Wahana Aktivitas dan Kreativitas Teknologi Unipasby **(WAKTU)**
e-ISSN: 2715-4947 p-ISSN: 1412-1867
Vol 22 No 01, 2024, pp. 31-38
Accredited "Sinta 5" by Kemenristek/ BRIN, No SK: 164/E/KPT/2021
Open Access: 10.36456/waktu.v22i1.8412

ANALYSIS OF EMPLOYEE PERFORMANCE AT IKM X WITH AHP-ELECTRE METHOD

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ARTICLE INFO

Article history:
Received November 20, 2023
Revised November 25, 2023
Accepted Desember 19, 2023
Available online Januari 21, 2024

Kata Kunci:
Kinerja karyawan, AHP, Electree, Konsistensi Ratio

Keywords:
Employee Performance, AHP, Electree, Consistency Ratio

ABSTRACT

Every organization has to raise the standards of its human resources and make them more receptive to any changes. Organizations with knowledge-based human resources with a variety of skills and experience are better able to compete and adapt to environmental changes. This research was conducted to evaluate employee performance and to find out the deficiencies possessed by their employees by using the AHP-Electre method so that business owners can determine what actions must be taken to improve their performance at work by previously calculating AHP as a weight for takers. decision (decision maker). The resulting criteria weight matrix after processing the AHP data is W = (0.081 0.094 0.165 0.088 0.073 0.049 0.050 0.049 0.054 0.099 0.147 and 0.049) with a consistency value of 0.092. And the order of dominance from those with the highest score to the lowest is Badrun (A2), Adi (A3), Dudi (A4), Mukmin (A1), and the last position is Yanto (A5)

ABSTRAK

Setiap organisasi harus meningkatkan standar sumber daya manusianya dan membuat mereka lebih reseptif terhadap setiap perubahan. Organisasi dengan sumber daya manusia berbasis pengetahuan dengan berbagai keterampilan dan pengalaman lebih mampu bersaing dan beradaptasi dengan perubahan lingkungan. Pada penelitian ini dilakukan untuk mengevaluasi kinerja karyawan, dan untuk mengetahui kekurangan yang dimiliki oleh karyawannya dengan menggunakan metode AHP-Electre sehingga pemilik usaha dapat menetukan tindakan apa saja yang mesti di ambil agar meningkatkan kinerja mereka di tempat kerja dengan sebelumnya menghitung AHP sebagai bobot untuk pengambil keputusan (decision maker). Nilai matriks bobot kriteria yang dihasilkan setelah dilakukan pengolahan data AHP adalah W = (0,081 0,094 0,165 0,088 0,073 0,049 0,050 0,049 0,054 0,099 0,147 dan 0,049) dengan nilai konsistensi 0,092. Dan adapun urutan dominasinya dari yang memiliki nilai tertinggi sampai yang terendah yaitu Badrun (A2), Adi (A3), Dudi (A4),Mukmin (A1) dan posisi terakhir yanto (A5). .

I. INTRODUCTION

The world of work needs people who have a growth mentality, are smart, innovative, and able to work with a good mood to face the current situation, as can be seen from the current global competition. Human resources are the most dependent assets of an organisation or business because, without them, other resources such as capital, machinery, materials, and others would not be as valuable [1]. This implies that using human resources effectively is critical to achieving business goals. The important role of human resources in achieving organisational goals must be matched with their capabilities, which must be rigorously examined to ensure that they can complete all work assignments accurately and deliver superior results in both quantity and quality [2][3]. Unfortunately, some problems arise with the growth of businesses in this digital era, one of which is that it is difficult for companies to

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find employees with specialised abilities that the company actually needs. As a result, businesses must be careful when selecting their employees [4]

In an organisation or agency, assessing the performance of a job is a stage of job evaluation to set benchmarks in determining the quality and achievements of each person [5][6]. Employee performance appraisal will provide an overview of how the company's employees behave in relation to their work and information on how compensation, training and development, employee advancement, and other factors are determined [7][8]. Low employee performance is a common problem that prevents businesses from achieving their goals. One of the researchers said that performance is the result of work that can be completed by a person or group of people in an organisation in accordance with their respective authorities and responsibilities in the context of efforts to achieve the objectives of the organisation concerned legally, without violating the law, and in accordance with applicable provisions. with norms and ethics [9].

There are several studies that have been conducted on measuring employee performance, the first is research conducted by [10] regarding employee performance appraisal using AHP and Vikor methods. The research findings show how the Vikor approach, which helps assess employee performance based on standards set by the organisation and weighs these standards using the AHP method The second research is employee performance research using Ahp and Moora Weighting [11]. Where the questionnaire was distributed to 27 workers at STMIK Bina Nusantara Jaya Lubuklinggau to assess the reliability of the criteria which will then be used in the evaluation of criteria. After testing the validity of the criteria to be used, it was determined that 5 criteria namely work performance, employee honesty, attendance, attitude, and responsibility were valid. The performance appraisal process involves the selection of options and standards to be applied. An Analitycal Hierarchy Process (AHP) approach was used to examine the weighting of the criteria. The performance appraisal process will be examined using the Multi-Objective Optimisation on the Basis of Ratio Analysis (MOORA) method once the criteria values are collected.

The next research is about performance appraisal of employees of Permata Hati Duri Hospital. Where competence, professionalism, communication, management, and friendliness are the assessment criteria used. This research utilises MySQL as a database, PHP programming, and TOPSIS methodology. Ten employees were taken as samples. The final output of the system is in the form of employee value assessment results [12]. In this research, we will use the AHP-Electre method in testing. The weighting of criteria is determined by the AHP technique, and the ranking of selected labour candidates is determined by the ELECTRE method. Thus, the purpose of this research is to help business owners in assessing the performance of their employees in completing their duties so that employees who have good performance can be extended their working period and also to find out what deficiencies each worker has.

II. RESEARCH METHODS

A. Data Collection Techniques and Data Sources

The two data collection methods required for this research are: interviews, which involved asking questions directly to the responsible parties and questionnaires, which involved collecting data by distributing questionnaires containing a list of questions relating to the research topic.

Primary data is what is needed to conduct this research. Primary data is in the form of information obtained through field exploration and direct observation. The information needed is in the form of a company profile, the names of the personnel whose performance will be evaluated and the criteria to be used.

B. Data Processing

The first step is with AHP (Analitycal Hierachy Process). The AHP method involves 4 steps, namely: structure for problem selection, build a matrix for pairwise comparisons, calculate normalised weights and synthesise priorities. Consistency of ratios will be seen if each comparison matrix is filled randomly. An indicator that theoretically approximates the degree of pairwise comparison is the consistency ratio (CR). It operates according to the largest eigenvalue and the size of the matrix (consistency index), which is then contrasted with its value if pairwise comparisons are performed randomly (random index). If the consistency ratio does not exceed 0.1, then the consistency of the comparison is accepted for pragmatic purposes.

The second step is with Electre (Et Choix Traduisant La Realite). There are several steps taken when processing data using the Electre method, namely:

1. Calculation of normalisation of pairwise comparisons
   $r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} {x_{ij}}^2}}$ with i = 1,2, ….., m and j = 1, 2, ……, n (1)
2. Calculating the multiplication of criteria weights with normalisation matrix
   $V_{ij} = w_j x_{ij}$ (2)
3. Determine concordance index dan discordance index.
   $C_{kl} = \{j | v_{kj} \geq v_{ij}\}$ untuk j = 1,2, ……, n (3)
   For discordance index:
   $D_{kl} = \{j | v_{kj} > v_{ij}\}$ untuk j = 1, 2, …., n (4)
4. Calculating concordance index
   $C_{kl} = \sum_{jC_{kl}} w_j$ (5)
5. Calculating discordance index
   $d_{kl} = \frac{\max\{|v_{kj} - v_{ij}|\}_{j \in D_{kl}}}{\max\{|v_{kj} - v_{ij}|\}_{\forall j}}$ (6)
6. Determine the dominant concordance index
   $\underline{c} = \frac{\sum_{k=1}^{m}\sum_{l=1}^{m} c_{kl}}{m\,(m-1)}$ where m is the dimension of the matriks (7)
   $f_{kl} = \begin{cases} \rightarrow 1, \text{ jika } C_{kl} \geq \underline{c} \\ \searrow 0, \text{ jika } C_{kl} < \underline{c} \end{cases}$
7. Calculate the matrix of G and use the result to find the applicable non-conformance index.
   $\underline{d} = \frac{\sum_{k=1}^{m}\sum_{l=1}^{m} d_{kl}}{m\,(m-1)}$ (8)
   $f_{kl} = \begin{cases} \rightarrow 1, \text{jika } dkl \geq \underline{d} \\ \searrow 0, \text{ jika } d_{kl} < \underline{d} \end{cases}$
8. The main aggregate matrix is identified.
   $e_{kl} = f_{kl} \times g_{kl}$ (9)
9. Removing the least favourable option from the ranking in the final stage by scanning the matrix column E, and the one with the least number 1 will be selected as the best.

C. Research Steps

The stages in this research involve 4 stages, namely data processing with AHP, data processing with Electre, analysis and discussion and the last stage is conclusions and suggestions. The research steps can be described as in the flow chart below:

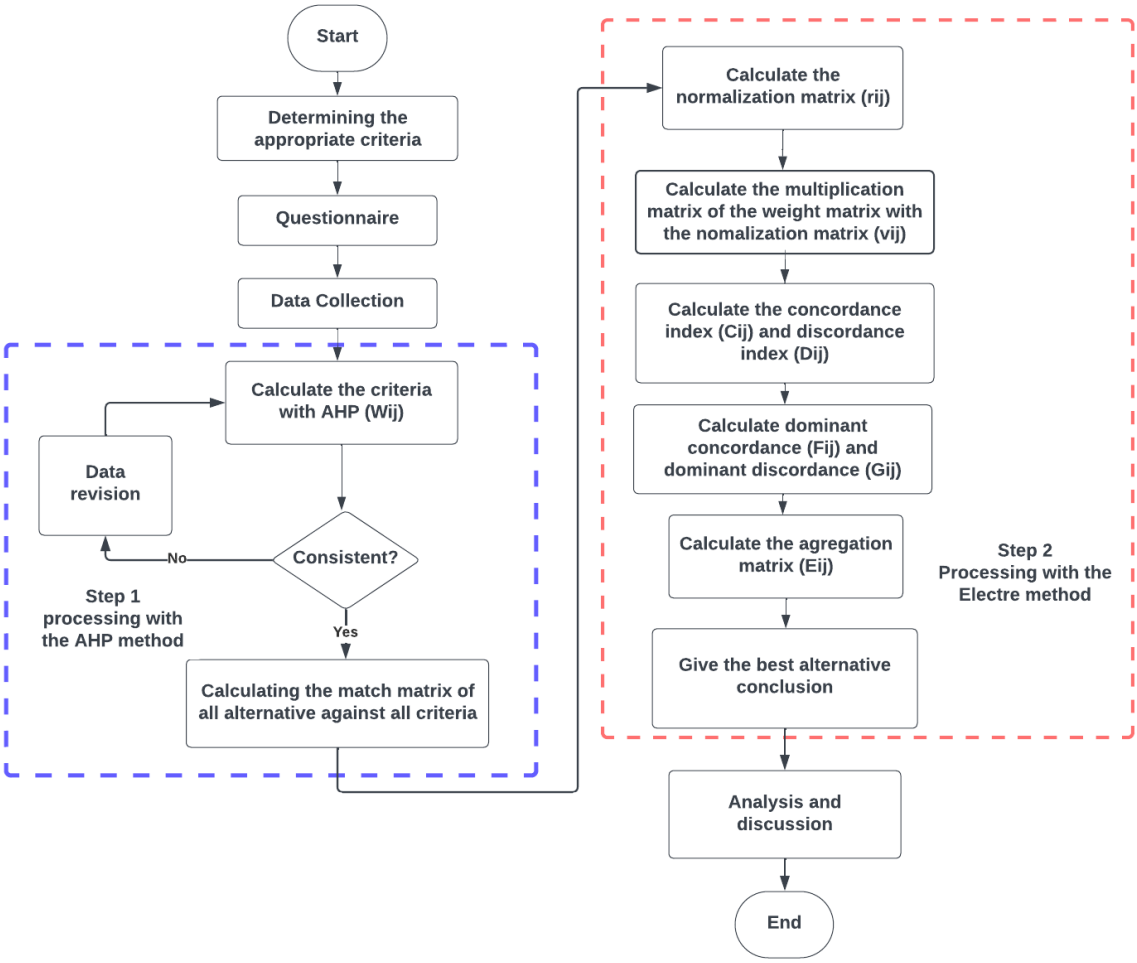

Figure 1. Research Flocwchart

III. RESULTS AND DISCUSSION

A. AHP (Analitycal Hierachy Process)

In this study, we will use 5 alternatives / 5 employees whose performance will be evaluated, namely Mukmin (A1), Badrun (A2), Adi (A3), Dudi (A4), and Yanto (A5), and use 12 criteria. The criteria that will be used in this research are tidiness of work (C1), cooperation (C2), honesty (C3), responsibility (C4), experience (C5), emotional stability (C6), attitude (C7), work period (C8), time utilisation (C9), skill (C10), creativity (C11) and communication (C12). The recapitulation of the results of the questionnaire comparison of the importance of the criteria is as follows:

Table 1. Recapitulation of criteria importance comparison questionnaire

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
C1	1	0,33	0,33	1	1	3	1	1	1	3	1	1
C2	3	1	0,2	0,33	1	3	1	3	1	1	1	3
C3	3	5	1	1	3	3	5	3	3	1	1	3
C4	1	3	1	1	1	1	1	3	1	0,33	1	1
C5	1	1	0,33	1	1	3	1	1	3	1	0,2	1
C6	0,33	0,33	0,33	1	0,33	1	1	1	1	0,33	1	1
C7	1	1	0,2	1	1	1	1	1	1	0,33	0,2	1
C8	1	0,33	0,33	0,33	1	1	1	1	1	1	0,33	1

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
C9	1	1	0,33	1	0,33	1	1	1	1	1	0,33	1
C10	0,33	1	1	3	1	3	3	1	1	1	0,33	3
C11	1	1	1	1	5	1	5	3	3	3	1	3
C12	1	0,33	0,33	1	1	1	1	1	1	0,33	0,33	1
TOTAL	14,66	15,32	6,38	12,66	16,66	22	22	20	18	13,32	7,72	20

In AHP, several steps must be taken to find the consistency value, and if the consistency value (CR) ≤ 1 then the data can be said to be consistent. The first stage in the AHP calculation is the calculation of consistency, obtained data as in the following table:

Table 2. Weight of criteria

A												W^T	$(A)(W^T)$
1	0,33	0,33	1	1	3	1	1	1	3	1	1	1,12	13,86
3	1	0,2	0,33	1	3	1	3	1	1	1	3	1,27	13,47
3	5	1	1	3	3	5	3	3	1	1	3	2,29	13,86
1	3	1	1	1	1	1	3	1	0,33	1	1	1,22	13,81
1	1	0,33	1	1	3	1	1	3	1	0,2	1	0,98	13,45
0,33	0,33	0,33	1	0,33	1	1	1	1	0,33	1	1	0,61	12,24
1	1	0,2	1	1	1	1	1	1	0,33	0,2	1	0,68	13,66
1	0,33	0,33	0,33	1	1	1	1	1	1	0,33	1	0,67	13,56
1	1	0,33	1	0,33	1	1	1	1	1	0,33	1	0,74	13,74
0,33	1	1	3	1	3	3	1	1	1	0,33	3	1,32	13,36
1	1	1	1	5	1	5	3	3	3	1	3	2,00	13,58
1	0,33	0,33	1	1	1	1	1	1	0,33	0,33	1	0,66	13,35
14,66	15,32	6,38	12,66	16,66	22	22	20	18	13,32	7,72	20	13,56	161,94

The next stage in AHP is to find the eugen value, calculate the consistency index and calculate the consistency ratio using the equation as follows:

$$t = \frac{1}{2} \sum_{i=1}^{n} \left(\frac{the\ i \text{ element in (A)}(W^T)}{the\ 1st \text{ element in } W^T} \right) = \frac{161,94}{12} = 13,495$$

$$CI = \frac{t-n}{n-1} = \frac{13,495-12}{12-1} = 0,136$$

For n = 12, obtained RI_{12} = 1,48

$$\frac{CI}{RI_{12}} = \frac{0,136}{1,48} = 0,092 < 0,1 \rightarrow \text{Consistent}$$

From the results of the calculation of the weight of the criteria, it can be seen that the Honesty Criteria has a value greater than the other criteria, which is 0.1651. This shows that the business prioritises the honesty of employees in carrying out their duties, while other criteria are only taken into account as support. The order of priority is as follows: C3 > C11 > C10 > C2 > C4 > C1 > C5 > C9 > C7 > C6 > C12, and C8 is the last order.

B. Electre (Et Choix Traduisant La Realite*)*

Data processing with the ELECTRE method is done to identify the concordance and non-concordance of each alternative provided. When one alternative's criteria perform better than another alternative's criteria, this is referred to as concordance, and the relative importance of each set of criteria is then calculated. Discordance on the other hand is a situation where the criteria of one choice is

outperformed by the criteria of another alternative. One can determine the dominance of the alternative to be selected by calculating the concordance threshold and the discordance threshold.

The first step of data processing with Electre is to determine the suitability matrix between alternatives for each criterion (Xij) and can be seen in the following table.

Table 3. Suitability matrix between alternatives against each criterion

Alternative	Criteria											
	C1	C2	C3	C4	C	C6	C7	C8	C9	C10	C11	C12
A1	4	4	5	3	4	3	4	5	3	3	4	3
A2	4	5	5	5	4	4	4	5	5	5	4	3
A3	5	5	4	5	4	3	3	5	5	5	5	5
A4	4	4	5	3	3	4	5	3	4	4	4	3
A5	3	3	4	4	3	3	3	4	3	3	4	3

After creating the suitability matrix, the next step is to find the value of the normalisation matrix using equation (1), so that the following data is obtained.

$$R = \begin{vmatrix} 0{,}441 & 0{,}419 & 0{,}483 & 0{,}327 & 0{,}492 & 0{,}390 & 0{,}461 & 0{,}5 & 0{,}341 & 0{,}364 & 0{,}424 & 0{,}384 \\ 0{,}441 & 0{,}524 & 0{,}483 & 0{,}545 & 0{,}492 & 0{,}520 & 0{,}461 & 0{,}5 & 0{,}569 & 0{,}485 & 0{,}424 & 0{,}384 \\ 0{,}552 & 0{,}524 & 0{,}386 & 0{,}545 & 0{,}492 & 0{,}390 & 0{,}346 & 0{,}5 & 0{,}569 & 0{,}606 & 0{,}529 & 0{,}640 \\ 0{,}441 & 0{,}419 & 0{,}483 & 0{,}327 & 0{,}369 & 0{,}520 & 0{,}577 & 0{,}3 & 0{,}341 & 0{,}364 & 0{,}424 & 0{,}384 \\ 0{,}331 & 0{,}314 & 0{,}386 & 0{,}436 & 0{,}369 & 0{,}390 & 0{,}346 & 0{,}4 & 0{,}341 & 0{,}364 & 0{,}424 & 0{,}384 \end{vmatrix}$$

Furthermore, by using equation (2), data is obtained as in the following table:

Table 4. Multiplication between criteria weights with normalisation matrix

Alt	Kriteria											
	C1	C2	C3	C4	C	C6	C7	C8	C9	C10	C11	C12
A1	0,036	0,040	0,080	0,029	0,044	0,019	0,023	0,025	0,019	0,036	0,062	0,019
A2	0,036	0,049	0,080	0,048	0,044	0,026	0,023	0,025	0,031	0,048	0,062	0,019
A3	0,045	0,049	0,064	0,048	0,044	0,019	0,017	0,025	0,031	0,060	0,078	0,032
A4	0,036	0,036	0,080	0,029	0,033	0,026	0,029	0,015	0,019	0,036	0,062	0,019
A5	0,027	0,027	0,064	0,039	0,033	0,019	0,017	0,020	0,019	0,036	0,062	0,019

By using equations (3) and (5) to find the value of the concordance index matrix and equations (4) and (6), the value of the discordance index matrix will be obtained. The results of the value of the following equations can be seen in tables 5 and 6.

Table 5. Concordance index matrix

Alternative	A1	A2	A3	A4	A5
A1	-	0,61	0,39	0,90	0,91
A2	1	-	0,62	0,69	1
A3	0,78	0,74	-	0,74	1
A4	0,88	0,54	0,25	-	0,86
A5	0,49	0,20	0,26	0,56	-

Table 6. Disconcordance index matrix

Alternative	A1	A2	A3	A4	A5
A1	-	1	1	0,59	0,6
A2	0	-	0,97	1	0
A3	0,67	1	-	0,67	0
A4	1	1	1	-	0,6
A5	1	1	1	1	-

After knowing the value of the concordance index and discordance index matrix, the next step is to determine the dominant concordance index using equation (7) and the dominant discordance index using equation (8)

Table 7. Dominant corcondance index matrix

Alternatif	A1	A2	A3	A4	A5
A1	-	0	0	1	1
A2	0	-	0	1	1
A3	1	1	-	1	1
A4	1	0	0	-	1
A5	0	0	0	0	-

Table 8. Dominant discorcondance index matrix

Alternative	A1	A2	A3	A4	A5
A1	-	1	1	0	0
A2	0	-	1	1	0
A3	0	1	-	0	0
A4	1	1	1	-	0
A5	1	1	1	1	-

The final result is an aggregation matrix, which is created by multiplying the dominant concordance matrix with the dominant discordance matrix, following (9).

Table 9. Agregation matrix

Alternatif	A1	A2	A3	A4	A5
A1	-	0	0	0	0
A2	0	-	0	1	0
A3	0	1	-	0	0
A4	1	0	0	-	0
A5	0	0	0	0	-

Based on the calculation results, the dominance order is obtained:

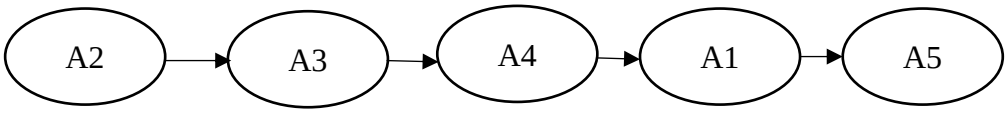

Figure 2. Electre dominance

D. CONCLUSION

From the results of the final calculation, the data shows that alternative A2 is superior to the other 4 alternatives, followed by alternatives A3, A4, A1 and the last position is owned by alternative A5. And from the calculation of the multiplication between the weight of the criteria with the normalisation matrix, it can be seen what deficiencies each employee has. for alternative A1 is lacking in emotional stability, time utilisation and communication. For A2 only has shortcomings in terms of communication. Alternative A3 lacks in emotional stability, and attitude. For alternative A4 has shortcomings in terms of tenure, time utilisation, and communication. As for A5, it is lacking in terms of emotional stability, attitude, tenure, and communication. From these results, it can be seen that each employee has a deficiency in terms of communication by only having a value of o.019 .

It is hoped that future research can add criteria or improve existing criteria and use different SPK methods such as Topsis, Promenthee, Vikor or other SPK **.**

ACKNOWLEDGEMENTS

The author would like to thank Mufiana as the business owner of IKM Simaluy, who has provided the opportunity and time for interviews and filling out questionnaires so that this research can be completed.

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