CHAPTER 3

INTRODUCTION TO DESIGN OPTIMIZED RULES FOR EMPLOYABILITY

3.1 Employability

The two highest anxieties of employers are to finding respectable workers and prepare them. The skills gap is the gap between the skills desired on the job and those influenced by the applicants. Companies would prefer to appoint people who are trained and prepared to perform desired work. Companies are generally willing to deliver the job specific training which is very mandatory for those lacking such skills. Most negotiation concerning workforce ultimately turn to employability skills. Employability skills are the elementary skills which are essential for receiving, observing, and doing well on a job**.** These are the skills, attitudes and activities that allow workers to acquire along with their associated workers and administrators to make sound and precarious decisions. Employability skills are generally divided into three skill sets first is basic academic skills (Education), second is higher-order thinking skills (Understanding Power) and third is personal qualities (Personal Development). The employability skill-Education includes reading, writing, oral communication and listening. The second one- Understanding Power includes learning, reasoning, thinking, creatively decisions and making problem solving. The employability skill-Personal Development includes social skills, self-confidence, self-control, integrity, honest, adaptable, self-motivated, self-directed, self-management, attitude, good work, well groomed and cooperative approach.

Employability is a person's potential for maintaining employment. Employability depends on the education, personal development and understanding power. Employability is the ability to achieve initial employment, to maintain it and to acquire new one, if required. Employability Skills defined as the convenient skills desired by a human being to make them employable. Along with superior technical appreciative and subject awareness, employers frequently sketch out a set of skills that they would like from an employee. The most employability skills which are generally looked in a potential employee are communication, teamwork, problem solving, positive attitude, self-management, learning and information technology, numeracy, planning and organizing. Employability depends on your knowledge, skills and attitudes that boost the employee's ability. The employability skills profile has been widely used by employers, educators, career counselors, as well as other interested organizations [115]. Table 3.1 shows the classification of basic employability skills.

Table 3. Classification of Basic Employability Skills

Education (Academic skills)	**Personal Development** (Higher order thinking skills)	**Understanding Power** (Personal qualities)
Education includes:- • Writing • Reading • Listening • Oral communication	**Personal Development includes:-** • Reasoning • Learning • Thinking • Creatively decisions	**Understanding Power includes:-** • Self confidence • Honest • Integrity • Adaptable • Self-management • Self-directed Self-motivated • Self-control • Cooperative

Employability is a set of three achievements that are skills, understandings and personal attributes which create gradates more prospective to increase employment and be successful in their preferred professions, which profits themselves, the community, the budget and the labor force. It moreover boosts student's capability to protected rewarding and satisfying consequences in their social, economic and community lives. In the present scenario almost each job includes the need for staff that communicates professionally with each other, understand the needs and give good service to their clients, work in a team, adaptability, willingness and flexibility.

Employability having approximately three abilities:

- Achieve preliminary employment
- Preserving employment
- Gaining new employment if required.

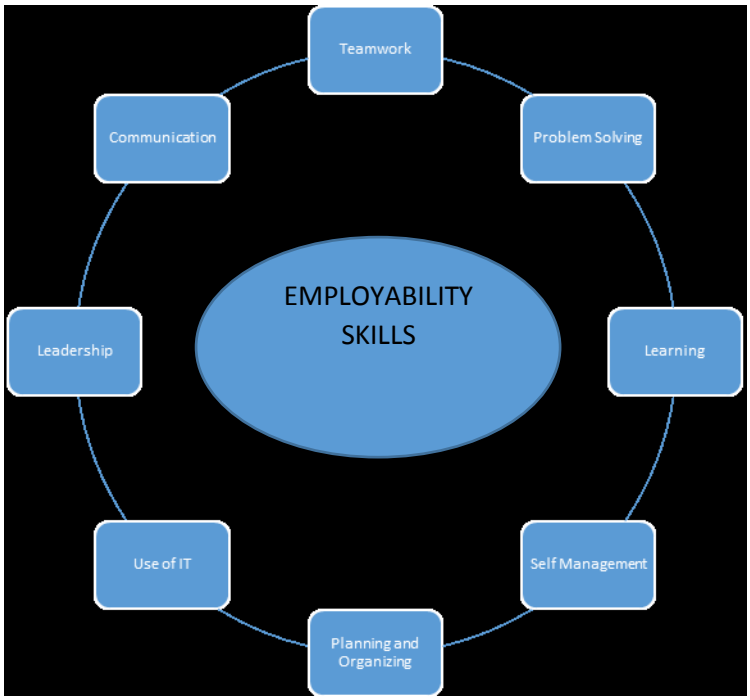

Figure 3. Most employability skills look in potential employees

3.1.1 The Employability Skills

Teamwork: - Teamwork includes the working with others to accomplish results and identifying the value of others contributions and concepts. The effective teamwork skills are established by taking different roles in a team, functioning independently or as a part of a team, giving beneficial criticism, being able to recognize strengths and faults of team participants and working with people of different religions, genders, races or political influences.

Planning and Organizing: - Planning and Organizing involves the ability to recognize that what is essential in a specified situation and to manage persons and resources efficiently to succeed results. It also includes being able to manage time powerfully and primacies what tasks essential to be completed to achieve an inclusive goal. The effective Planning and Organizing skills are established by managing time and primacies, allocating people and further resources to tasks, establishing clear project goals and deliverables, collecting, analyzing and organizing information and time management.

Self-Management:- Self-management skills rise to the ability to revenue duty for your own schedules and life direction, and to set goals and successfully complete them. It includes setting practicable goals and using your time and resources successfully to achieve them. The effective self-management skills are established by taking responsibility, expressing one's ideas and visualization, planning fast and consuming a personal vision and goals and estimating and observing one's own performance.

Communication: - Communication is maybe the most required after skills by most employers and includes fundamentals such as being a worthy listener, explaining things to persons from different circumstances and presenting a perfect case. The effective self-

management skills are established by negotiating, writing and speaking in languages other than English and listening and understanding evidence.

Problem Solving and Creativity: - Problem Solving and Creativity involves being able to propose an explanation to a problem by examining a situation and employed out how to reach at a satisfactory outcome. It often includes making optimal use of accessible resources and procuring others to achieve an outcome. The effective self-management skills are established by solving problems in groups, applying a variety of approaches to problem solving and determining customer complaints satisfactorily.

Learning: - Learning skills refers to your ability to achieve your own learning and contribute to ongoing improvement and expansion in your own knowledge and skill set. This also denotes to your ability to learn workplace skills and expectations specific to your organization. The effective self-management skills are established by contributing to the knowledge community at the workstation, open to innovative thoughts and techniques and prepared to spend time and effort into learning innovative skills

Use of Information Technology: - Information Technology involves being able to preserve abreast of present technology and apply it to difficulties, as well as the capability to embrace life-long knowledge in the field of technology. The effective self-management skills are established by being prepared to acquire new IT skills, selecting the suitable technology for a specified task and having a variety of basic IT skills.

Leadership: -It is the art of leading a group of people or an association, or the ability to do this. The skill to influence others to act in order to accomplish a common goal and to use the skills and knowledge of team members to work productively together.

Leadership in association has a specific focus on decision-making leadership in large. Organizations and is an effort at bridge the inlet between academics and management practitioners.

3.1.2 Application of Employability

The devotion within advanced education to increasing student's employability potentially helps a number of significant purposes. First, it reacts to students' motivations for inflowing higher education. A survey of school students originate that the most significant personal reasons mentioned for going to university were beside to study a subject that really suits them and three vocationally oriented causes to increase job prospects, to have a professional career and to achieve entrance to a well-paid career. Each of these four causes was evaluated by around four-fifths as extremely or very important [106]. Where tuition fees are payable, such vocational inspirations are likely to be supported. Second, it reacts to policy concerns in two salutations; an important part of the motivation for the huge sums which the Government finances in higher education is the involvement which it creates to the development of the country's human capital [107]. The further employable students are the superior. The economic revenue is likely to be from this investment. Increasing higher education is also considered to attend social-equity goals by growing access for disadvantaged groups. To achieve such goals, devotion needs to be rewarded not only to confirm the participation of these groups in higher education but also to enhance their consequent success in the employment market [108]. Third, far away from depression wider academic principles it can be deduced as reinforcing such values in three salutations by underlining generic aptitudes rather than straight subject relevance, it can help to fight stealing occupational in terms of course content, and to legitimize the

remaining value of traditional academic corrections. Over two-thirds of graduate opportunities in the UK are for graduates in any subject [109]; companies tend to be much more concerned with standard graduate attributes than with subject knowledge [110]. A detailed study of employability in Information Communication Technology carried out by M. de Hoyos [111]. Employability in Europe: enhancing post graduate complementary skills training projected by GP Wall and CP Welsch [112]. Factors Influencing the acquirement of Employability Skills by Students of Selected Technical Secondary School in Malaysia proposed by Jovinia Danialand Shamsiah Mohamed [113]. Research for Application of the "Internet of Things" in University's Teaching Management proposed by CJ Zong, BX Jia, and Y Zhang [114].

Employability in Europe, enhancing post graduate complementary skills training proposed by G P Wall and C P Welsch [132]. Aim of this paper to enhance the employability of researchers by providing both generic training and subject specific from a diversity of academic and industry instructors. With this influence, the training impression is presented and student criticism summarized as a means of appreciating the benefits, or otherwise, derived from such trainings. Literature Review on Employability, Inclusion and ICT, Report 2 proposed by M de Hoyos [133]. Customer relationship management, an empirical study of new media intervention in Iranian and Indian corporate houses proposed by Dr. BP Guru and F. Ghanbari [134]. The objective of Customer Relationship Management is to spread out to the customers who are the most significant segment of stakeholders from the observation of organizational development. A good agreement of interest has been stimulated in India and abroad on the new media, which are necessary for meaningful communications between the customers and modern organizations. Factors Influencing

the Acquisition of Employability Skills by Students of Selected Technical Secondary School in Malaysia proposed by J. Danial and S. Mohamed [135]. The main objective of the study was to measure the achievement of employability skills by professional students in Malaysia. A total of 214 students contributed in the study. We used the SCANS mechanism to assess professional students' employability skills.

Case study Integrating Essential Employability Skills in Community-Based Trade Training Programs proposed by Holland College. Case study Integrating Essential Employability Skills into Applied/Professional Degree Programs proposed by Kwantlen University and Mount Royal College. Case study Integrating Essential Employability Skills College-Wide: The Generic/Employability Skills Initiative at Humber College proposed by George Brown College. Case study "How Colleges and Institutes Support Essential Employability Skills Development for Aboriginal Students" is proposed by Saskatchewan Institute of Applied Science and Technology. Case study The Development of Essential Employability Skills in Technical Training Programs in Québec: An Integrated Institution/Industry Approach proposed by Cegep de Sorel-Tracy. Case study Assessment and Evaluation of Essential Employability Skills proposed by Bow Valley College. Case study "expediting the Transition of Immigrants to the Canadian Workplace" is proposed by George Brown College [136]. Case study Provision for young people not in education employment or training, Education and training a college-based young apprenticeship programmed for 14-16 year olds which allows able and well-motivated pupils to gain experience of real work and a work-based Apprenticeship in Business Administration course proposed by Jim Neilson Director, South West Regional Skills Partnership [137].

Innumerable applications of fuzzy logic have piercing a method for an operational exploitation of fuzzy logic in the framework of challenging processes. Fuzzy logic is a modeling method well suited for the control of complex and non-linear systems [116]. Control design of an ankle foot orthosis with the application of fuzzy logic is proposed by M. Kanthi, V. I. George and H. S. Mruthyunjaya [117]. Type-2 Fuzzy Logic in Decision Support Systems is proposed by Comas and Diego S [Comas]. Fuzzy Logic Applications in Flanges Manufacturing proposed by Turc, Cristian Gheorghe and George Belgiu[118]. Combining Boolean consistent fuzzy logic and ahp illustrated on the web service selection problem proposed by Dragovic and Ivana [119]. Application of the L-fuzzy concept analysis in the morphological image and signal processing proposed by Alcalde, Cristina, Ana Burusco, and Ramón Fuentes-González [120]. "Intelligent maximum power point trackers for photovoltaic applications using FPGA chip" proposed by Chekired [121]. Interval type-2 fuzzy weight adjustment for back propagation neural networks with application in time series prediction is proposed by Gaxiola and Fernando [122]. Fuzzy Logic Applications in Control Theory and Systems Biology proposed by Xu and Sendren Sheng-Dong [123]. New Applications of Soft Computing, Artificial Intelligence, Fuzzy Logic & Genetic Algorithm in Bioinformatics proposed by A. T. Hiwarkar, and R. Sridhar Iyer [124]. Application of a model based on fuzzy logic for evaluating nursing diagnostic accuracy of students proposed by MHBM Lopes [125].

3.2 Employability Valuation through Fuzzification

The employability valuation through fuzzification is an innovative framework in respects to employability assessment through fuzzification. It examines the fuzzified optimal assessment for

employability skills with the help of some fuzzy rules. The concern research involves three employability skills Education, Personal development and Understanding power. These skills used as an input which will result in future finding towards a new crisp range for fuzzified employability.

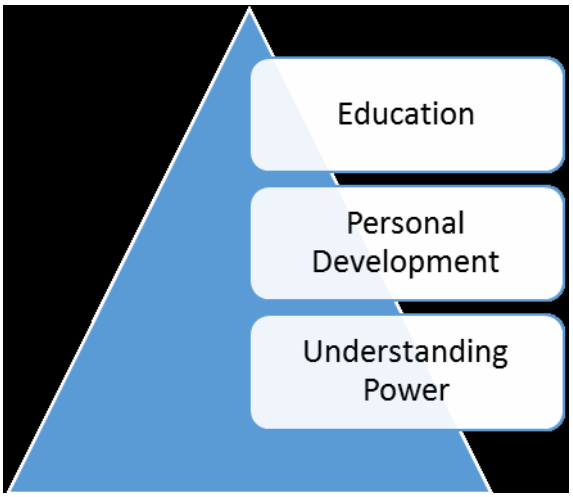

Figure 3. Three Employability Skills Use as Input

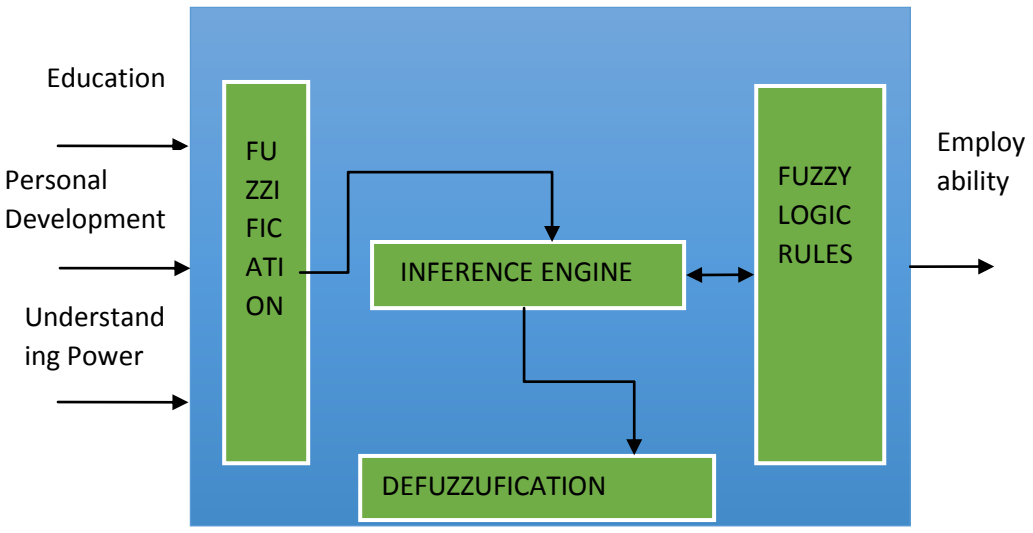

Figure 3. Architecture of employability valuation

This section use suitable linguistic variables as input and output to compute a crisp value for employability skills. Education (E), Personal Development (PD) and Understanding Power (UP) are the input variables and employability skills (ES) is output variable. The figure 3.2 shows the three input variables. The figure 3.3 shows the proposed architecture of employability valuation.

3.3 Fuzzified Expert System for Employability Assessments

The fuzzified expert system for employability assessment initiates a ground-breaking expert system for appraisal of employability with the help of some fuzzy rules. These rules are basically used to examine the optimal assessment for employability. This employability deals with some fuzzy rules and these rules are based on employability skills.

This work is proposed to compute the Employability Skills for any employee with the help of Mamdani type inference. This work use appropriate linguistic variables as input and output to compute a crisp value for employability skills. Education (E), Personal Development (PD) and Understanding Power (UP) measured as Low, Medium and High. Employability skills (ES) measured as Very Low, Low, Medium, High and Very High. The proposed skills are a collection of linguistic fuzzy rules which describe the relationship between defined input variables (E, PD and UP) and output (ES). Figure 3.4 show the proposed architecture of the fuzzified expert system.

3.3.1 Fuzzy Rules

Table 3.2 contains the membership functions and range of input variables named as education, employability and understanding power. Table 3.3 contains membership function and range of output

variable named as employability. Table 3.4 contains the twenty seven rules which are based on IF THEN statement such as **IF E is low and PD is low and UP is low THEN ES is low.**

These rules compute the crisp value using centroid defuzzification method of Mamdani inference in Mat-lab that represents the employability skill of each and every employee.

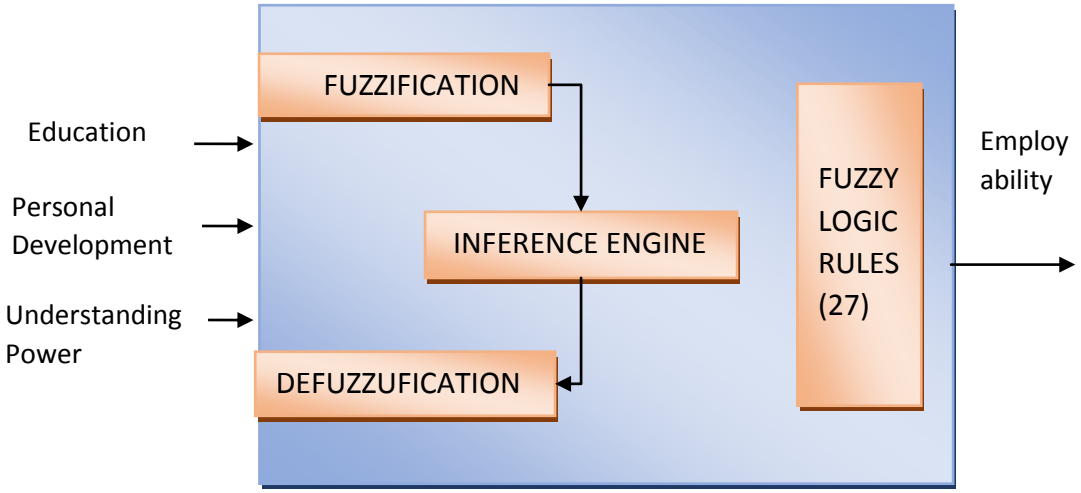

Figure 3. Architecture of fuzzified expert system

Table 3. Membership function and range of input variables "Education, Personal Development and Understanding Power"

Education	**Personal Development**	**Understanding Power**	**Range**
Low	Low	Low	0-4
Medium	Medium	Medium	2-8
High	High	High	6-10

Table 3. Membership function and range of output variable "Employability"

Employability	**Range**
Very Low	0-2
Low	1-4
Medium	3-6
High	5-8
Very High	7-10

Figure 3.5 shows the membership function of input variable education, membership function of input variable personal development, input variable understanding power and membership function of output variable

employability in figure 3.6 to 3.8. Figure 3.9 outlines the rules of employability.

Table 3. Set of proposed rules

R No	Education	Personal Development	Understanding Power	Employability
1	Low	Low	Low	Very Low
2	Low	Low	Medium	Very Low
3	Low	Low	High	Low
4	Low	Medium	Low	Very Low
5	Low	Medium	Medium	Medium
6	Low	Medium	High	Medium
7	Low	High	Low	Low
8	Low	High	Medium	Medium
9	Low	High	High	Medium
10	Medium	Low	Low	Very Low
11	Medium	Low	Medium	Medium
12	Medium	Low	High	Low
13	Medium	Medium	Low	Medium
14	Medium	Medium	Medium	Medium
15	Medium	Medium	High	High
16	Medium	High	Low	Medium
17	Medium	High	Medium	High
18	Medium	High	High	Very High
19	High	Low	Low	Low
20	High	Low	Medium	Medium
21	High	Low	High	Medium
22	High	Medium	Low	High
23	High	Medium	Medium	High
24	High	Medium	High	Very High
25	High	High	Low	High
26	High	High	Medium	Very High
27	High	High	High	Very High

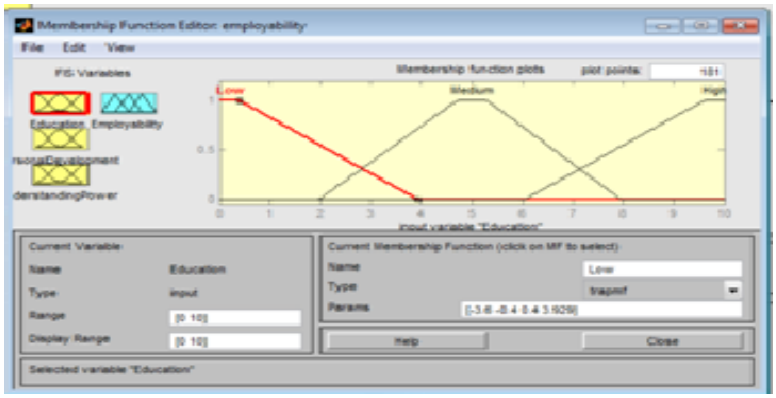

Figure 3. Input Variable “Education”

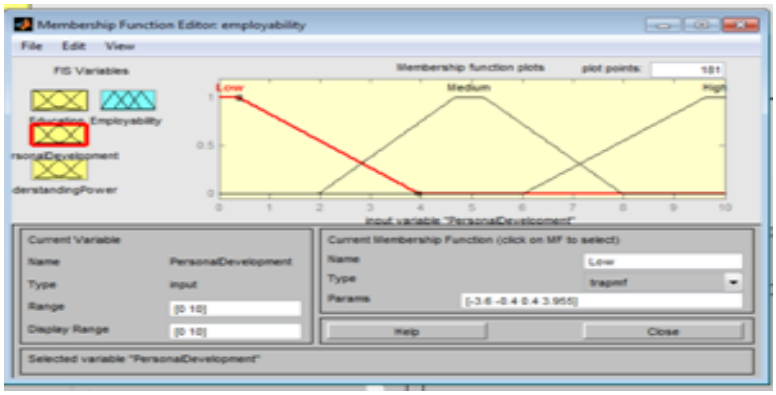

Figure 3. Input Variable “Personal Development”

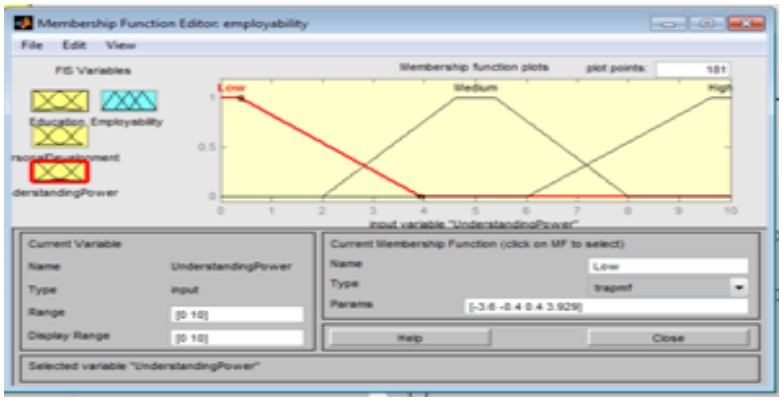

Figure 3. Input Variable “Understanding Power”

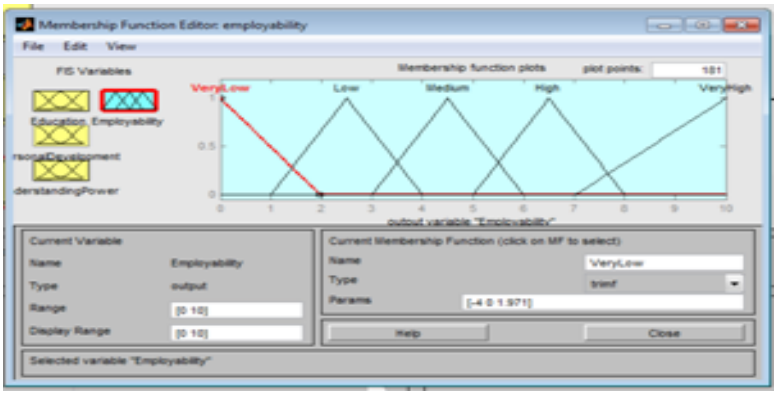

Figure 3. Output Variable "Employability"

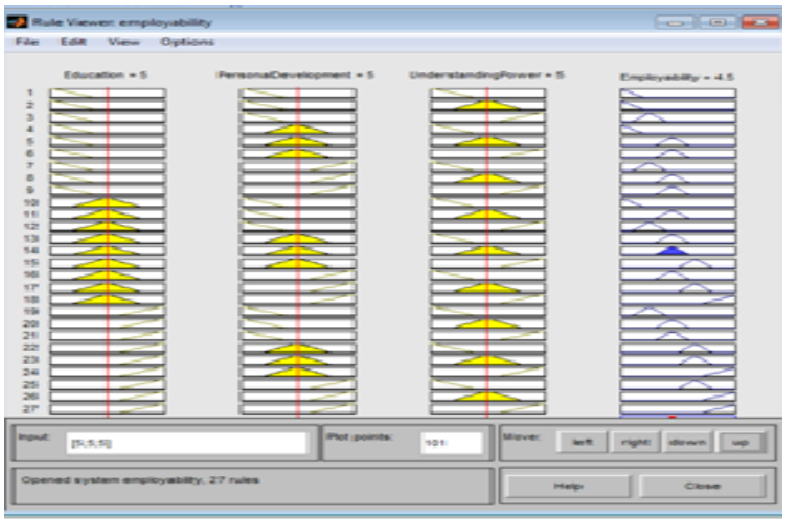

Figure 3. Rules of employability

3.4 Adaptive Neural Fuzzy Inference System for Employability Assessment

This work introduced an innovative adaptive neural fuzzy inference system for employability with the help of some neuro fuzzy rules. These neuro fuzzy rules are ultimately used for examine the best valuation for employability. This employability deals with some neuro fuzzy rules and these rules are based on three employability skills named as education, Personal Development and Understanding

Power. This work is proposed to compute the Employability Level for any employee with the help of Takagi Sugeno type inference.

This concern research use suitable linguistic variables as input and output to calculate a crisp value for employability. Education (E), Personal Development (PD) and Understanding Power (UP) measured as Low, Medium and High and Employability skills (ES) measured as Very Low, Low, Medium, High and Very High. The recommended skills is a gathering of linguistic neuro fuzzy rules which designate the relationship between input variables (E, PD and UP) and output (ES).

3.4.1. Fuzzy Rules

Table 3.5 encloses the membership functions and range of input variables named as education, employability and understanding power. Table 3.6 encloses membership function and range of output variable named as employability.

Table 3. Membership function and range of input variables "Education, Personal Development and Understanding Power"

Education	**Personal Development**	**Understanding Power**	**Range**
Low	Low	Low	0-4
Medium	Medium	Medium	2-8
High	High	High	6-10

Table 3. Membership function and range of output variable "Employability"

Employability	**Range**
Very Low	0-2
Low	1-4
Medium	3-6
High	5-8
Very High	7-10

Table 3. Set of proposed rules

Rule No	Education	Personal Development	Understanding Power	Employability
1	Low	Low	Low	Very Low
2	Low	Low	Medium	Very Low
3	Low	Low	High	Low
4	Low	Medium	Low	Very Low
5	Low	Medium	Medium	Medium
6	Low	Medium	High	Medium
7	Low	High	Low	Low
8	Low	High	Medium	Medium
9	Low	High	High	Medium
10	Medium	Low	Low	Very Low
11	Medium	Low	Medium	Low
12	Medium	Low	High	Medium
13	Medium	Medium	Low	Medium
14	Medium	Medium	Medium	Medium
15	Medium	Medium	High	High
16	Medium	High	Low	Medium
17	Medium	High	Medium	High
18	Medium	High	High	Very High
19	High	Low	Low	Low
20	High	Low	Medium	Medium
21	High	Low	High	Medium
22	High	Medium	Low	High
23	High	Medium	Medium	High
24	High	Medium	High	Very High
25	High	High	Low	High
26	High	High	Medium	Very High
27	High	High	High	Very High

Table 3.7 encloses the twenty seven rules which are built on IF THEN statement such as

IF E is high and PD is high and UP is high THEN ES is high.

These rules are used for calculate the crisp value using a centroid defuzzification technique of Sugeno type inference in the Mat - lab that signifies the employability level of each and every employee.

Figure 3.10 shows the FIS editor of employability skills. Figure 3.11 shows the membership function of input variable education, figure 3.12 shows input variable personal development, figure 3.13 shows input variable understanding power, figure 3.14 shows output variable employability, figure 3.15 shows ANFIS structure and figure 3.16 outlines rules of employability.

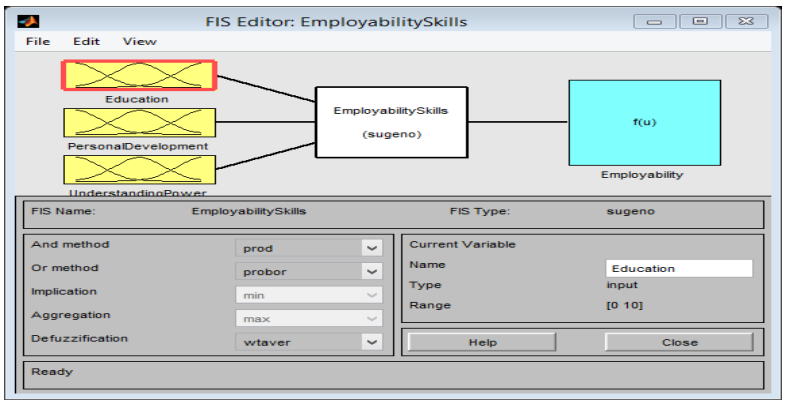

Figure 3. FIS Editor of employability skills

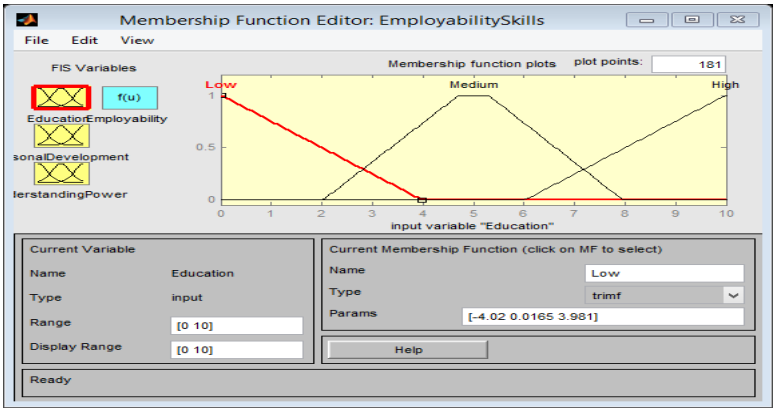

Figure 3. Input Variable “Education”

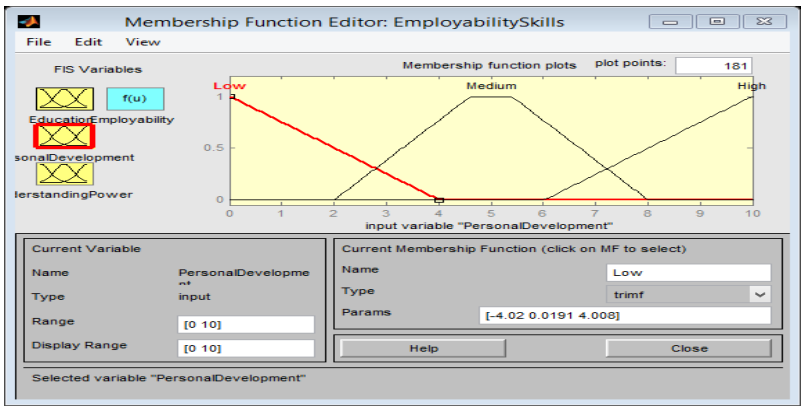

Figure 3. Input Variable "Personal Development"

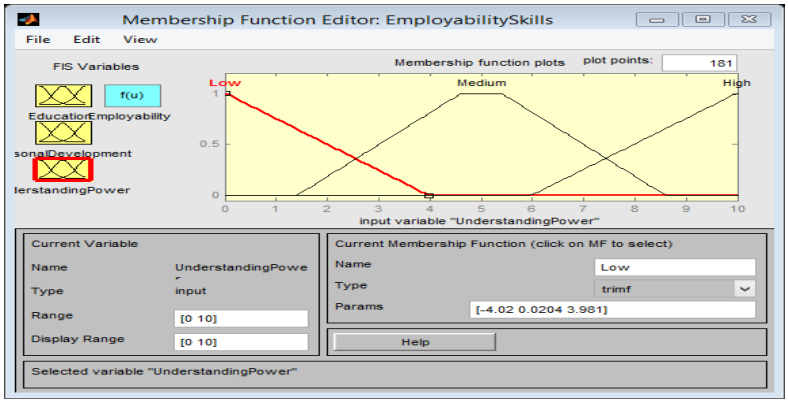

Figure 3. Input Variable "Understanding Power"

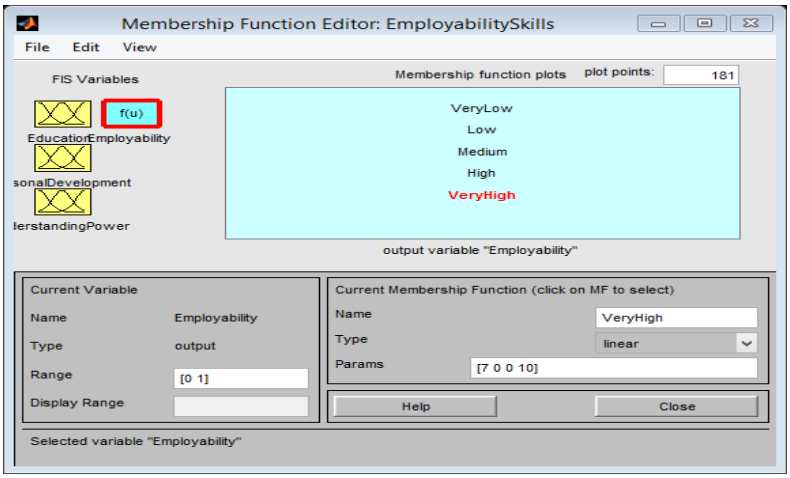

Figure 3. Output Variable "Employability"

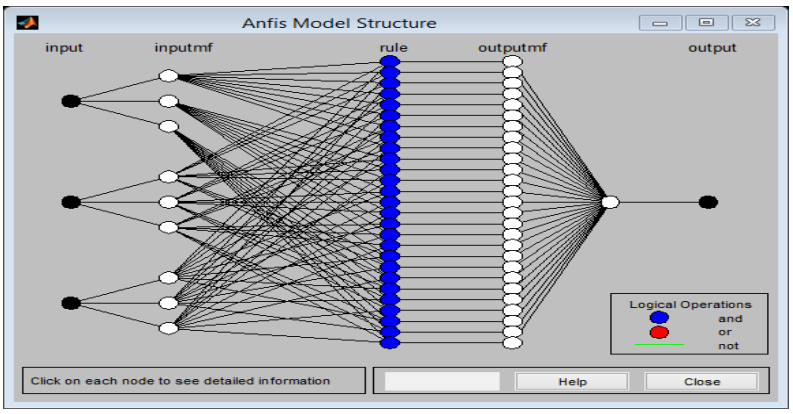

Figure 3. ANFIS Structure for Employability

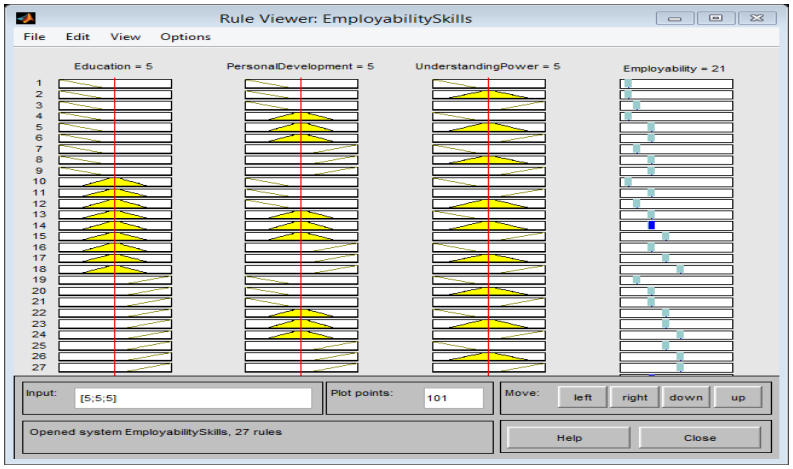

Figure 3. Rules for Employability Skills

3.5 Comparison between Employability through Fuzzy Logic and Neuro Fuzzy Logic

Table 3. Employability through Fuzzy Logic and Neuro Fuzzy Logic

Input variables			Output	
Education	**Personal Development**	**Understanding Power**	**Employability (Fuzzy Logic)**	**Employability (Neuro Fuzzy Logic)**
5	7.17	5	5.53	6.95
1.75	1.63	2.59	0.811	2
6.93	2.47	3.31	3.6	5.34
6.57	7.29	8.49	7.8	9.2
9.94	8.86	9.34	8.96	10

The adaptive neural fuzzy inference system gives the better result as compare to fuzzified expert system for employability assessment. The adaptive neural fuzzy inference system operates inputs based on neuro fuzzy rules rather than fuzzy rules.

3.6 Conclusion

This chapter proposed an expert system for employability valuation. The proposed system finds the capability or level of any employee with the help of three employability skills. Subsequently a fuzzified expert system for employability assessment and an adaptive neural fuzzy inference system for employability assessment are proposed. System with fuzzy logic control and neural fuzzy logic control are compared and it is observed that system with neural fuzzy logic control gives better performance.