Profile Matching Algorithm in Determining the Position of Colleagues

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Abstract. The selection of a colleague or business is a process that must be thoroughly detailed, this will affect the development of a company. A decision support system is a solution to shorten a leader or staff in the cooperation section, where a company has several categories to be applied to the decision support system. The Profile Matching algorithm is an algorithm that is applied to build a system that can help provide a choice of potential partners or colleagues / business partners in certain companies, this profile matching algorithm requires many variables to be able to calculate the proposed output from the ranking value later. There are Core Factors and Secondary Factors, in the case of this discussion there are 3 prospective partners who are calculated for this profile matching algorithm. The distribution of variable data entered into the Profile Matching Algorithm, there are 8 categories, there is 4 categories included Core Factor and 4 categories included in the Secondary Factor, more then results of the GAP calculation show that the ranking value gets a maximum value of 4 (Partner 3), sequence No.2 is M1 and the last one M2 with each GAP value is 3.5.

1. Introduction

This condition is mainly faced by companies wishing to expand their activities to international or global markets. By conducting partnerships, companies get several important benefits, namely access to markets, technology and capital (this is especially true if the company partners with partners who have large capital). Existence This partnership in turn will have an impact on both parties, both positively and negatively. Positively, companies and partners can access knowledge and opportunities to innovate, increase the capabilities of their organizational members and can access capital and markets for expanding the marketing of products and services. They allow the user to give more importance to multiple attributes and give each attribute a different similarity measure [1]. In the profile matching process, a comparison is made between individual competencies into ideal competencies so that gaps can be identified. The smaller the resulting gap, the greater the weighted value which has a greater chance of occupying one of the placements. they demonstrated the need for better profile matching algorithms suitable for mobile devices [2], discussed matching user profiles by considering all attributes proposed gathering information about neighboring users and inferring facts that could be used in many applications [3]. Currently the concept of computer-based decision support systems is growing [4] [8] and many more methods can be used very quickly to help the decision making process [8]. In this co-worker selection model, it involves several variables or aspects to be able to determine that this coworker has a similar vision and mission. Many incidents of co-workers who belong to the company do not have the same target, thus making it a separate job for the
company. Employee performance is important in increasing employee productivity. In improving employee performance, the company must be able to determine the factors that can affect the performance of the company, from this matter it can be used as a record for choosing a work partner. Job performance is the result of the quality and quantity of work completed by an employee in carrying out a task with given responsibilities. Performance is the result of work achieved in carrying out the tasks assigned to them based on skills, experience, and seriousness [9]. of this matter, it can be used as a note to choose a work partner. Job performance is the result of the quality and quantity of work completed by an employee in carrying out a task with given responsibilities. Performance is the result of work achieved in carrying out the tasks assigned to them based on skills, experience, and seriousness [9]. from this matter, it can be used as a note to choose a work partner. Job performance is the result of the quality and quantity of work completed by an employee in carrying out a task with given responsibilities. Performance is the result of work achieved in carrying out the tasks assigned to them based on skills, experience, and seriousness [9].

To deal with that actually a practical problem, we designed a campus recruitment recommendation system for college placement offices by making use of two kinds of mechanisms of profile matching algorithms and also providing keyword-based search [10]. Decision making also has the desired criteria influencing the selection of the best employees, the method used to help best evaluate employees using the Profile Matching Algorithm, this algorithm for decision making related to Multi-criteria evaluation of maturity for it using weights and gaps [1] [5] [11] [12]. So that this research with the Profile Matching Algorithm will be able to produce a faster proposal to the company leadership when choosing a partner for the company.

2. Literature Review

In this study, there will be several definitions that can be used as a data dictionary in making a region-based blood donor information system or application.

2.1. Profile Matching

Profile Matching Algorithm is a method that is often used as a decision-making mechanism with these assumptions there is an ideal level of predictor variables that must be met by the subject studied [4] [5] [6], instead of the minimum rate that must be met or passed. In Profile Matching, an outline is the process of comparing the actual data value of a profile to be assessed with the expected value from the profile calculation [4], So it could be that differences in competence (also called gaps), the smaller the resulting gap, the bigger the weighted value [6] [7].

2.1.1. Weighting

At this stage determine the weight value for each criterion that will be compared with the value of each alternative test. The input of this weighting process is the difference in value from the customer criteria and the eligibility standard criteria, in determining the ranking on the customer eligibility criteria for each gap, an example of the gap value is shown below:

| Different GAP | Weight Value | Explanation               |
|--------------|--------------|---------------------------|
| 1            | 0            | 3                         | No Difference             |
| 2            | 1            | 2.5                       | Reasonable                |
| 3            | -1           | 2                         | Feasibility shortage 1 level |
| 4            | 2            | 1.5                       | 2 level feasibility shortage |
| 5            | -2           | 1                         | 3 level feasibility shortage |
2.1.2. Grouping of Core and Secondary Factor

a. Core Factor
This Core Factor is the most important aspect (criteria) needed in the assessment process, to take into account the core factors using the formula:

\[ NCF = \frac{\sum_{i=1}^{NC}}{\sum_{i=1}^{IC}} \quad [5] \quad [6] \]  

NCF = average value of core factor  
NC = Number of total core factor  
IC = Number of items core factor

b. Secondary Factor
Secondary Factor or a value other than the most important (core) and secondary aspects, the factors used to calculate the formula:

\[ NSF = \frac{\sum_{i=1}^{NS}}{\sum_{i=1}^{IS}} \quad [5] \quad [6] \]  

NSF = average value of secondary factor  
NS = Number of total secondary factor  
IS = Number of items secondary factor

2.1.3. Ranking
The end result of the profile matching process is a classification of each viable alternative to unfit, and the classification decision using the following formula:

\[ N = 60\% \cdot NCF + 40\% \cdot NSF \quad [3] \]  

N = Total Value Criteria  
NCF = Core Value Factor  
NSF = Secondary Value Factor

3. Methodology
Profile matching is a decision-making mechanism by assuming that there is an ideal level of predictor variables that must be met by the subject under study, not a minimum level that must be met or passed:

![Figure 1. Profile Matching Algorithm](image-url)
In Figure 1, the first flow that is done is to take the data of each partner who has joined, then mapping the gap value for each criterion, then weighting the gap value that has been obtained, which is then continued with the calculation of the core factor (CF) and secondary factor (SF), where the results of the calculation of cf and sf will continue to calculate the total value, and then the ranking of the total value.

3.1. Use Case Diagram
Use case diagrams present the interactions between use cases and actors. Where actors can be people, equipment or other systems that interact with the system being built. Use cases describe the functionality with or requirements that the system must meet from the user's point of view.

![Use Case Diagram Profile Matching in Administrator Features](image)

**Figure 2.** Use Case Diagram Profile Matching in Administrator Features

In Figure 2 is a use case diagram of the information system run by the admin user. The following is an explanation of each use case in the picture:

1. Use cases manage user data, function as a menu to manage all users who use the information system, including admins, leaders, pic, and tenants. Starting from seeing all users who have been entered into the system, adding new user data, editing user data, and deleting user data.
2. Use cases manage group data, function to view group data that has been created, add new data, and delete data that is no longer used.
3. Use cases manage prospective tenant data, function to view potential tenants who have registered on the registration page, and can delete unwanted prospective tenant data.
4. Use cases manage aspect data, function to view aspect data that has been entered into the system, add new aspect data, edit aspect data, and delete aspect data.
5. Use cases manage sub-aspect data, function to view sub-aspect data that has been entered into the system, add new sub-aspect data, edit sub-aspect data, and delete sub-aspect data.
6. Use cases manage weight data, function to view weight data entered into the system, add new weight data, edit weight data, and delete weight data.
7. Use cases manage data on the value of prospective tenants, function to see the value data from the answers of prospective tenants in each sub aspect. In this menu, profile matching calculations can be performed.
8. Use cases manage calculation results, function to see the results of profile matching calculations that show the best value according to the method, so that the prospective tenant data can be added to tenants.
9. Use cases manage question data, function to view question data, which can add question data, edit question data, and delete question data that is no longer used.

The following is an attachment of urgency or sequence for points from several requirements for recruiting and / or accepting tenants / partners based on the following priority scales:

| Variable in Case                                                                 | Point |
|---------------------------------------------------------------------------------|-------|
| K1 Has businesses in focus areas including: Food, Health and Medicine, Energy, Transportation, Information and Communication Technology, Defense and Security, Raw Materials, and Advanced Materials | ✓     |
| K2 Have a Product Production from the focus area of the business                 | ✓     |
| K3 Having a place or office for the business                                     | ✓     |
| K4 Have a Business Entity Legality                                              | ✓     |
| K5 Have an Organizational Structure                                              | ✓     |
| K6 Has a strengthening of the branding of the product to be incubated           | ✓     |
| K7 Have a food product permit, and certification (PIRT, SNI, etc.)              | ✓     |
| K8 Able to occupy existing Inwall in Partner / Coworking Companies              | ✓     |
| K9 Able to follow all the rules that exist in the company                       | ✓     |

From table 2 above is used as a calculation variable to find the difference in value for each individual, the only variable value that is not used is point K9, because every tenant who wants to join is obliged to follow all the existing rules in the company.

**4. Results and Discussions**
In the process of the Profile Matching algorithm, a case study with more than 1 colleague is needed, which refers to the minimum data that must be fulfilled in the minimum assessment in table 2 above. The following is an example of the calculation of the profile matching method. First, the determination of partners who will register as colleagues:
Data from partners who have joined will be mapping the required criteria, to be used using aspects and variables that have been interviewed from the company to prospective partners, with the following steps:
1. Determine the Core Factor and Secondary Factor to be assessed

Table 4. Aspect 1

| No. | Prospective Partners | K1 | K2 | K3 | K4 |
|-----|----------------------|----|----|----|----|
| 1   | M1                   | ✓  | ✓  | ✓  | ✓  |
| 2   | M2                   | ✓  | ✓  | ✓  | ✓  |
| 3   | M3                   | ✓  | ✓  | ✓  | ✓  |

Table 5. Aspect 2

| No. | Prospective Partners | K5 | K6 | K7 | K8 |
|-----|----------------------|----|----|----|----|
| 1   | M1                   | ✓  | ✓  | ✓  | ✓  |
| 2   | M2                   | ✓  | ✓  | ✓  | ✓  |
| 3   | M3                   | ✓  | ✓  | ✓  | ✓  |

Core Factor: Aspect 1: K1 and K2  Aspect 2: K5 and K6
Secondary Factor: Aspect 1: K3 and K4  Aspect 2: K7 and K8

2. GAP calculation

Table 6. GAP

| No. | Prospective Partners | Aspect 1 | Aspect 2 |
|-----|----------------------|----------|----------|
|     |                      | K1 K2    | K3 K4    | K5 K6 K7 K8 | Information |
| 1   | M1                   | 1 2 2 3  | 2 1 1 1  |           |
| 2   | M2                   | 1 1 2 3  | 2 2 1 1  |           |
| 3   | M3                   | 1 2 3 3  | 2 2 3 1  |           |
|     | Standard Point       | 1 2 3 3  | 2 2 3 1  |           |
3. Calculation Weight

**Table 7. Weighted Value.**

| Difference | Weighted Value | Explanation                              |
|------------|----------------|------------------------------------------|
| 0          | 4              | There is no difference (competency as required) |
| 1          | 3.5            | 1 level excess individual competence     |
| -1         | 3              | 1 level deficient individual competence   |
| 2          | 2.5            | Two levels of excess individual competence |
| -2         | 2              | Individual competence lacks 2 levels      |

The results of the calculation of the Profile Matching Algorithm resulting in the Ranking of 3 Prospective Partners can be seen in table 8 below:

**Table 8. Weighted Value.**

| Prospective Partners | Aspect 1 | Aspect 2 | Result |
|----------------------|----------|----------|--------|
| M3                   | 4        | 4        | 4      |
| M1                   | 3.8      | 3.4      | 3.5    |
| M2                   | 3.5      | 3.5      | 3.5    |

From the results of the calculations that have been done, it is found that the best partners produce the following levels:
Partner 1 (M1) has a final score of 3.55, and Partner 2 (M2) has a score of 3.55 and Partner 3 (M3) has a final score of 4. The result recommended by this method is a partner named Mitra 3.

5. Conclusion
The implementation of the Profile Matching Algorithm which is used to find the best potential partners based on predetermined criteria can speed up the calculation model if the existing criteria in the company have various variables. That way it will be easy to select prospective tenants and company employees will also get recommendations from potential partners from the company. The greater the value (with number 4) there is no difference or competence with the company is appropriate, it will have a great opportunity to be selected as a potential partner.

6. References
[1] Aneja P, Gambhir. S, "Geo-Social Semantic Profile Matching Algorithm for Dynamic Interests in Ad-hoc Social Network”. International Conference on Computational Intelligence & Communication Technology, IEEE, p 354-358, 2015.
[2] Q. Trieu and T. Pham, “STARS: Ad-Hoc Peer-to-Peer Online Social Network,” in Computational Collective Intelligence. Technologies and Applications, ser. Lecture Notes in Computer Science, N.-T. Nguyen, K. Hoang, and P. Jdrzejowicz, Eds. Springer Berlin Heidelberg, 2012, vol. 7653, pp. 385–394. [On line]. Available: http://dx.doi.org/10.1007/978-3-642-34630-9 40
[3] S. Gambhir and N. Aneja, “Ad-hoc Social Network: A Comprehensive Survey,” International Journal of Science and Engineering Research, vol. 4, no. 8, pp. 156–160, Aug 2013. [Online]. Available: http://www.ijser.org/researchpaper%5CAd-hoc-Social-Network-A-Comprehensive-Survey.pdf.

[4] R. SEETHARAM, "Profile Matching Scheme in Mobile Social Networks using iCPM Protocol," International Journal of Computer Engineering in Research Trends, vol. 2, no. 1, pp. 13-17, 2015.

[5] L. Abdullah and CR Adawiyah, "Simple Additive Weighting Methods of Multi-criteria Decision Making and Applications: A Decade Review," International Journal of Information Processing and Management (IJIPM), vol. 5, no. 1, pp. 39-49, 2014.

[6] F. Dressler, G. Fuchs, S. Truchat, Z. Yao, Z. Lu and H. Marquardt, "Profile-Matching Techniques for On-Demand Software Management in Sensor Networks," Hindawi Publishing Corporation - Journal on Wireless Communications and Networking, vol. 2007, pp. 1-10, 2007.

[7] K. Shewale and SD Babar, "An Efficient Profile Matching Protocol Using Privacy Preserving In Mobile Social Network," Procedia Computer Science, vol. 79, pp. 922-931, 2016.

[8] Risawandi and R. Rahim, "Study of the Simple Multi-Attribute Rating Technique For Decision Support," International Journal of Scientific Research in Science and Technology (IJSRST), vol. 2, no. 6, pp. 491-494, 2016.

[9] APU Siahaan, "Fuzzification of College Adviser Proficiency Based on Specific Knowledge," International Journal of Advanced Research in Computer Science and Software Engineering, vol. 6, no. 7, pp. 164-168, 2016.

[10] Xiangpei Hu, Lirong Wu, Chao Li "SMS-based Mobile Recommendation System for Campus Recruitment in China", 10th International Conference on Mobile Business 2011.

[11] Adiyyendi, "Multi-Attribute Decision Making Using Simple Additive Weighting and Weighted Product in Food Choice," IJ Information Engineering and Electronic Business, vol. 6, pp. 8-14, 2015.

[12] RP Kusumawardani and M. Agintiara, "Application of Fuzzy AHP-TOPSIS Method for Decision Making in Human Resource Manager Selection Process," Procedia Computer Science, vol. 72, pp. 638-646, 2015.