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The Implementation of Decision Support System in Recruiting Prospectives Employees at SMK Telkom Malang Using Fuzzy Tsukamoto Method

Bias Damiasa[1]
Magistrate of Vocational Education, Malang State University
biasd30@gmail.com

Pashatania Fitri Indah Lestari[2]
Magistrate of Vocational Education, Malang State University
pashatania.lestari@gmail.com

Anik Nur Handayani[3]
Magistrate of Vocational Education, Malang State University
aniknur.ft@um.ac.id

Abstract—Vocational graduates are expected to fill job vacancies according to the needs of the business / industry. With the increasingly fierce labor market competition, graduates from Vocational High Schools are expected to not only have competency but also excellent soft skills in order to have a great chance of being accepted to work in the desired industry. PT. Visionet Internasional is one of the companies that from year to year always conducts recruitment process for prospective employees from 12th grade students at SMK Telkom Malang. The number of students willing to participate in the program which are not balanced with the number of staff and the short amount of time to select prospective employees is feared to affect the final results of recruitment. To get the expected results, a decision support system was developed to provide recommendations for PT Visionet in accepting or rejecting prospective candidates. This system is web based and applies the Fuzzy Tsukamoto algorithm. The Spearman Correlation test used to compare the results from system and experts shows a high level of accuracy, with rs value 0.739394.

Keywords: Decision Support System, Recruitment, Fuzzy Tsukamoto

I. INTRODUCTION

In SMK Telkom Malang, the absorption of graduates, both from the Department of Software Engineering (RPL) and Computer and Network Engineering (TKJ), is high. One of the ways that many 12th grade students do to be absorbed by the workforce is by utilizing the recruitment process held in schools. Several different industries engaged in Information Technology came to SMK Telkom Malang to find and recruit prospective graduates with the required qualifications. One company that from year to year always does the recruitment process for prospective employees at Telkom Malang Vocational School is PT Visionet Internasional, or more commonly referred to as Visionet. Telkom Malang Vocational School is considered to have students with the skills and soft skills needed by the company. In collaboration with the Industrial Relations Unit of SMK Telkom Malang, the recruitment process held in this school is always in great demand because it makes it easier for students in the process of finding employment.

Some staff are specifically brought in directly from the office based in Tangerang to conduct recruitment which lasted for two to three days. However, the number of candidates who are not balanced with the number of staff and the short time to select prospective employees is feared to affect the final recruitment results. To get the expected results, an objective recruitment mechanism is needed but also efficient to capture the best prospective employees. This is important because employee qualifications can influence the productivity and earnings of the company.

Based on that background, a web application is developed to be a solution in supporting the recruitment process of Visionet prospective employees conducted at SMK Telkom Malang. This application acts as a decision support system that can help companies, in this case Visionet, to make decisions regarding the best candidates to be recruited as employees. This application implements the Fuzzy Tsukamoto Method to achieve objective and efficient recruitment results.

This study aims to develop web applications that are able to act as a decision support system in determining Visionet's best prospective candidates more objectively and efficiently.

II. RELATED WORKS

Several previous researches have applied the Fuzzy Tsukamoto Method to solve the same problem. The first one is "Selection of Prospective Employees Using Fuzzy Tsukamoto" which aims as a tool for decision making to determine the best prospective employees based on the value of the variables that have been determined by the company. The values of these variables are then calculated using the Tsukamoto fuzzy method. The ranking of the results of the Tsukamoto FIS is compared with the ranking produced by experts using the Spearman correlation test. The correlation test value of 0.6136 indicates that the system has produced an accurate solution. [1]

The second research is "Tsukamoto Fuzzy Inference System To Determine the Feasibility of Prospective Employees" of which goal is to help companies to make decisions and choose prospective employees who really deserve to be accepted. To test the accuracy between expert

ranking and the system, Spearman's non parametric correlation test was used. Correlation test produces an accuracy value of 0.952 which means the level of accuracy between experts and the system is very high. [2]

Based on the results of both researches, it can be concluded that the system or application that applies the Fuzzy Tsukamoto Method can be used as a decision support in determining the best prospective employee in a company. Both studies show that the system shows accurate results when compared with expert results.

III. METHOD

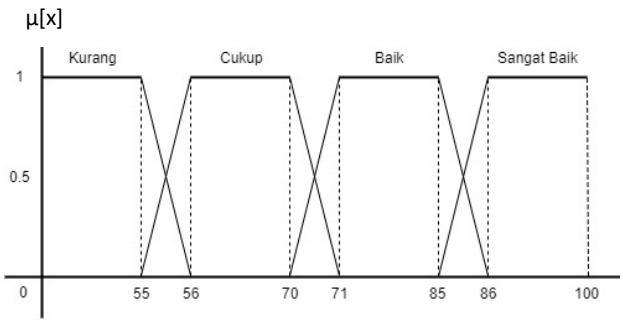
1. Formation of Fuzzy Sets

Input and output variables in the Tsukamoto method consist of one or more sets. For input variables, the system uses the qualifications needed by Visionet. Meanwhile, the output variable is a recommendation for prospective employee recruitment.

Fuzzy sets are entities that represent a certain condition or condition in a fuzzy variable. There are four linguistic variables used, including KURANG, CUKUP, BAIK, and SANGAT BAIK. The formation of this fuzzy set is adjusted to the provisions stated on the report cards of 12th grade students at SMK Telkom Malang. Linguistic variables are combined with fuzzy sets, each of which has a defined membership function. The following is a modeling of the membership function of each input variable an ership function.

μ[z]

a) Score on Web Programming



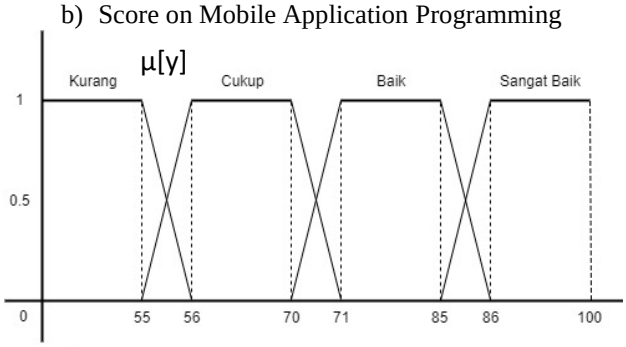
$$\mu\, KURANGWeb\,(x) = \begin{cases} 1 & 0 \le x \le 55 \\ (56-x)/(56-55) & 55 < x < 56 \\ 0 & x \ge 56 \end{cases}$$

$$\mu\, CUKUPWeb\,(x) = \begin{cases} (x-55)/(56-55) & 55 < x < 56 \\ 1 & 56 \le x \le 70 \\ (71-x)/(71-70) & 70 \le x \le 71 \\ 0 & x \ge 71 \end{cases}$$

$$\mu\, BAIKWeb\,(x) = \begin{cases} (x-70)/(71-70) & 70 < x < 71 \\ 1 & 71 \le x \le 85 \\ (86-x)/(86-85) & 85 \le x \le 86 \\ 0 & x \ge 86 \end{cases}$$

$$\mu\, SANGATBAIKWeb\,(x) = \begin{cases} (x-85)/(86-85) & 85 < x < 86 \\ 1 & 86 \le x \le 100 \\ 0 & x \ge 100 \end{cases}$$

b) Score on Mobile Application Programming



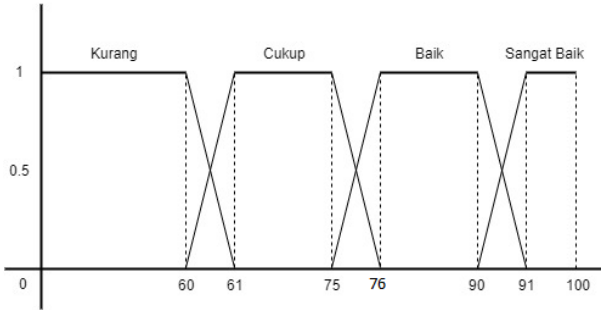
$$\mu\, KURANGWeb\,(x) = \begin{cases} 1 & 0 \le x \le 55 \\ (56-x)/(56-55) & 55 < x < 56 \\ 0 & x \ge 56 \end{cases}$$

$$\mu\, CUKUPWeb\,(x) = \begin{cases} (x-55)/(56-55) & 55 < x < 56 \\ 1 & 56 \le x \le 70 \\ (71-x)/(71-70) & 70 \le x \le 71 \\ 0 & x \ge 71 \end{cases}$$

$$\mu\, BAIKWeb\,(x) = \begin{cases} (x-70)/(71-70) & 70 < x < 71 \\ 1 & 71 \le x \le 85 \\ (86-x)/(86-85) & 85 \le x \le 86 \\ 0 & x \ge 86 \end{cases}$$

$$\mu\, SANGATBAIKWeb\,(x) = \begin{cases} (x-85)/(86-85) & 85 < x < 86 \\ 1 & 86 \le x \le 100 \\ 0 & x \ge 100 \end{cases}$$

c) Softskill



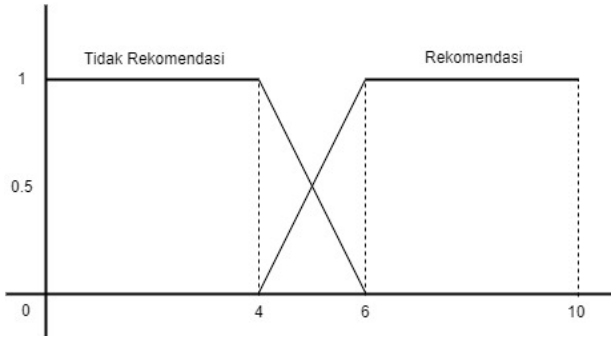
$$\mu\, KURANGSoftskill(z) = \begin{cases} 1 & , 0 \le z \le 60 \\ (61-z)/(61-60) & , 60 < z < 61 \\ 0 & , z \ge 61 \end{cases}$$

$$\mu\, CUKUPSoftskill(z) = \begin{cases} (z-60)/(61-60) & , 60 < y < 61 \\ 1 & , 61 \le y \le 75 \\ (75-z)/(76-75) & , 75 < y < 76 \\ 0 & , y \ge 76 \end{cases}$$

$$\mu\, BAIKSoftskill(z) = \begin{cases} (y-75)/(76-75) & , 75 < y < 76 \\ 1 & , 76 \le y \le 90 \\ (91-y)/(91-90) & , 90 < y < 91 \\ 0 & , y \ge 91 \end{cases}$$

$$\mu\, SANGATBAIK\,(Z) = \begin{cases} (z-90)/(91-90) & , 90 < y < 91 \\ 1 & , 91 \le y \le 100 \\ 0 & , 91 > 100 \end{cases}$$

Meanwhile, the output variable which acts as a decision support has three linguistic variables, including TIDAK REKOMENDASI and REKOMENDASI. Output variables are modeled as follows.



.

$$\mu\, TIDAKREKOMENDASI(x) = \begin{cases} 1 & , 0 \le x \le 4 \\ (6-x)/(6-4) & , 4 < x < 6 \\ 0 & , x \ge 6 \end{cases}$$

$$\mu\, REKOMENDASI(x) = \begin{cases} (x-4)/(6-4) & , 4 < x < 6 \\ 1 & , 6 \le x \le 10 \\ 0 & , x \ge 10 \end{cases}$$

2. Fuzzy Inference System Rules

Fuzzy inference is used to formulate mapping from input variables to output variables using fuzzy logic. This mapping will be the basis of which decisions will be made, or patterns that are visible. The decision rules used in this study are given in Table 1. The formation of these rules is done by considering the qualifications required by Visionet.

Table 1 Rules Used in The System

Rule	Nilai Web	Nilai Android	Nilai Softskill	Hasil
1	D	D	Kurang	Tidak Rekomendasi
2	D	D	Cukup	Tidak Rekomendasi
3	D	D	Baik	Tidak Rekomendasi
4	D	D	Sangat Baik	Tidak Rekomendasi
5	D	C	Kurang	Tidak Rekomendasi
6	D	C	Cukup	Tidak Rekomendasi
7	D	C	Baik	Tidak Rekomendasi
8	D	C	Sangat Baik	Tidak Rekomendasi
9	D	B	Kurang	Tidak Rekomendasi
10	D	B	Cukup	Tidak Rekomendasi
11	D	B	Baik	Rekomendasi
12	D	B	Sangat Baik	Rekomendasi
13	D	A	Kurang	Tidak Rekomendasi
14	D	A	Cukup	Tidak Rekomendasi
15	D	A	Baik	Rekomendasi
16	D	A	Sangat Baik	Rekomendasi
17	C	D	Kurang	Tidak Rekomendasi
18	C	D	Cukup	Tidak Rekomendasi
19	C	D	Baik	Tidak Rekomendasi
20	C	D	Sangat Baik	Tidak Rekomendasi
21	C	C	Kurang	Tidak Rekomendasi
22	C	C	Cukup	Tidak Rekomendasi
23	C	C	Baik	Tidak Rekomendasi
24	C	C	Sangat Baik	Tidak Rekomendasi
25	C	B	Kurang	Tidak Rekomendasi
26	C	B	Cukup	Tidak Rekomendasi
27	C	B	Baik	Rekomendasi
28	C	B	Sangat Baik	Rekomendasi
29	C	A	Kurang	Tidak Rekomendasi
30	C	A	Cukup	Tidak Rekomendasi
31	C	A	Baik	Rekomendasi
32	C	A	Sangat Baik	Rekomendasi

Table 2 Rules Used in The System cont.

Rule	Nilai Web	Nilai Android	Nilai Softskill	Hasil
33	B	D	Kurang	Tidak Rekomendasi
34	B	D	Cukup	Tidak Rekomendasi
35	B	D	Baik	Rekomendasi
36	B	D	Sangat Baik	Rekomendasi
37	B	C	Kurang	Tidak Rekomendasi
38	B	C	Cukup	Tidak Rekomendasi
39	B	C	Baik	Rekomendasi
40	B	C	Sangat Baik	Rekomendasi
41	B	B	Kurang	Tidak Rekomendasi
42	B	B	Cukup	Tidak Rekomendasi
43	B	B	Baik	Rekomendasi
44	B	B	Sangat Baik	Rekomendasi
45	B	A	Kurang	Tidak Rekomendasi
46	B	A	Cukup	Tidak Rekomendasi
47	B	A	Baik	Rekomendasi
48	B	A	Sangat Baik	Rekomendasi
49	A	D	Kurang	Tidak Rekomendasi
50	A	D	Cukup	Tidak Rekomendasi
51	A	D	Baik	Rekomendasi
52	A	D	Sangat Baik	Rekomendasi
53	A	C	Kurang	Tidak Rekomendasi
54	A	C	Cukup	Tidak Rekomendasi
55	A	C	Baik	Rekomendasi
56	A	C	Sangat Baik	Rekomendasi
57	A	B	Kurang	Tidak Rekomendasi
58	A	B	Cukup	Tidak Rekomendasi
59	A	B	Baik	Rekomendasi
60	A	B	Sangat Baik	Rekomendasi
61	A	A	Kurang	Tidak Rekomendasi
62	A	A	Cukup	Tidak Rekomendasi
63	A	A	Baik	Rekomendasi
64	A	A	Sangat Baik	Rekomendasi

3. Defuzzyfication

The next step, is to find the output value in the form of a crisp value (z) known as the defuzification process. The method used is the Center Average Defuzzyfier method, as follows.

$$Z = \frac{\Sigma(\alpha_{pi} * z_i)}{\Sigma\alpha_{pi}}$$

Z = center average defuzzyfier

α_p = alpha predicate value (minimum value of membership degree)

Zi = crisp value obtained from the results of inference

I = number of fuzzy rules

IV. RESULTS

The system developed is a web-based system that can be used as a decision support in recruiting prospective employees of PT Visionet Internasional from 12th grade students of SMK. The algorithm used is Fuzzy Tsukamoto. Inputs processed in this application are adjusted to the qualifications required by Visionet, consisting of report cards on Dynamic Web Programming, The following is an example of the system's implemtation.

Hasil Fuzzy

Nama	: Pasha
NIS	: 12345
Nilai Web	: 95
Nilai Android	: 80
Akumulasi Softskill	: 100
Nilai Z	: 6
Hasil	: Rekomendasi

Figure 1 Execution Result I

Hasil Fuzzy

Nama	: Bias
NIS	: 123
Nilai Web	: 70.2
Nilai Android	: 85.7
Akumulasi Softskill	: 90.8
Nilai Z	: 4.8181818181818
Hasil	: Tidak Rekomendasi

Figure 2 Execution Result II

With the score of Web Programming at 95 labeled as A, the score of Mobile Device Programming is 80 labeled as … and the Softskill score is 100 labeled as Sangat Baik, the result displayed on the system are ... This result is then used as a recommendationfor Visionet to accept or reject prospective candidates.

Following are the Fuzzy Tsukamoto manual calculations for the same input variable.

Problem 1
Score of Web Programming = 95
Score of Mobile App Programming = 80
Score of Softskill = 100

Problem solving:
Web Programming = 95
This score is labeled as SANGAT BAIK, which results into

$$\mu\, SANGATBAIKWeb[95] = 1$$

Mobile App Programming = 80
This score is labeled as BAIK, which results into

$$\mu\, BAIKAndroid[80] = 1$$

Softskill = 100
This score is labeled as SANGAT BAIK, which results into

$$\mu\, SANGATBAIKSoftskill[100] = 1$$

Determining the value of α and z for each rules
[R60] JIKA NilaiWeb SANGAT BAIK & NilaiAndroid BAIK & NilaiSoftSkill SANGAT BAIK MAKA Hasil Rekomendasi

$$\alpha 60 = \mu SANGATBAIKWeb\ [X] \cap \mu BAIKAndroid\ [Y] \cap \mu SANGATBAIKSoftskill\ [Z]$$

$$= \min(\mu SANGATBAIKWeb\ [95], \mu BAIKAndroid\ [80], \mu SANGATBAIKSoftskill\ [100]\ )$$

$$= \min(\ [1], [1], [1])$$

$$= 1$$

According to the membership set function of Hasil REKOMENDASI, then

$$\frac{Z60 - Zmin}{Zmax - Zmin} = \alpha 60$$
$$Z60 = \alpha 60(Zmax - Zmin) + Zmin$$
$$Z60 = 1(6 - 4) + 4$$
$$Z60 = 2 + 4$$
$$Z60 = 6$$

The result is 6 according to the Tsukamoto Method

Problem 2:
Web Programming = 70.2
Mobile App Programming = 85.7
Softskill = 90.8
Apakah siswa tersebut direkomendasikan sebagai karyawan?

Problem solving:
Web Programming = 70.2
This score belongs into two sets: CUKUP dan BAIK, which results into

$$\mu\, CUKUPWeb[70.2] = \frac{71 - 70.2}{71 - 70} = \frac{0.8}{1} = 0.8$$

$$\mu\, BAIKWeb[70.2] = \frac{70.2 - 70}{71 - 70} = \frac{0.2}{1} = 0.2$$

Mobile App Programming = 85.7
This score belongs into two sets: BAIK and SANGAT BAIK, which results into

$$\mu\, BAIKAndroid[85.7] = \frac{86 - 85.7}{86 - 85} = \frac{0.3}{1} = 0.3$$

$$\mu\, SANGATBAIKAndroid[85.7] = \frac{85.7 - 85}{86 - 85} = \frac{0.7}{1} = 0.7$$

Softskill = 90.8
This score belongs into two sets: BAIK dan SANGAT BAIK, which results into

$$\mu\, BAIKWeb[70.2] = \frac{91 - 90.8}{91 - 90} = \frac{0.2}{1} = 0.2$$

$$\mu\, SANGATBAIKWeb[70.2] = \frac{90.8 - 90}{91 - 90} = \frac{0.8}{1} = 0.8$$

Determining the value of α and z for each rules.
[R27] JIKA NilaiWeb CUKUP & NilaiAndroid BAIK & NilaiSoftSkill BAIK MAKA Hasil TIDAK REKOMENDASI

$$\alpha 27 = \mu CUKUPWeb\ [X] \cap \mu BAIKAndroid\ [Y] \cap \mu BAIKSoftskill\ [Z]$$

$$= \min(\mu CUKUPWeb\ [70.2], \mu BAIKAndroid\ [85.7], \mu BAIKSoftskill\ [90.8]\ )$$

$= \min([0.8],[0.3],[0.2])$

$= 0.2$

According to membership function set of TIDAK REKOMENDASI, then

$$\frac{Zmax - Z27}{Zmax - Zmin} = \alpha 27$$
$$Z27 = Zmax - \alpha 27(Zmax - Zmin)$$
$$Z27 = 6 - 0.2(6 - 4)$$
$$Z27 = 6 - 0.4$$
$$Z27 = 5.6$$

[R28] JIKA NilaiWeb CUKUP & NilaiAndroid BAIK & NilaiSoftSkill SANGAT BAIK MAKA Hasil TIDAK REKOMENDASI

$$\alpha 28 = \mu CUKUPWeb\ [X] \cap \mu BAIKAndroid\ [Y] \cap \mu SANGATBAIKSoftskill\ [Z]$$

$= \min(\mu CUKUPWeb\ [70.2], \mu BAIKAndroid\ [85.7],$

$\mu SANGATBAIKSoftskill\ [90.8])$

$= \min([0.8],[0.3],[0.8])$

$= 0.3$

According to membership function set of TIDAK REKOMENDASI, then

$$\frac{Zmax - Z28}{Zmax - Zmin} = \alpha 28$$
$$Z28 = Zmax - \alpha 28(Zmax - Zmin)$$
$$Z28 = 6 - 0.3(6 - 4)$$
$$Z28 = 6 - 0.6$$
$$Z28 = 5.4$$

[R31] JIKA NilaiWeb CUKUP & NilaiAndroid SANGAT BAIK & NilaiSoftSkill BAIK MAKA Hasil TIDAK REKOMENDASI

$$\alpha 31 = \mu CUKUPWeb\ [X] \cap \mu SANGATBAIKAndroid\ [Y] \cap \mu BAIKSoftskill\ [Z]$$

$= \min(\mu CUKUPWeb\ [70.2], \mu BAIKAndroid\ [85.7],$

$\mu BAIKSoftskill\ [90.8])$

$= \min([0.8],[0.3],[0.2])$

$= 0.2$

According to membership function set of TIDAK REKOMENDASI, then

$$\frac{Zmax - Z31}{Zmax - Zmin} = \alpha 31$$
$$Z31 = Zmax - \alpha 31(Zmax - Zmin)$$
$$Z31 = 6 - 0.2(6 - 4)$$
$$Z31 = 6 - 0.4$$
$$Z31 = 5.6$$

[R32] JIKA NilaiWeb CUKUP & NilaiAndroid SANGAT BAIK & NilaiSoftSkill SANGAT BAIK MAKA Hasil TIDAK REKOMENDASI

$$\alpha 27 = \mu CUKUPWeb\ [X] \cap \mu SANGATBAIKAndroid\ [Y] \cap \mu SANGATBAIKSoftskill\ [Z]$$

$= \min(\mu CUKUPWeb\ [70.2], \mu SANGATBAIKAndroid$

$[85.7], \mu SANGATBAIKSoftskill\ [90.8])$

$= \min([0.8],[0.7],[0.8])$

$= 0.7$

According to membership function set of TIDAK REKOMENDASI, then

$$\frac{Zmax - Z32}{Zmax - Zmin} = \alpha 32$$
$$Z32 = Zmax - \alpha 32(Zmax - Zmin)$$
$$Z32 = 6 - 0.7(6 - 4)$$
$$Z32 = 6 - 1.4$$
$$Z32 = 4.6$$

[R43] JIKA NilaiWeb BAIK & NilaiAndroid BAIK & NilaiSoftSkill BAIK MAKA Hasil Rekomendasi

$$\alpha 27 = \mu BAIKPWeb\ [X] \cap \mu BAIKAndroid\ [Y] \cap \mu BAIKSoftskill\ [Z]$$

$= \min(\mu BAIKWeb\ [70.2], \mu BAIKAndroid\ [85.7],$

$\mu BAIKSoftskill\ [90.8])$

$= \min([0.2],[0.3],[0.2])$

$= 0.2$

According to membership function set of REKOMENDASI, then

$$\frac{Z43 - Zmin}{Zmax - Zmin} = \alpha 43$$
$$Z43 = \alpha 43(Zmax - Zmin) + Zmin$$
$$Z43 = 0.2(6 - 4) + 4$$
$$Z43 = 0.4 + 4$$
$$Z43 = 4.4$$

[R44] JIKA NilaiWeb BAIK & NilaiAndroid BAIK & NilaiSoftSkill SANGAT BAIK MAKA Hasil Rekomendasi

$$\alpha 44 = \mu BAIKWeb\ [X] \cap \mu BAIKAndroid\ [Y] \cap \mu SANGATBAIKSoftskill\ [Z]$$

$= \min(\mu BAIKWeb\ [70.2], \mu BAIKAndroid\ [85.7],$

$\mu SANGATBAIKSoftskill\ [90.8])$

$= \min([0.2],[0.3],[0.8])$

$= 0.2$

According to membership function set of REKOMENDASI, then

$$\frac{Z44 - Zmin}{Zmax - Zmin} = \alpha 44$$
$$Z44 = \alpha 44(Zmax - Zmin) + Zmin$$
$$Z44 = 0.2(6 - 4) + 4$$
$$Z44 = 0.4 + 4$$
$$Z44 = 4.4$$

[R47] JIKA NilaiWeb BAIK & NilaiAndroid SANGAT BAIK & NilaiSoftSkill BAIK MAKA Hasil Rekomendasi

$$\alpha 47 = \mu BAIKWeb\ [X] \cap \mu SANGATBAIKAndroid\ [Y] \cap \mu BAIKSoftskill\ [Z]$$

$$= \min(\mu BAIKWeb\ [70.2], \mu SANGATBAIKAndroid\ [85.7], \mu BAIKSoftskill\ [90.8])$$

$$= \min([0.2], [0.7], [0.2])$$

$$= 0.2$$

According to membership function set of REKOMENDASI, then

$$\frac{Z47 - Zmin}{Zmax - Zmin} = \alpha 47$$
$$Z47 = \alpha 47(Zmax - Zmin) + Zmin$$
$$Z47 = 0.2(6 - 4) + 4$$
$$Z47 = 0.4 + 4$$
$$Z47 = 4.4$$

[R48] JIKA NilaiWeb BAIK & NilaiAndroid SANGAT BAIK & NilaiSoftSkill SANGAT BAIK MAKA Hasil Rekomendasi

$$\alpha 27 = \mu BAIKWeb\ [X] \cap \mu SANGATBAIKAndroid\ [Y] \cap \mu SANGATBAIKSoftskill\ [Z]$$

$$= \min(\mu BAIKWeb\ [70.2], \mu SANGATBAIKAndroid\ [85.7], \mu SANGATBAIKSoftskill\ [90.8])$$

$$= \min([0.2], [0.7], [0.8])$$

$$= 0.2$$

According to membership function set of REKOMENDASI, then

$$\frac{Z48 - Zmin}{Zmax - Zmin} = \alpha 48$$
$$Z48 = \alpha 48(Zmax - Zmin) + Zmin$$
$$Z48 = 0.2(6 - 4) + 4$$
$$Z48 = 0.4 + 4$$
$$Z48 = 4.4$$

Tsukamoto method uses Center of Average to determine crisp output:

$$Z = \frac{\alpha 27 * z27 + \alpha 28 * z28 + \alpha 31 * z31 + \alpha 32 * z32 + \alpha 43 * z43 + \alpha 44 * z44 + \alpha 47 * z47 + \alpha 48 * z48}{\alpha 27 + \alpha 28 + \alpha 31 + \alpha 32 + \alpha 43 + \alpha 44 + \alpha 47 + \alpha 48}$$
$$Z = \frac{0.2 * 5.6 + 0.3 * 5.4 + 0.2 * 5.6 + 0.7 * 4.6 + 0.2 * 4.4 + 0.2 * 4.4 + 0.2 * 4.4 + 0.2 * 4.4}{0.2 + 0.3 + 0.2 + 0.7 + 0.2 + 0.2 + 0.2 + 0.2}$$
$$Z = \frac{10.60}{2.2} = 4.82$$

The result obtained is 4.82 with Tsukamoto Method. The defuzzyfication value generated by the system is pretty close to what was obtained from manual calculation.

To determine the level of accuracy, a comparison between the results from system and experts is done using the Spearman correlation test. The following is a table that shows the results of system and expert comparisons.

Data	Z System	Z Expert	System Rank	Expert Rank	di	di^2
1	6	6	10	7	-3	9
2	4.81	5	2	2	0	0
3	5.28	6	7	7	0	0
4	4	4	1	1	0	0
5	5.36	6	9	7	-2	4
6	5.28	6	7	7	0	0
7	5.12	5	5	2	-3	9
8	5.06	5	4	2	-2	4
9	5	5	3	2	-1	1
10	5.15	5	6	2	-4	16
Σdi^2						43

The value of rs calculated with the Spearman Correlation formula:

$$rs = 1 - \frac{6\Sigma d^2}{n(n^2 - 1)}$$
$$rs = 1 - \frac{6 \times 43}{10(100 - 1)}$$
$$rs = 1 - \frac{258}{990}$$
$$rs = 1 - 0.260606061$$
$$rs = 0.739394$$

The result is then interpreted using The Spearman Correlation Interpretation Table.

Nilai	*Makna*
0,00-0,19	Sangat rendah/sangat lemah
0,20-0,39	Rendah/lemah
0,40-0,59	Sedang
0,60-0,79	Tinggi/kuat
0,80-1,00	Sangat tinggi/sangat kuat

In accordance with the interpretation table, the value of rs (0.739394) belongs to the high / strong category. So by using the Spearman correlation test, the results of the accuracy of the expert ranking and the system number are 0.739394.

V. CONCLUSION

From the discussion and implementation of the system described earlier, the following conclusions are obtained:

1) Fuzzy Tsukamoto Logic can be used to help industry, in this case Visionet, as a consideration for recruiting prospective employees from 12th grade students of Telkom Telkom
2) The web-based application developed accepts input report cards for Web Programming and Mobile

Programming Programming subjects, and the value of soft skills, according to the qualifications required by Visionet

3) There are two types of output from this application, namely TIDAK REKOMENDASI and REKOMENDASI. This result is a material consideration for Visionet to accept or reject employee candidates.
4) The Spearman Correlation test used to compare the results from system and experts shows a high level of accuracy, with rs value 0.739394.

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