiters and Application Evaluation**

Figure 3.5 Database Diagram of a new model ERS

3.2.2.1 How the Database Functions

Process: The process category contains information related to the recruiting processes. It contains three tables: **process**, **step**, and **process_step**. This explains the processes to be employed and the categorized steps to achieve the aimed objective. The process step stores information about the candidate recruitment processes.

Jobs: stores all the information related to the job(s) we're recruiting for. The classification of the jobs and the description. The employment duration, the job code, the position and process id. The organization associated to the job in the list.

Application, Applicant, and Documents consists of the tables that store information about job applicants, their applications, and any documents that come with the applications. The applicants actually are the candidate that applied for the jobs based on the description and organization. The applications is the indication of the interest of the candidates for a particular position. The documents becomes the related qualifications and professional achievement of the candidate with a certified document submitted by uploading or pasting on the form.

Test and Interviews: The test table stores test details including its unique id, code name, its duration in minutes, and the maximum score possible for that test. One application can be associated with multiple tests and one test can be associated with multiple applications. Once again, we have a lookup table to implement this relation: application_test. The start_time and end_time columns are annullable, since a test might not have any specific duration, start time, or end time. The interview table stores basic information (the start_time, end_time, a unique id, and the relevant application_id) for each interview. One interview can be associated with only one application. On the other hand, one application can have multiple interviews. Therefore, a one-to-many relationship exists between the application and interview table.

Recruiters Application Evaluation and Status: The recruiters table stores each recruiter's first name, last_name,

and unique id number. The application_evaluation table holds information about application evaluations. In addition to the application_id and recruiter_id, it contains recruiter's feedback (in notes) and the final hiring<w decision, if any, in hired. One application can be evaluated by multiple recruiters and one recruiter can evaluate multiple applications, so both the recruiter and the application table have a one-to-many relationship with the application evaluation table.

Procedure for interaction in database of a new model ERS

The Process and Job requirements is a database schema table stores applicant application processing details, job requirement, job qualifications, job descriptions etc.

Jobs is a database schema table store job duration, job code, job descriptions and job requirement and salary

Application, Applicant, and Documents is a database schema table store application form details, vacant positions, the applicant name, qualification, certificates, job experience etc. and the attachments of certificates professional appraisals

Test and Interviews is a database schema table store test questions, corrects answers and maximum point, applicant score

Recruiters and Application Evaluation is a database schema table store expert system decision either rejected or accepted applicant, job title, applicant name, position, job description, evaluated decision from knowledge base and result from the inference engine (accept or reject applicant).

3.2.2.2 Fuzzy diagram of a new model Expert Recruitment System

Expert system are targeted to decision making using a certain control structure of IF THEN system of determining the best possible outcome of a problem. Fuzzy expert system models are similar to the classical expert system models, where input spaces are mapped to an output space. Refer to Figure 3.3, a fuzzy expert system uses a collection of fuzzy membership functions and rules for knowledge representation and reasoning with observed system state data.
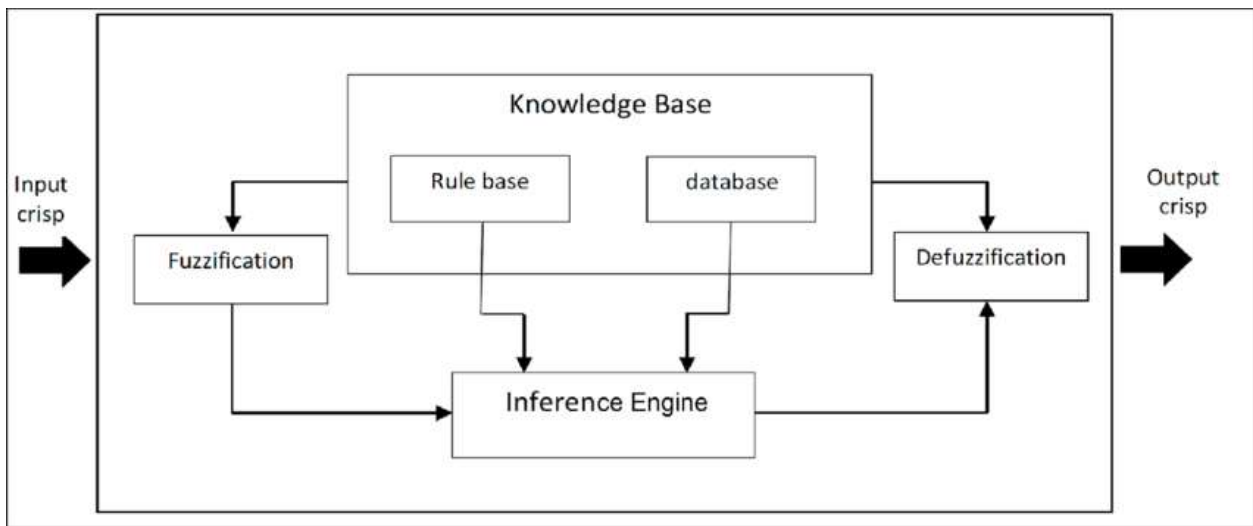
Figure 3.6 Fuzzy diagram of a new model Expert Recruitment System

A Fuzzy Inference System contains the knowledge and experience of an expert, in the design of a system that controls a process whose input output relations are defined by a set of fuzzy control rules, e.g., IF–THEN rules [23]. Fuzzy logic-reasoning contains two types of information. The first concerns the labels and membership functions assigned to the input and output variables. The accurate selection of these represents one of the most critical stages in the design model. The other type of information is related to rule-base which processes the fuzzy values of the inputs to fuzzy values of the outputs [23]. The inference engine is the FIS heart, and can reproduce the human decision-making process by performing approximate reasoning in order to achieve a control strategy [24].

Algorithm of Fuzzy for the new model ERS

Fuzzy system requires input from crisp
Convert inputs to linguistic variable from knowledge base
Inference engine assigns evaluation task;
Decision making: loop to evaluate input using fuzzy rule by IF-THEN control structure for degree membership
Defuzzy system transforms the fuzzy output into a crisp value.
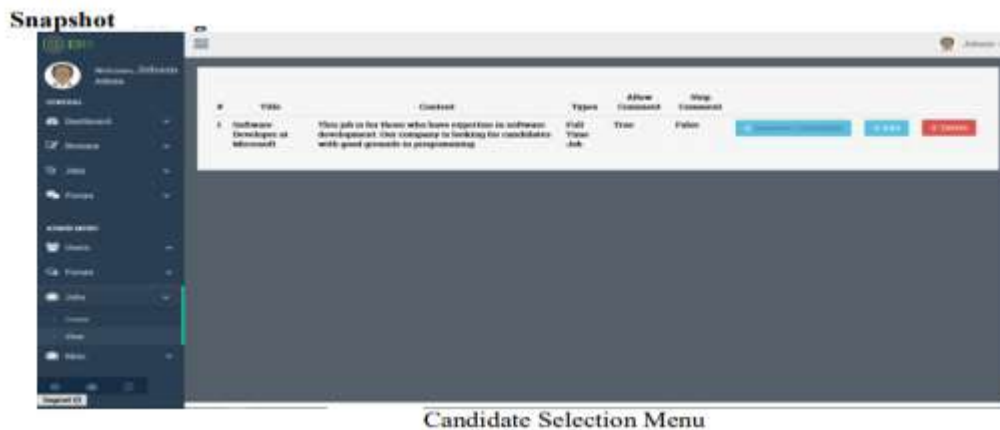
IV. DISCUSSION AND RESULTS

Figure 4.1 Adapted from [2]

From the figure above, the selection is done by skills and experience as shown in this figure above but no relay of process to finishing the recruitment to testing levels and finally offer letters. We see the new system has incorporated in the database interview and testing.
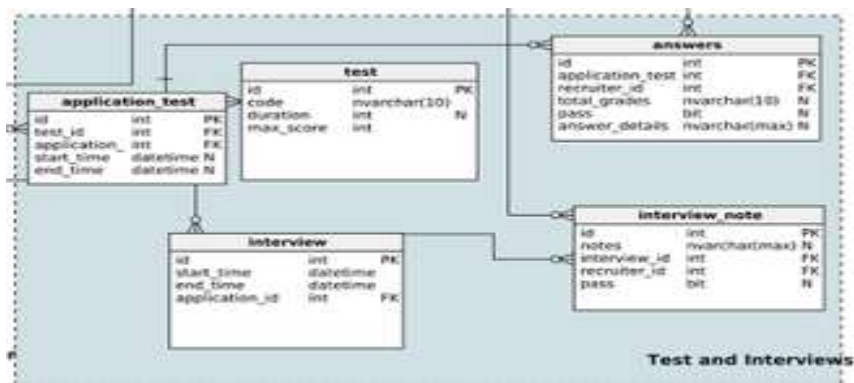
See figure 4.3:

Figure 4.2 Test and interview Database module

V. CONCLUSION

The expert system of a recruitment process model where applicants don't actual have direct interaction with the employers but the expert system that make decision. The care provider response to applicant request and provide procedure for recruitment start to finish. The applicants make request or applications and the care provider (knowledge base) studies the request then provide solution to them through auto response and till testing and job offer

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