Implementation of Algorithm TOPSIS and ISO 9126 on the Selection of Employee Acceptance

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Keywords: Employess, Recruitment, Application.

Abstract: Human resources in a company is one of the determinable of a company to deal with competition with other companies. So in managing a human resource is required the right steps. A company should do a very strict selection in employee acceptance. Employees must meet the criteria required by the company. Most of the recruitment by the company is to post jobs on web site job seekers such as jobsdb.com, JobStreet and Linkedln. So that recruitment will receive many work applications from the applicants. and check it one. Thus ineffective and efficient and often errors in the calculation of the value of each prospective employee as well as a subjective appraisal that resulted in the elected employee is not the best employee and not in accordance with the assessment. In this research using TOPSIS algorithm so that the value of each prospective employee will be calculated and carried out using the algorithm and displayed in the application. To prove the feasibility of an application that has been created using ISO 9126. The result of this research is a decision support system application that uses TOPSIS algorithm.

1 INTRODUCTION

Acceptance of the selection process of employees in a company is very important. Because the recruitment process is correct and in accordance with the procedure will produce high quality human resources. And vice versa if the recruitment is done not in accordance with the procedure will produce human resources that do not qualify. Recruitment processes that occur in large companies in the region of Indonesia are still using manual calculations and do not utilize methods or algorithms. By utilizing algorithms such as TOPSIS then the calculation of each prospective employee's process will be very fast and accurate. The rank process of each prospective employee's value can also be displayed by Graphik so that decision makers can quickly decide on every prospective employee. Like previous research Wahyuni, Elyza Gustri and Ananto Tri Anggoro titled Support system for Employee acceptance by TOPSIS method. In the research using 5 criteria, namely IPK, TOEFL, TPA, work experience and age and the test of application results using interviews. Similarly, the previous research Djamain dan De Christin is about the system of supporting the recruitment decision of the State electricity company using Simple Additive Weighted algorithm. The criteria used are discipline, obedience in carrying out duties, skills, Moral and attitudes, work experience, cooperation and innovation. The results of the research include the value of each prospective employee and have not used the test application that has been created. Referring to the previous two studies then in this research at the stage of testing software or applications that have been made will be tested with ISO 9126.

2 MAIN CONCEPT

2.1 Multi Attribute Decision Making

Multi Attribute Decision Making is a way or method used in looking for a maximum alternative from several alternatives with specified criteria. The goal of the MADM is to determine the value of the weights on each attribute, and continue with each alternative. According to Kusumadewi some of the features that exist in the MADM, namely:

a. Alternative, that is, prospective employees who will be recruited to become employees.

Prasetyo, B., Mujito, ., Anubhakti, D. and Idrus, M.
Implementation of Algorithm TOPSIS and ISO 9126 on the Selection of Employee Acceptance.
DOI: 10.5220/0008930801400146
In *Proceedings of the 1st International Conference on IT, Communication and Technology for Better Life (ICT4BL 2019)*, pages 140-146
ISBN: 978-989-758-429-9

b. Attributes, or also called criteria. i.e. the size that is the basis of judgment or determination of something in decision making.
c. Weight of decision, the decision weight will show the value of relative interest on each criterion, W = (w1, w2, ..., wn).
d. Decision Matrik, a decision matrix or X, will be M X N, and contains xij elements, representing from an alternate Ai (i = 1, 2,..., m) against the Cj criterion (j = 1, 2,..., N)..

On MADM The calculation process is done into 3 stages, first the preparation of the components of the situation, then analyzes and processes the synthesis of information. The decision matrix given each alternative to each X attribute as follows:

$$X = \begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1n} \\ \vdots & & \ddots & \vdots \\ X_{m1} & & \cdots & X_{mn} \end{bmatrix} \quad (1)$$

2.2 Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

TOPSIS method is one method that can help the decision making process to solve the problem of optimal decision practically. This is because the concept is simple and understandable, efficient and computing have the ability to measure the relative performance of the decision alternatives in the form of a simple mathematical.

2.2.1 Procedure TOPSIS

a. Computes the matrix the normalization

TOPSIS need rating the performance of each prospective employee on any criteria or sub criteria the normalization. normalization matrix formed from Equation 1.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij^2}}} \quad (2)$$

b. Computes the weigh matrix normalization

Equations (3) used to calculate weighted the matrix normalization, then it must be determined in advance the value of weights that represent absolute preferences of decision makers. The value indicates the level of preference weights of the relative importance of each criterion or sub criteria in equation (2)

$$W = \{w1, w2, ..., wn\} \quad (2)$$

$$y_{ij} = w_i r_{ij} \quad (3)$$

c. Calculate the Ideal Solution Matrix of positive and Negative Ideal Solution Matrix

The ideal solution is positive and negative ideal solution can be determined based on the weighted rating of normalization. Please note terms in equations (4) and (5) in order to calculate the value of an ideal solution by first determining whether the of the advantage (benefit) or costs (cost).

$$A+ = (y1+ , y2+,\ldots\ldots yn+) \quad (4)$$

$$A- = (y1- , y2-,\ldots\ldots yn-) \quad (5)$$

d. Determines the distance between the value of each Alternative with a positive Ideal Solution Matrix and matrix Ideal Solution Negative

Determine the distance between the alternative Ai with a positive ideal solution, which is described in equation (6).

$$D_i^+ = \sqrt{\sum_{j=1}^{n}\left(y_i^+ - y_{ij}\right)} 2 \text{ ; i= 1,2.....m} \quad (6)$$

Determine the distance between the alternative Ai with a negative ideal solution, which is described in equation (7)

$$D_i^- = \sqrt{\sum_{j=1}^{n}\left(y_{ij} - y_i^-\right)} 2 \text{ ; i= 1,2.....m} \quad (7)$$

e. e. Calculate the value of Preferences for each Alternative

The value of preferences (Vi) for each alternative are formulated in the equation (8) as follows:

$$V_i = \frac{D_i^-}{D_i^- + D_i^+} \quad (8)$$

2.2.2 ISO 9126

To conduct application testing the ISO 9126 is very suitable for use, ISO 9126 is an international standard in testing software. ISO 9126 defines the quality of the software products, models, quality characteristics, and related metrics used to evaluate and determine the quality of a software product. According to Al-Qutaish The testing aspects adopted are as follows:

a. Functionality. That is the ability of a software to serve the needs of users according to its functions.
b. Reliability. Is a permissible software is capable of working in optimal conditions even in certain conditions.

c. Usability. Is a simple permissible software is easy to grasp and understand as well as easy to pull and not dull when...

d. Efficiency Is the permissible software can provide maximum performance to the resources used.

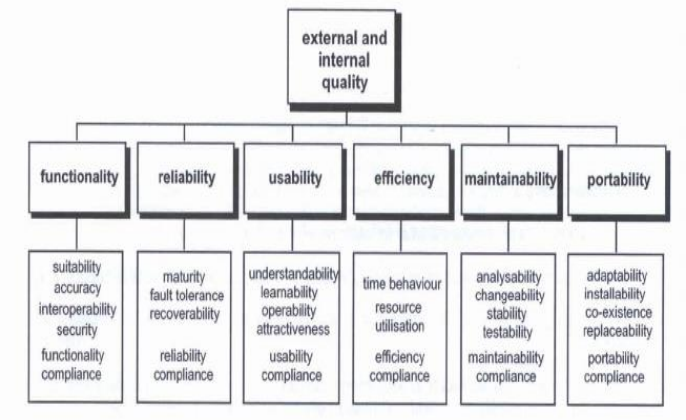

Figure 1: ISO 9126

Table 1. ISO 9126 Capability Aspects

Criteria	Sub Criteria	Description
Functionality	Suitability	Able to perform tasks according to the objectives set
	Accuracy	Able to produce accurate and detail output according to the needs
	Security	Able to face someone who is not given access to enter the system
	Interoperability	Able to interact between operating system platforms
	Compliance	Able to meet the needs in accordance with prevailing standards and regulations
Reliability	Maturity	Able to avoid failures of software errors
	Fault tolerance	Able to maintain application performance in the event of a software error
	Recoverability	The application is able to improve performance after a system failure including connection to network and data
Usability	Understandability	Easy to understand
	Learnability	applications already to learn
	Operability	Easy to operate applications
	Attractiveness	Application is able to attract users to use it
Efficiency	Time behavior	Able to provide fast response for data processing according to function
	Resource behavior	Able to manage the resources owned when performing predefined functions

3 DISCUSSION AND RESULT

In this study the overall criteria using the attribute table benefit, and for the assessment of use Range from 1 – 5, use 6 Criteria and 5 prospective employees

Table 2: Table of Criteria

No	Code	Criteria Name	Default Value
1	C01	Physical Appearance	4
2	C02	intelligence	5
3	C03	Communication	4
4	C04	Work Motivation	4
5	C05	Education	5
6	C06	Work Experience	5

Description:
5 = Very Good
4 = Good
3 = Enough
2 = Poor
1 = Very Poor

3.1 Calculation Method TOPSIS

a. After Alternative following the selection process and the assessment then obtained data are shown in table 3:

Table 3: Table of Assessment

No	Alternative Name	Criteria Name					
		C01	C02	C03	C04	C05	C06
1	Indah	5	3	4	5	5	5
2	Rudiyanto	5	4	5	4	4	4
3	Kurniawan	5	5	5	3	3	4
4	A. Riyan	4	3	4	4	4	4
5	Charles	5	5	5	5	3	3
Devideer		10,770	9,165	10,344	9,539	9,055	9,055

The value of the divider is derived from the value of the root of criteria each alternatif then square and calculate. Example (SQRT ((5^2) + (5^2) + (5^2) + (4^2) + (5^2)) = 10,770.

b. Specifies matrix decision normalization, are shown in table 4.

Table 4: Table of Normalization

No	Alternative Name	Criteria Name					
		C01	C02	C03	C04	C05	C06
1	Indah	0,464	0,327	0,387	0,524	0,577	0,552
2	Rudiyanto	0,464	0,436	0,483	0,419	0,462	0,442
3	Kurniawan	0,464	0,546	0,483	0,314	0,346	0,442
4	A. Riyan	0,3741	0,327	0,387	0,419	0,462	0,442
5	Charles	0,464	0,546	0,483	0,524	0,346	0,331

Then each alternate value divided by the value of the divisor. Sample: 5 / 10,770 = 0,464.

c. Calculate the decision matrix weighted normalization, are shown in table 5. As for the weighting used is W = (4, 5, 4, 4, 5, 5). So the retrieved results i.e.

Table 5: Table of Weights Normalization

No	Alternative Name	Criteria Name					
		C01	C02	C03	C04	C05	C06
1	Indah	1,857	1,637	1,547	2,097	2,887	2,761
2	Rudiyanto	1,857	2,182	1,933	1,677	2,309	2,209
3	Kurniawan	1,857	2,728	1,933	1,258	1,732	2,209
4	A. Riyan	1,486	1,637	1,547	1,677	2,309	2,209
5	Charles	1,857	2,728	1,933	2,097	1,732	1,656

Then the value of the matrix is multiplied by the value of the normalization decision W. Sample: 0,464 * 4 = 1,857.

d. Calculate the ideal solution matrix of positive and negative, the ideal solution matrix are shown in table 6:

Table 6: Table of Matrix Solutions

A+	1,857	2,728	1,933	2,097	2,887	2,761
A-	1,486	1,637	1,547	1,258	1,732	1,656

e. Calculate the distance between the value of each alternative with ideal solution matrix of positive and negative ideal solution matrix. that will be shown in table 7:

Table 7: Table of Matrix Solutions Ideal Positive and Negative

D+	D-
1,157588	1,474639
0,898207	1,046059
1,427105	1,215706
1,409644	0,713553
1,154701	1,476901

f. Calculate the value of preferences for each alternative, which would be shown on table 8:

Table 8: Table Value Preference

No	Alternative Name	Alternative Value (V)
1	Indah	0,560
2	Rudiyanto	0,538
3	Kurniawan	0,460
4	A. Riyan	0,336
5	Charles	0,561

Based on calculation using TOPSIS method then obtained data that the alternative name charles who gained the highest score namely 0.561 and charles received employee.

3.2 Test Validating ISO 9126

Test Validating ISO 9126 (Examine of Functionability, Reliability, Usability, Efficiency Model). In testing with the use of ISO 9126 applied this, researchers involving 3 users to give value to this Model. and using likert scale for the assessment

a. Percentage Score models for Variable Functionality

Table 9: Table of Score Model Variable Functionality

Answer Criteria	Weight	*Functionality*								Total
		Suitability		*Accuracy*		*Security*		*Interoperability*	*Compliance*	
		1	2	3	4	5	6	7	8	
SS	5	0	0	0	0	0	0	1	1	2
S	4	3	3	3	0	0	0	2	2	13
R	3	0	0	0	3	3	3	0	0	9
TS	2	0	0	0	0	0	0	0	0	0
STS	1	0	0	0	0	0	0	0	0	0
Total Responden		3	3	3	3	3	3	3	3	
Score Actual		12	12	12	9	9	9	13	13	89
Score Ideal		15	15	15	15	15	15	15	15	120

% Score Actual: Score Actual Functionality x 100 %
Score Ideal Reliability
% Score Actual: 89 x 100%
120
% Score Actual: 74,2 %

From the result of the calculation of Functionaliy model obtained a value of 74,2%. Then it can be concluded this model goes well.

b. Percentage Score models for Variable Reliability

Table 10: Table of Score Model Variable Reliability

Answer Criteria	Weight	*Reliability*					Total
		Maturity		*Fault Tolerance*		*Compliance*	
		9	10	11	12	13	
SS	5	0	0	0	0	0	0
S	4	3	3	0	3	3	12
R	3	0	0	3	0	0	3
TS	2	0	0	0	0	0	0
STS	1	0	0	0	0	0	0
Total Responden		3	3	3	3	3	
Score Actual		12	12	9	12	12	57
Score Ideal		15	15	15	15	15	75

% Score Actual: Score Actual Reliability x 100 %
Score Ideal Reliability
% Score Actual: 57 x 100%
75
% Score Actual :76 %

From the result of the calculation of Reliability model obtained a value of 76%. Then it can be concluded this model goes well.

c. Percentage Score models for Variable Usability

Table 11: Table of Score Model Variable Usability

Answer Criteria	Weight	*Usability*							Total
		Understandability	*Learnability*		*Operability*		*Attractiveness*		
		14	15	16	17	18	19	20	
SS	5	0	0	0	0	0	0	0	0
S	4	2	3	3	3	3	0	3	17
R	3	1	0	0	0	0	3	0	4
TS	2	0	0	0	0	0	0	0	0
STS	1	0	0	0	0	0	0	0	0
Total Responden		3	3	3	3	3	3	3	
Score Actual		11	12	12	12	12	9	12	80
Score Ideal		15	15	15	15	15	15	15	105

% Score Actual: Score Actual Usability x 100 %
Score Ideal Usability
% Score Actual: 80 x 100%
105
% Score Actual: 76,19 %

From the result of the calculation of Usability model obtained a value of 76,19%. Then it can be concluded this model goes well.

d. Percentage Score models for Variable Efficiency

Table 12: Table of Score Model Variable Efficiency

Answer Criteria	Weight	*Efficiency*				Total
		Time behavior			*Resource Behaviour*	
		21	22	23	24	
SS	5	0	0	0	1	1
S	4	3	3	0	2	8
R	3	0	0	3	0	3
TS	2	0	0	0	0	0
STS	1	0	0	0	0	0
Total Responden		3	3	3	3	
Score Actual		12	12	9	13	46
Score Ideal		15	15	15	15	60

% Score Actual: Score Actual Efficiency x 100 %
Score Ideal Efficiency
% Score Actual: 46 x 100%
60
% Score Actual: 76,67 %

From the result of the calculation of Efficiency model obtained a value of 76,67 %. Then it can be concluded this model goes well.

Description:
SS = Very Agree
S = Agree
R = Hesitation
TS = Not Agree
STS = Very Not Agree

4 CONCLUSIONS AND FURTHER WORK

In application testing using ISO 9126 obtained a value of functionality of 74.2 and reability 76.19 while usability value 76.19 and efficiency value 76.67. The final result obtained 75.76%. This indicates that the ISO 9126 test goes well. In calculating the value of prospective employees using the TOPSIS algorithm obtained the data received into the employee is Charles with a total value of 0561 while the lowest value of prospective employees obtained A. Riyan with the value of 0336. For subsequent research the algorithm can be combined with other algorithms such as AHP, ANP, WP or any other algorithm. As for testing applications can use Test Accepment Test or other test models.

ACKNOWLEDGEMENTS

The authors wish to thank Rector Budi luhur University and Faculty of information technology and the related parties so that the journal can be resolved.

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