The gap values in the profile matching method by fuzzy logic

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Abstract. In this research, the determination of the appropriate values of Gap for the assessment of promotion criteria of position in an institution / company. In this study the authors use Fuzzy Sugeno logic on the determination of Gap values used in Profile Matching method. Test results of 5 employees obtained the eligibility of promotion with the position of Z* values between in 3.20 to 4.11.

Keywords: Decision Supporting System, Fuzzy Profile Matching Algorithm, ranking, Gap values.

1. Introduction

Calculation process in Profile Matching method is started by defining the minimum values for each variable of valuation. The Gap of each values of test data against the minimum values of each variable is became the Gap that should be given a weight. The weight of a variable will be calculated based on the average values of group of Core Factor (CF) and Secondary Factor (SF) variable. The CF composition added by SF is 100\%, depend on the interest of user of this method. The last stage of the method is accumulation process of CF and SF values based on data testing variable values.

Weighting on method of Profile Matching, is the definite values of a certain values because the existing values is a member of the crisp set. In a crisp set, membership is stated expressly. If it is associated with the process of determining the eligibility of employees who occupy a position in the newly promoted, this will result in rigidity for the PDAM Tirtanadi Sumatera Utara in the promotion of the employee. Whereas, in the process of the promotion of the position of the employee it is required to be more just and wise.

2. Study of literature

2.1. Fuzzy Logic

Fuzzy logic is a branch of artificial intelligence systems (Artificial Intelligent) that emulates human thinking ability into the form of algorithms which then executed by the machine. This algorithm is
used in a variety of data processing applications that cannot be represented in binary form. Fuzzy logic interprets the vague statements into a logical sense [2]. Fuzzy logic is a branch of computer science that studies about the values of truth that worth a lot. In contrast to the values of truth in classical logic of values 0 (false) or 1 (true), Fuzzy logic has a values of truth in the real interval [0,1]. Fuzzy logic was first developed by Lotfi A. Zadeh a United States-born scientist of Iran nationality from the University of California at Berkeley. Even so, the fuzzy logic more developed by Japan practitioners [3]. In Fuzzy theory, membership of an element in the set is expressed with the degree of membership (membership values) whose values lies on [0,1]. Research on Fuzzy logic is used in the process of weighting variables feasibility assessment of a particular position promotion. This is done in the hope of accumulation of testing data values on the feasibility assessment process will are normally grouped with the predicate less, fair and good. So the company's management can apply the policy in determining the eligibility of a person to occupy a position in the office. The predicate of this classification, based on Fuzzy logic that is capable of bridging the expressive machine language with human language that emphasized the meaning based on natural language.

2.2. Decision Support System
Decision Support System abbreviated by DSS is a system that aimed for managerial decisions to support the semi structured decision. Herbert. A. Simon determining decision-making in three stages, namely Intelligent, Design Choice, Implementation. According to Whitten (2004) Decision Support System/DSS can be defined as a system of information that helps identify opportunities to make decisions or provide information to assist decision making. With a variety of special characters such as expressed above, decision support system can deliver profits or values in order for the users. In the early 1970’s, Scott Morton is the first in articulating the concept of the crucial decision support systems. He defines a decision support system as "interactive computer-based systems, which help decision-makers to use data and models to solve unstructured problems." Other classic definition of "Decision support system combines the intellectual resource of individuals with computer capabilities to improve the quality of decisions" [5].

2.3. Gap Values
In the research of Kansil and Sutapa, conducted surveys of library service user satisfaction at Petra University (UK Petra). The UK Petra Library is one of the libraries that is very concerned about the quality of its services. This is demonstrated by the user satisfaction survey for service quality in 2011 and 2012. Data show CSI (Customer Satisfaction Index) in 2011 and 2012 high values, while CDI (Customer Dissatisfaction Index) is very low. This study not only examines the Gap between user satisfaction and user interest in the quality of the UK Petra library service (Gap 5), but also the interests of users with management interests (Gap 1), user interests with staff interests (Gap 6), and interests management and staff interests (Gap 7). The research is done by measuring the values of Gap (Gap) on the quality of library service with Servqual method [6].

The result of the research is the smallest Gap values 5 found in the service quality of the library staff is neat and polite, with the score is -0.46. The greatest Gap values is found in the quality of the library staff's liveliness offering assistance to users, with a score of -1.47. The most positive Gap 1 values is found in the quality of updated data collection service on iSPEKTRA online log (0.81). Quality of service that has a values of Gap of 1 close to 0 is the library staff is believed to maintain the serenity of the library (0,08), the ambiguity of room signs (0,08), the comfort of the room furniture (-0.06). The values of the 1 pal-ing negative Gap is the quality of the Digital Theses collection conformity service to user requirements (-1.00). The most positive values of Gap 6 is found in the quality of interior room service (0.56). The values of Gap 6 approaching 0 is found in the quality of the collection service arranged neatly on the shelf (0.06). The values of Gap 6 which has the most negative values is found in the quality of DiVo's presence service as a means of information and promotion (-0.15). The most positive Gap values found in the quality of the collection service is neatly arranged on the shelf (0.44). The values of Gap 7 approaching 0 is in 3 service quality. The quality of this services is the speed of
the library staff in helping users obtain the required information (0.06), the completeness of the iSPEKTRA online catalog feature [6].

2.4. Profile Matching Method
In the research of Sopianti and Bahtiar, conducted the determination of specialization on mathematics and Natural Sciences, Social Sciences, and Language and Culture Sciences. The learners conducted since class X. in this study applied Profile Matching method to calculate the competence of each individual based on the criteria given. Implementation of Profile Matching method is optimized by placing core and secondary factor dynamically in each department so as to obtain ideal calculation result. The results of experiments on this system can determine the interest of students based on the data criteria that have been determined by the school and generate data on the determination of interest with a match rate of 94.73%. Supporting decision support system of learners can give consideration in the determination of student interest in accordance with the priority field of alternative majors [7].

The goals of decision support system are:
1. Assist managers in decision-making over issues of semi structured.
2. Provide support for the consideration of the Manager and not intended to replace the function of the Manager.
3. Increase the effectiveness of the decisions taken the Manager over on the efficiency improvements.
4. Speed of computation. The computer allows the decision makers to do a lot of computing rapidly and costs are low.
5. Increased productivity. Build a group decision makers, especially the experts, can be very expensive. Supporters of the group could reduce the size of the computerized and allows its members to be in various different locations (save travel costs). In addition, support staff productivity (e.g. financial and legal analysis) could be improved.
6. Productivity can also be upgraded using the optimization tools to determine the best way to run a business.
7. Quality support. Computers can enhance the quality of the decisions made. For example, the more data is accessed more alternative can also be evaluated. Risk analysis can be done quickly and the views of the experts (some of them are in what is a much) can be collected quickly and with lower costs. Expertise could even be taken directly from a computer system via a method of artificial intelligence. With computers, decision-makers can perform complex simulations, check out the many scenarios that are possible, and assess the range of influences in a fast and economical. All of these capabilities lead to better decisions.
8. Competitive power. Management and empowerment of company resources. The pressure of competition led to the decision maker to be difficult task. The competition is based not only on price but also on the quality, speed, kustomasi products, and customer support. Organizations must be able to frequently and rapidly changing operating mode, reverse engineer restarted the process and structure, empowering employees, and innovate. Technology decision making can create significant empowerment by way of allowing someone to make good decisions quickly, even if they have a less knowledge.
9. Overcoming limitations in cognitive processing and storage. According to Simon (1977), the human brain has a limited ability to process and store information. People are sometimes difficult to remember and use information in a manner that is free from errors.

3. METHODS OF ANALYSIS
The assessment process for promotion is done by the method of Profile Matching standard and with the method of Fuzzy Profile Matching. On the methods of Profile Matching, it is known the existence of the level difference between the values of test data with a minimum values called the Gap. On the assessment process using the standard method of Profile Matching, Gap values have been determined by decision makers.

In Fuzzy Profile Matching method, employee classification process for promotion of position, weighting of Gap values using Fuzzy logic where Gap values is given weight, so it can be determined average values of composition of the comparison values in the form of fuzzy set based on idea to
extend the range of function characteristics such that the function will include real numbers at intervals [0.1]. The membership values indicates that an item in the universe of speech is not only 0 or 1, but also the values that lies between them. In other words, the truth values of an item is not only true or false or 0 indicates false, values 1 indicates true. That there are still more values lies between right and wrong. By using Fuzzy Profile Matching method, it is expected that promotion of appraised positions can be categorized not only feasible and not feasible, but can be categorized in detail that the category "less" is not feasible and the categories "adequate" and "good" are considered feasible.

Step-by-step method of Profile Matching is:
1. Determine the variable data that is needed.
2. Determine the aspects used for assessment.
3. Mapping the Gap profile.
   \[ \text{Gap \ Profile \ Matching} = (\text{Minimal \ profile} - \text{Profile \ of \ test \ data}) \]
   \[ \text{Gap \ Fuzzy \ Profile \ Matching} \] calculated with the approach of Fuzzy Logic.
4. After the next Gap values obtained are given weights for each values of the Gap.
5. Calculation and classification of Core Factor and Secondary Factor.
6. After determining the weighting values of Gap, then grouped into 2 groups, the Core Factor (a major factor) and a Secondary Factor (factor endowments).
7. The Calculation Of The Total Values.

Determination of the ranking calculation where the end result of the process of Profile Matching is a ranking that can be made by the values of the threshold in a classification of promotion of the employee. Weights on the values is given to each criteria.

| No | Employee id | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----|-------------|---|---|---|---|---|---|---|---|---|----|
| 1  | K001        | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4  |
| 2  | K002        | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5  |
| 3  | K003        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4  |
| 4  | K004        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3  |
| 5  | K005        | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5  |

The calculation of values by method of Profile Matching
Table Values obtained in accordance with weighing of assessment.

| No | Employee id | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----|-------------|---|---|---|---|---|---|---|---|
| 1  | K001        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2  | K002        | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 3  | K003        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 4  | K004        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5  | K005        | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
Table 4. The Values of Competence Aspect

| No | Employee_id | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----|-------------|---|---|---|---|---|---|---|---|
| 1  | K001        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2  | K002        | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 3  | K003        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 4  | K004        | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5  | K005        | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

The calculation of the values of the Gap at any values derived

\[ \text{Gap} = \text{Values Attribute} - \text{Values Target} \]

Description:
Attribute Values: The values obtained by officers of the appropriate weighting.
Target Values: The values of a standard that has been set.

Table 5. The Final Values of Profile Matching

| No | Employee_Id | Ns | Nkc | Nkp | Final Values |
|----|-------------|----|-----|-----|--------------|
| 1  | K001        | 4,4| 4,75| 2,74| 3,68         |
| 2  | K002        | 4,2| 4,25| 3,00| 3,62         |
| 3  | K003        | 4,5| 4,75| 2,74| 3,70         |
| 4  | K004        | 4,45| 4,75| 2,74| 3,69        |
| 5  | K005        | 3,8| 4,25| 2,36| 3,22         |

The results of the ranking of promotion on table 3.5 above can be seen as in Table 3.6.

Table 6. Results of the Ranking by Method of Profile Matching

| No | Employee_Id | Ranking Result |
|----|-------------|----------------|
| 1  | K003        | 3,70           |
| 2  | K004        | 3,69           |
| 3  | K001        | 3,68           |
| 4  | K002        | 3,62           |
| 5  | K005        | 3,22           |

Calculation method of Fuzzy values with Profile Matching

Table interval of eligibility category of promotion with the method of Fuzzy Profile Matching as in Table 7 below:

Table 7. Interval Values of Eligibility of Promotion Category

| No | Z*       | Category | Final Values |
|----|----------|----------|--------------|
| 1  | Z ≤ 2    | Less     | Not Viable   |
| 2  | 2.1 ≤ Z ≤ 3.5 | Less   | Viable      |
| 3  | 2.5 ≤ Z ≤ 4.5 | Less Good | Viable |
| 4  | 3.6 ≤ Z ≤ 4.99 | Good  | Viable      |
| 5  | Z ≥ 5    | Good     | Viable      |

The results of the determination of position of promotion with the method of Fuzzy Profile Matching as follows:
4. Conclusion

Based on the results of the analysis of the calculation of values of the variables used in the promotion of Office have some conclusions as follows:

a. The process of classification using profile matching method will have the final result of the definite values (crisp).

b. It is recommended to use classification method in the case of the decision support system, because this method can do a ranking of test data/test in large quantities.

c. The results of the classification by using the methods of fuzzy logic can categorize data in more than one category depending on the set are used. So this method contains elements of policies on the promotion.

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