ISSN 2320 - 2602
Volume 14 No. 7, July 2025
International Journal of Advances in Computer Science and Technology
Available Online at http://www.warse.org/IJACST/static/pdf/file/ijacst021472025.pdf
https://doi.org/10.30534/ijacst/2025/021472025

Empowering HR Evaluation and Selection through Decision Support Systems

[1]Shadi R. Masadeh, [2]Amit Dutta, [3]A.V.Senthil Kumar
[1]Cyber Security Department, Isra University, Amman, Jordan, shadi.almasadeh@iu.edu.jo
[2]All India Council for Technical education, India, amitdutta07@gmail.com
[3]Hindusthan College of Arts and Science, India, avsenthilkumar@yahoo.com

Received Date : May 24, 2025 Accepted Date : June 29, 2025 Published Date : July 07, 2025

ABSTRACT

This paper is used to evaluate twenty-five CVS and select the best three among them from linked in to decrease the human interaction with the employment process which may increase the accuracy of employees hiring. The aim of this study is to develop Implementation of a Decision Support System for Human Resources Evaluation and Selection. In this study, the researcher seeks for the appropriate staff for the project according to their skills and characteristics using Artificial Intelligence techniques. In addition, the objectives of this study are studying the previous approaches to define or modify a method for solving its problem by performing an evaluation study to see the effectiveness of our defined method. The study major contribution is the suggestion an ontology that focuses on defining the competencies and experience for workers using the Genetic Algorithm to use the classification rule, and the use of semantic methods in the current thesis, it is the first attempt to create a method that selects the right staff according to their skills and expertise without the intervention of the human factor. To use this system in different companies to reduce time and effort in the selection process. However, any company will be more productive in its various businesses because of choosing the right employee in the right place. The program was created by using C# and Asp.net. The assessment of the classifier accuracy of the resulting classification rule indicates the requiring to create more precise descriptions to improve the SRL. In the present study, the researcher introduced a semantic-based framework capable of recommending the workers that apply for job by examining the experiences, skills, major and. The plan achieved impressive outcomes via an F-Measurement value of 0.7747 and Precision Value of 0.7942.

Key words: Human resources, Ontology, Semantic Index, semantic annotation, Genetic algorithm

1.INTRODUCTION

The department of Human Resources (HR) plays an important role in the success of software projects. The automatic selection of an employee for a certain job helps achieving the selection of the most suitable people away from human's factors that may negatively affect the selection process, in addition to reducing time, effort, and cost while making the selection process. For these reasons the human resources department should assess and recognize a wide variety of resources regarding skills of staff to make choices appropriate to the special conditions as a result of staff planning, selection, recruiting, resignation, endorsement, development, training and encouragement for employees [1].

The researcher will use an ontology based on selecting the appropriate staff for a project according to their skills and characteristics instead of selecting employees according to the similarity between previous projects and the new project. This thesis is important because it identify the importance of supporting human decisions specially HR, it helps to choose the appropriate employee without human intervention, and this encourages every person who will apply to the appropriate job according to the skills and characteristics. Related to software, the Decision Support System (DSS) should pass through the Software Development Life Cycle (SDLC) that involves several activities, such as requirement engineering, software design, implementation, testing, deployment and maintenance.

The "Intelligent Decision Support System" (IDSS) has been designed to assist decision-makers in various stages of it whilst also incorporating modelling techniques as well as human existence. These systems are ways proceed the decision-making procedure where there is confusion as well as missing data or wherever risk-taking decisions are required utilizing pure logic and expectations. In particular, this IDSS systems are based on the premise which perhaps the decision-maker is acquainted as the issue to be addressed. Within this situation, it provides users complete control over the acquiring, assessment and ultimate decision-making of data.

This system seems to be adaptive, versatile, resilient and explicitly built framework to facilitate the implementation of an unstructured and semi-structured systemic issue of better decision-making [11].

The Human Resources division is the most vulnerable and significant section, since this department provides employees who facilitate the production in their entirety. The Human Resources department is accountable for coordinating the whole operations when new recruiting is needed. The problem is restricted to apply the Decision Support System for Human Resources Department to improve the process of selecting and evaluating the employees to create a method for solving the mapping issue.

This research is going to answer the following questions. Firstly, how to choose the right staff for a software project based on their skills and experience in using artificial intelligence techniques. Secondly, how to improve the process of selecting employees in the fastest time and with less effort, using artificial intelligence techniques.

The human resource management system is a significant component of any institution performance, recognized as an interconnected field of human resource human resource job involves many unorganized procedures such as recruitment, practicing, encouragement and management. In addition, decision for processes generally dependent on people conviction and plan [10].

Human decisions are subject to difficulty, nevertheless, since many people ignore the key nature of the incident and, therefore, equality and honesty are very necessary in any form of judgment. Hence, the human element is the most important asset in various business enterprises in light of the tremendous technological developments; This is because the levels of effectiveness of the performance of this element are the main factor in achieving excellence, development and determining the value of these institutions; Considering that the efficiency of the human resource is the basis for overcoming all obstacles that the institution may face; Because of the individual's innovative and capabilities and the ability to support his organization and improve its performance [12]

However, the significance of this research is to develop Implementation of a Decision Support System for Human Resources Evaluation and Selection. The Software solutions as a decision support system can be used to make clear and equitable choices, while at the same time enhancing the efficiency of the decision-making process.

In this research, the researcher is going to propose a system that helps human resources to select the appropriate personnel for the program project, according to their skills and characteristics found in their profiles. This system consists of two important components; SRS project requirements and employee profile.

The aim of this study is to develop the Implementation of a Decision Support System for Human Resources Evaluation and Selection. However, the researcher will seek for the appropriate staff for the project according to employee's skills and characteristics using Artificial Intelligence (AI) techniques.

2.RELATED WORK

The study of [2], "An ontology-based approach with which to assign human resources to software projects" The researchers proposed the uses of ontologies of a DSS help human resources to select employee's best to the work new software development project. Ontologies allow the system to discover semantic relatedness among new and previous software project's by means of its requirement's specifications, the system can select people who have participated on similar project's.

The study of [4], "Profile matching and competency based human resources management approaches for employee placement decision support system"

The researchers suggested a methodology for developing an online DSS to customize an employee's location according to company standards. the proposed solution addressed the problem that arose in Presisi Cimanggis Makmur Co, it has been working in the field of plastic injection since 1983 in Cimanggis, where there is insufficient information to describe the actual condition of the employee, and that the information contained in the company in the form of a printed sheet is lost and dispersed easily. One of the main factors for the approach that was used to help HRM in identifying employee competency gap versus job level is matching employee profile. The evaluation refers to a simplified four-stage development process, such as system start up, system analysis, system design, and system implementation.

The study of [5], "Improvements of decision support ystems for public administrations via a mechanism of co-creation of value"The researchers focused on improving the knowledge-based decision support system for human resource management within public administrations according to the dominant service logic model (SDL). In particular, ontology-based data entry procedures are being applied to increase cooperation between the public administration and its employees. The data entry process by defining the term "ontology" improves the quality of the data collected, which helps reduce potential mismatch problems and conducts an appropriate analysis to reduce the skills gap between real and ideal competency profiles for employees. Actions are performed through, Experience the proposed approach in a small test case, as the decision support system reorganized Italian public administrations where people unfortunately participate in activities not close to their competence.

The study of [6], "Mapping RUP roles to small software development teams". The researchers demonstrated the Rational Unified Process (RUP) process to simplify the number of RUP roles. Through this study, they obtained one set of (RUP) roles, without neglecting any critical role in the software development process, can be easily adopted by a develop team Small or medium software projects in this study they presented a complete set of rules of assignment between the roles of RUP and the formation of one of the most important teams in the development of small software.

The study of [3], "Decision model for allocating human resources in information system projects"

Human Resource Allocation (HRA) had been viewed as core processes of the project management of Information Systems (MIS). Based on dynamic programming, the assignment human resources to software development projects is performed. The methodology takes into account the complexity of each project and the capabilities staff and the skills required for the project.

The study of [7], "A knowledge-based evolutionary assistant to software development project scheduling"The researchers have proposed a method to assist project managers in the early stage of project scheduling, and potential project schedules are designed automatically, and our goal is also to employ the most effective staff in each project activity. For this reason, the evaluation of the schedules designed in our approach was developed on the basis of the knowledge available about the competence of the staff participating in each project activities timetable. In this study the researchers proposed an algorithm to solve the problem of project tables. This knowledge-based genetic algorithm designs potential project tables. and each table is designed according to the goal of improving the selection process by selecting the right staff based on available knowledge about the effectiveness of the employees participating in each table. Specifically, this algorithm relies on determining the level of effectiveness of specific groups of employees in

project activities. The researchers conducted a set of different experiments to evaluate the performance of the proposed algorithm. The trials consisted of eight different groups.

The study of [8], "Method and system for implementing workflows and managing staff and engagements" The researchers related to the invention of a program and explained how it was used to carry out workflows and manage contracts and employees. More specifically, this program is related to tracking employee data, participation and workflow, how to use this data to manage employees and assign tasks. Staff related information is entries in the database by the manager and employees and is tracked. Staff related information includes employee availability, ability, and experience. Workflow / task information is entered into the database when any customer submits a request to service the company, or an internal workflow / task is needed for work. Job information includes the nature of work and deadlines. Job information is compared to employee information. A list is created automatically by naming the most suitable personnel for the task's mandate.

The study of [9]. "An integrated DEMATEL and AHP approach for personnel estimation" In this study, the researchers proposed an experimental employee selection model and suggested the use of DEMATEL and the analytical evaluation of the DEMATEL method to prioritize the importance of different criteria and the use of an Analytic Hierarchical process (AHP) that helps us choose the most appropriate employee for the project and (MCDM) approach to support project decisions and arrange alternatives in a detailed order to determine what is best for the project. In order to carry out a serious examination and analysis of previous works, the researcher maintains a table to help determine the contribution that are going to be accomplished in this study.

3. PROPOSED APPROACH

The Plan for Achieving Study Goal to achieve the study goal, the plan is illustrated in Figure 1. to assist the human resource to select the employees and chose three candidates for specific job. This system 's depends on major tenets: employee profiles (CV), ontology, semantic indexing and the DSS

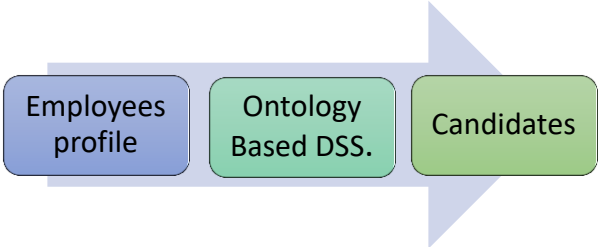

Figure 1: Study Plan

1. System Architecture

The process of workflow is outlined in the following steps (Figure 2):

1- SRS documents review the specifications of the software and assist to define the technical skills and expertise which workers should be implicated throughout the software. However, the SRS documents are semantics annotated throughout order to comply with both the ontology contained in repository. the semantic annotation is used to find similarities.

2- The characteristics of the workers were established into an ontology which allows them to identify the abilities of the workers, everyone expertise and skills surrounding software solutions techniques. In order to comply with ontology stored in an ontological all CVS are annotated semantically. Profiles of staff provide details regarding their experience, skills, education level, major and department. The program introduced here gains from this information so that the top 3 candidates can be chosen in company.

3- When SRS documents are validated they are annotated semantically, which is calculated by the semantic index to signify the value of them as an ontological object. Such values were indeed calculated by adjustment of the genetic algorithm based mostly on incidences of ontological object in each CV.

4- The CV of a work seeker and Employer profile with job listings contained in MySQL database initially

5- The classes in MySQL are accessed and the ontology is used in which weights are allocated to the boundaries among groups. In addition, that semantic of data is computed using the semántic similarity genetic algorithm regard to ontology throughout the prospective candidates and applicant characteristics. The module gives every person a score using the similarities levels for related participants.

6- In addition, there is the front-end layers that provides the user a browser interface that takes input from the candidates by form

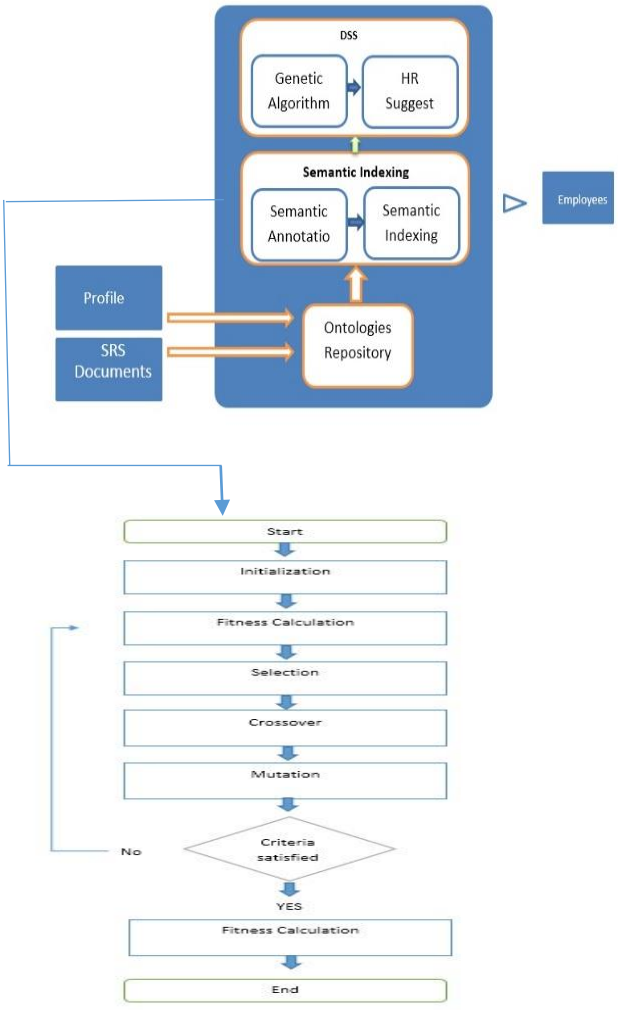

Figure 2: System Architecture

2. Data sources

The used data source for this study was the SRS documents and employee profile.

- **SRS Documents**

The SRS is descriptively defined by documentation arranged for the specifics of the program. It consists of a number of points. Even so, a clear overview of the major sections is provided as the following:
The whole SRS must be addressed in this segment. software should also be given the title, explained whatever the software program would do, the advantages, aims Definition: The specific parameters influencing the program and its needs must be identified. It offers a context in relation to the viewpoint of objects, roles, user rates and features, the operational requirements, development and execution limitations and expectations and commitments.
Requirements of Interface. The details about user interfaces, hardware, software and communications functionalities must be given.
Functions of the system. This must include all software specifications to a reasonable amount of precision to allow the developer to develop or evaluate the system to meet these specifications. This portion may be grouped by event, operating mode, category of users, category of objects, operational structure or combos.

- **Profile**

The current plan must also recognize the expertise of the staff. They suggest an ontology where the qualifications of the participants are identified, highlighting, in comparison to their experience, the expertise and qualifications. This ontology takes not just the demographic details of the candidates but also qualifications, experience, education level, major and department (Figure 3).

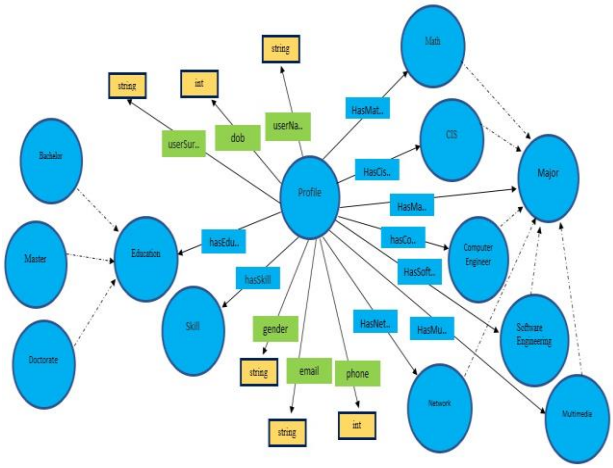

Figure 3: Employees Ontograph

3. Ontology Repository

Throughout this study a systematic overview of a field wherein the DSS proposed is applied. In addition, this ontology database contains all ontological designs often used conduct the upwards of with semantic annotation subsystem. A software engineering technology area has also been developed and introduced to accomplish the principal objective of this study.

4. Semantic indexing module

- **Semantic Annotation**

The SRS documents and employee records are the knowledge tools upon that semantic indexing module is based. natural language techniques are utilized in the treatment of SRS documents to acquire a collection of semantic annotations as per the ontology contained in an ontology repository. The purpose of such a method is to put the SRS document, throughout this case, into a tool that provides a definition of certain characteristics of just a product design concept ontology in relation to a precise definition models [13]. This integration would then enable the DSS to explore semantic similarities among the software projects as well as the statuses of a staff. The semantic analysis to obtain the total score of each CV. However, the genetic algorithm chose the best 3 scores.

- **Semantic Indexing**

This unit, when annotated sémintically, gives value for annotations, so that the ontological structure can represent the importance of the context of the SRS Text. The weight allocation is crucial when it becomes a question of calculating the semántic connectivity between the data sources associated with this study. This method automatically calculates weights dependent mostly on number of occurrences of ontological object for every SRS document via an adjustment of the algorithm [33]. The value of ontological object can be determined with the following formula in particular.

$$(tf - idf)\ i,p = (ni,E\ /\ \sum k\ nk,E) * \log(|E|\ /Ni) \quad (1)$$

ni, p : the amount of occurrences in the SRS
E, $\sum$ knk, p: the sum of the occurrences of all the ontological entities identified in the SRS
E, |E|: the set of all SRS documents
Ni: the number of all SRS with i.
ontological identities which specifically exist in SRS documents are included in the annotations evaluating process. The semantic significance of such texts, the algorithm was used to include not the ontological objects which have relationship with the original.

5. DSS

The Decision Support System profits through feature vectors including its data sources shown in this study to indicate that workers must be chosen for a job by evaluating the semantic relationship between it. Thus, it is important to define its specifications through the SRS. When this tool is developed, the SRS is processed by the semantic indexing system to acquire feature vector.

- **HR Suggest**

The secondary function of DSS is to recommend individuals that should participate, based on experiences, skills and major. The choice of the related employees remains a challenge as many employees have a range of skills to suit the required job. Throughout this regard, the program

suggested incorporates a customizable model that enables human resources, on the basis of the series of trials carried out before deployment within the enterprise, to choose the criterion that best matches their needs. Once a number of applications have been received, all employee profiles must be collected. The HR recommendation module also takes into account the characteristics of workers and their expertise, competencies and training. After getting all profiles, the system must now identify a score for each individual to decide which staff is most suited to the new vacancy. Eventually, the ranking is sorted for all workers. In addition, the program gives data about your CVs for each individual.

6. Genetic Algorithm

Throughout this study, the semantic similarities are among a work profile and a profile for applicants, each with many abilities. Thus, the algorithm measures and achieves a complete semantic similarity of all the qualities of a work category, together with a candidate's category. These are replicated with the job description for a specific candidate profile or conversely on the database. Furthermore, all the opportunities for particular applicant is eligible and then all the applicants accessible qualify to a specific job which constitutes an essential attribute according to semantic similarity, will be reassembled from high to low. The mechanism for the development of more persons, created through parents are reproduction [14]. It is obviously related in nature to the degree of human environmental tolerance, and it is more probable that the mutations will be transmitted. There's many various methods that this conduct can be simulated throughout the algorithm. For such a study, the competition approach utilized operates as continues to follow: participants are selected independently from the participants with best fitting values to allow a crossover to be achieved. Children are brought up whenever the chromosomes among parents mixed. This could be done in a number of forms, including the form of cutting [14]. In figure 2 the flow diagram of GA is shown.

Reputation is a major element in population development as it enables parents to transfer their features to the descendants. Nevertheless, it is subject to intervention as a physical operation, which could cause changes in the descendants. The mutation is the alteration in gene-based combinations that can alter the genes and chromosomal architecture. Without any of the mutations a higher percentage avoids development would've been difficult to alter. The secondary function of DSS is to recommend employees who should be interested in job requirements in line to the experience. This element thus acquires the three most similar CV from the CV TO CV matrix in above figure. The percentage shows the similarities level at the proportion of findings. The choice of the related employees in this framework incorporates a full featured framework that helps HR to choose the level that specifies the conditions of curriculum vitae score out of 100 points. After all individual's CVs have been collected, the system requires to align a rating for each individual to determine what employees fit the job requirements best. The scoring within each individual is thus created by taking the similarity levels of the most CV participating, currently achieved through a percentage calculation. The algorithm is displayed in formula (4)

$$CVscore\ (A, E) = \sum Sim\ (E, Ei) \quad 4$$

Sim (E, Ei) is the similarity rate.

4.EXPERIMENTAL RESULT

- **Case Study**

In this study, in evaluating the utility throughout the profiles similarity and selection of human resources. The program has been implemented in Asp.net and C# which provides graphical user interface that help HR and applicants to select the best candidates for required jobs. The assessment procedure is explained as the following:

Modeling the domain. Domain interpretation is to gain the semantic significance among all data sources that the program uses, and the researcher used the ontology.

The SRS standards enable the company will offer top quality selection process to its employees and they are added to the new software architecture. Consequently, the SRS in each section implements the document structure provided. The design contains data regarding various types of specifications, like technical needs, features and user interface criteria. In addition to the availability of CV2CV matrix, that includes the similarities levels between all CVs, and SRS have been handled via the semantical indexing unit.

Profile. Knowledge relating to staff experience, skills, major, department, was interpreted by ontology. In addition, this information will be recorded in the ontology repository introduced with a SQL data administration.

Experiment. It was conducted once those knowledge sources were identified. Consequently, the below operations were carried out. Twenty-five new CVs were obtained from linked in within the major of computer science, IT, programming and computer engineering. However, it was suggested as well as characterized by the SRS template. The profiles with best fit were selected upon their calculated scores mainly according to the skills, experience and major. Finally, the selected profiles were 3 with the highest scores and were compared to the system results in the study of Paredes-Valverde [2] .

However, to assess the performance, the corresponding quality metrics was utilized:

- **Precision**

The precision measurements are being utilized to demonstrate how helpful is the study results. Precision and recall are monitoring instruments that indicate how well a program does while looking for the records in query. In view of a correct number of documents divided on total papers, it tests how often search documents is important. Equation (5)

Precision =correct/total …… 5

- **Recall**

Recall is close to precision, however aims only at number of documents in query,

Recall = correct / (# of relevant) ……6

- **F-measure**

It seeks to offer a positive measure of efficacy than to recall, and precision by itself is capable of achieving that as well (Table 1 and Table 2).

F-measure =2 (precesion ×recall)/(precesion+recall)

Table 1: Evaluation Results for Proposed Methodology

Profiles	Precision	Recall	F-Measure
1	0.9213	0.8999	0.8721
2	0.9765	0.8887	0.8700
3	0.8974	0.8854	0.8342
4	0.7296	0.8341	0.7342
5	0.8243	0.8089	0.7276
6	0.7456	0.8029	0.7678
7	0.6456	0.8007	0.7000
8	0.6567	0.7999	0.6871
9	0.8000	0.7992	0.8653
10	0.7456	0.7989	0.6890
Average	**0.7942**	**0.8318**	**0.7747**

Table 2 : Evaluation results obtained in [2]

Profiles	Precision	Recall	F-Measure
1	0.9213	0.8999	0.8721
2	0.9765	0.8887	0.8700
3	0.8974	0.8854	0.8342
4	0.7296	0.8341	0.7342
5	0.8243	0.8089	0.7276
6	0.7456	0.8029	0.7678
7	0.6456	0.8007	0.7000
8	0.6567	0.7999	0.6871
9	0.8000	0.7992	0.8653
10	0.7456	0.7989	0.6890
Average	**0.7942**	**0.8318**	**0.7747**

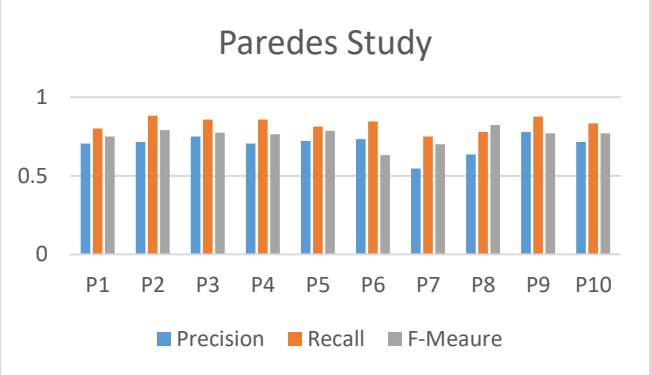

Figure 5 : Paredes Evaluation Results

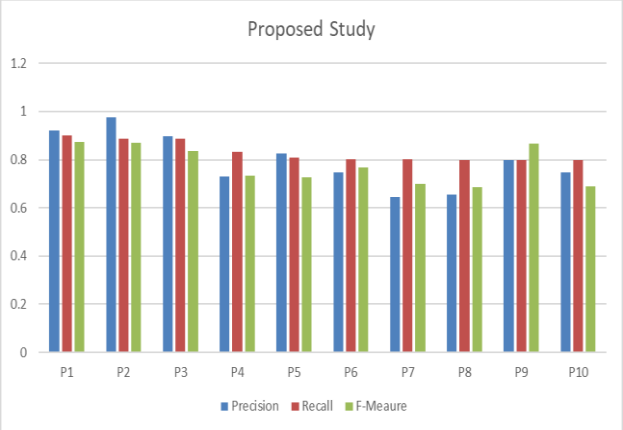

Figure 6 : Proposed Study Evaluation Results

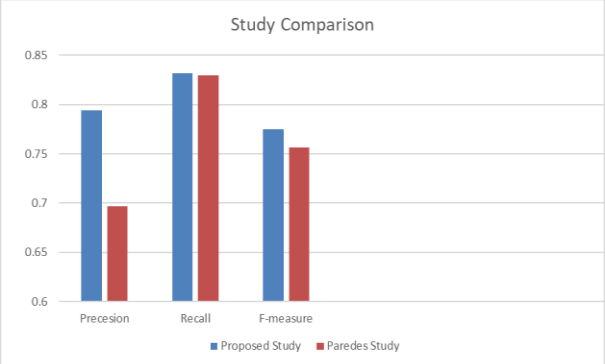

Figure 7 : Evaluation Average Results Comparison

Figure 5 shows Paredes Evaluation Results, figure 6 shows Proposed Study Evaluation Results and figure 7 shows the Evaluation Average Results Comparison.

5.CONCLUSION

In the current study, the described needs, are analyzed by SRL to produce the roles which identify the attributes of selection and evaluation. However, these data were utilized to distinguish cv SRS, as well as utilized by Genetic Algorithm to produce a better classifying method. In the present study, the researcher introduced a semantic-based framework capable of recommending the workers that apply for job by examining the experiences, skills, major and. The plan achieved impressive outcomes via an F-Measurement value of 0.7747 and Precision Value of 0.7942.

In this study, the researcher proposed a system that helps human resources to select the appropriate personnel for the

program project, according to their skills and characteristics found in their profiles. This system consists of two important components: SRS project requirements and employee profile. The study major contribution is the suggestion an ontology that focuses on defining the competencies and experience for workers using the Genetic Algorithm to use the classification rule, and the use of semantic methods in the current thesis, it is the first attempt to create a method that selects the right staff according to their skills and expertise without the intervention of the human factor. To use this system in different companies to reduce time and effort in the selection process. However, any company will be more productive in its various businesses because of choosing the right employee in the right place. The program was created by using C# and Asp.net. The assessment of the classifier accuracy of the resulting classification rule indicates the requiring to create more precise descriptions to improve the SRL.

REFERENCES

1. Armstrong, M. (2006). A handbook of human resource management practice. Kogan Page Publishers.
2. Paredes-Valverde, M. A., del Pilar Salas-Zárate, M., Colomo-Palacios, R., Gómez-Berbís, J. M., & Valencia-García, R. (2018). An ontology-based approach with which to assign human resources to software projects. Science of Computer Programming, 156, 90-103.
3. e Silva, L. C., & Costa, A. P. C. S. (2013). Decision model for allocating human resources in information system projects. International Journal of Project Management, 31(1), 100-108.
4. Nasriyah, R., Arham, Z., & Aini, Q. (2016). Profile matching and competency based human resources management approaches for employee placement decision support system (case study). Asian J. Appl. Sci, 9(2), 75-86.
5. Abbate, T., Bassano, C., D'Aniello, G., Miranda, S., Perano, M., Piciocchi, P., & Rarità, L. (2015). Improvements of decision support systems for public administrations via a mechanism of co-creation of value. Complex Systems Informatics and Modeling Quarterly, (2), 19-30.
6. Borges, P., Monteiro, P., & Machado, R. J. (2012, January). Mapping RUP roles to small software development teams. In International Conference on Software Quality (pp. 59-70). Springer, Berlin, Heidelberg.
7. Yannibelli, V., & Amandi, A. (2011). A knowledge-based evolutionary assistant to software development project scheduling. Expert Systems with Applications, 38(7), 8403-8413
8. Swierz III, N. F., Baron, J., Vroom, B., Powell, M., Loughridge, R., Perreault, S., ... & Poirier, G. (2017). U.S. Patent No. 9,779,386. Washington, DC: U.S. Patent and Trademark Office.
9. Roy, B., Misra, S. K., Gupta, P., & Goswami, A. (2012). An integrated DEMATEL and AHP approach for personnel estimation. International Journal of Computer Science and Information Technology & Security, 2(6), 1206-1212.
10. DeCenzo, D. A., Robbins, S. P., & Verhulst, S. L. (2016). Fundamentals of human resource management. John Wiley & Sons.
11. Quintero, A., Konaré, D., & Pierre, S. (2005). Prototyping an intelligent decision support system for improving urban infrastructures management. European journal of operational research, 162(3), 654-672.
12. Aryanto, R., Fontana, A., &Afiff, A. Z. (2015). Strategic human resource management, innovation capability and performance: An empirical study in Indonesia software industry. Procedia-Social and Behavioral Sciences, 211, 874-879.
13. Andrews, P., Zaihrayeu, I., & Pane, J. (2012). A classification of semantic annotation systems. Semantic Web, 3(3), 223-248.
14. Barcellos, J. C. H. D. (2000). Algoritmosgenéticosadaptativos: um estudocomparativo (Doctoral dissertation, Universidade de São Paulo).