http://ejournal.seaninstitute.or.id/index.php/InfoSains
Jurnal Info Sains : Informatika dan Sains, Volume 13, No 02, 2023
E-ISSN.2797-7889, P-ISSN.2089-3329

Implementation of the Decision Support System for the Appointment of Permanent Employees at CV. Armas Suan Sejahatera Using the Analytical Hierarchy Process (AHP) Method

Muhammad Iqbal Panjaitan [1], Denni M. Rajagukguk [2], Mamed Rofendi Manalu[3]
[1,2,3] Universitas Imelda Medan
Email: Iqbalpj87@gmail.com [1], rajdenni@yahoo.co.id [2], endy.budidarma@gmail.com [3]

Keywords

Decision support system, AHP Method, Employee Appointment.

Abstract. The development of information technology today requires fast and accurate information in its implementation. Appointment of employees who perform well with the support of a decision support system is one implementation of the development of information technology. Research that uses the AHP method in this decision support system produces an appointment decision support system application that can be used in companies. The criteria used in this employee hiring decision support system are: Quality of employee work. The results of this study are to produce a ranking order of the selected good performing employee candidates, and the output of the application can assist decision makers in selecting alternative employee appointments. The application in this study is implemented using the VB programming language. NET 2008 and the database uses MySQL. The Analytical Hierarchy Process (AHP) method is a method used in designing decision support systems. The concept used by the AHP method is to change the value of a qualitative Decision Support System into a quantitative value. So that the decisions taken can be more objective. By using the Analytical Hierarchy Process, it is hoped that the process of hiring employees will be more effective and efficient so that company leaders quickly get the value of employees who will be appointed as permanent employees to get the expected results.

1. INTRODUCTION

In the ever-evolving corporate landscape, the challenge of making informed, unbiased, and strategic decisions concerning human resource management is one of the crucial aspects that can determine the future and sustainability of a business [1]. As firms expand and competition heightens, the importance of hiring the right talent becomes even more pronounced [2] [3]. Recognizing this significance, CV. Armas Suan Sejahatera, a renowned enterprise in its respective field, has been confronted with the predicament of streamlining its employee appointment process to ensure that only the most suitable candidates are inducted into permanent positions.

In traditional hiring systems, decisions are often made based on human judgment, which can sometimes be clouded by biases, personal experiences, and emotions [4]. These factors can inadvertently lead to sub-optimal choices which can adversely impact the company in the long run. With the advancements in technology and analytical methods, businesses are looking for systematic approaches to supplement their decision-making processes. The Decision Support System (DSS) has gained prominence in this regard, known for providing objective, quantifiable insights to aid complex decision-making scenarios [5].

The amount of competition in the business world, especially in the printing industry, requires developers to find a strategy that can increase product orders at printing companies. With the printing activity every day, the longer the data will be more and more [6] [7]. Therefore every company must have a good data processing system so that the data generated from these transactions can be useful to be made into a monthly or annual report. The data not only functions as an archive for the company, the data can be used and processed into useful information for increasing product orders [4][8].

Printing (printing) is a technology or art that produces copies of an image very quickly, such as words or drawings on paper, cloth, and other surfaces. The development of science and technology is progressing faster, so that at this time the printing industry has become more complete and modern. Printing companies in Indonesia are growing rapidly, both on a large, medium, and small scale. This development also took place in the city of Medan, where there were various printing companies in quite a large number. The development of the number of printing companies has resulted in increasingly high business competition in the printing sector. Employee human resources are one of the important factors

in the running of a company organization. A good manager of these employees will greatly affect the aspect of work success, if employees can be well organized, it is hoped that the organization can carry out all business processes well too. The problem of subjectivity in evaluating employee performance is unavoidable. Quantitative assessment is often considered disappointing because of the difficulty of measuring the existing parameters. On the other hand, management and employees need regular and quick performance appraisals so they can provide quick feedback and improvements in the work environment.

Transparency of the appraisal process can usually have a positive effect on increasing employee motivational performance. The problem that arises at this time is a complicated evaluation (appraisal) process, which means that what is happening now is that many company employees are using contract terms for their employees. The core problem at this time is the process of evaluating contract employees who will be appointed as permanent employees[9].

As long as they are working at CV. Armas Suan Sejahatera, the personnel department recapitulated the results of the assessment with several criteria such as discipline, work performance, work experience and behavior. From the results of this assessment, a leadership report is then prepared which is then used as a decision support in appointing prospective contract employees to become permanent employees of CV. Armas Suan Sejahtera. The current problem is that the employee appraisal process is still manual (conventional) so it takes quite a long time and there are no systems and applications that support the employee appraisal process. In the selection of these employees there are criteria such as discipline, work performance, work experience and behavior. The staffing section of CV. Armas Suan Sejahatera must record contract employee data in a book as documentation. And after the assessment data is obtained, then the staffing section will calculate and make a report for the leadership of the CV. Armas Suan Sejahtera. Assessment calculations in this system will be built using the Analytical Hierarchy Process (AHP) method.

According Teguh Triatmojo, et.al, entitled "Implementasi Aplikasi Keberangkatan Pelaut Berbasis Web Menggunakan Metode AHP (Analytic Hierarchy Process)". The web-based sailor departure application implements the AHP algorithm to determine the decision regarding sailor departures at Fast Offshore Supply. This application facilitates sailors in reporting their tasks, transitioning from manual to digital methods. Although the application is functional, there are proposed enhancements that can be integrated in line with technological advancements. [10].

This research focuses on the integration of the AHP method into the recruitment and appointment system of CV. Armas Suan Sejahatera, aiming to craft a robust and efficient Decision Support System. This new model is intended to aid HR professionals in making informed choices when appointing permanent employees, ensuring that the decisions align with the company's strategic objectives and values. In this case the alternative in question is the best employee based on predetermined criteria. This system is used to help make decisions in semi-structured and unstructured situations, where no one knows for sure how decisions should be made.

2. METHOD

To design and implement a Decision Support System (DSS) that aids CV. Armas Suan Sejahatera in making optimal choices for the appointment of permanent employees by leveraging the Analytical Hierarchy Process (AHP) method.

1. Literature study
   Researching and understanding previous works related to DSS, particularly those using the AHP method in the context of human resource management. Pinpointing the challenges CV. Armas Suan Sejahatera faces in appointing permanent employees without a structured system.
2. Field Research
   At this stage the writer collects data and criteria as an object of research while the objectives are:
   a. Observation
      At this observation stage the authors conducted direct research on the activities and work processes of existing employees
   b. Interview
      To determine the existing data the author conducted interviews in the form of appropriate data.

3. Analysis and Design
   a. Analysis
      From the data obtained from the company, the authors analyze the appointment of employees who are still manual.
   b. Design
      At this stage the authors designed a system that is faster and more accurate using a database and mysql.
4. Testing
   Developing the web-based DSS using a suitable programming language and platform, integrating the AHP logic into it. The results of the research on decision support systems are then tested with a new system that aims to make it easier for the company.
5. Research Report
   After all the research has been done, the results obtained from start to finish, the author makes a form of scientific work called the final project

3. RESULTS AND DISCUSSION

To get the total ranking by as a whole, then do the calculation with using the AHP method to determine the weight every criterion. Here are the steps and calculations using the AHP method.

Status Appointment Eligibility

Before carrying out the process of approval and appointment of status, the company must first conduct an analysis of contract employees by taking into account the 6C factor. Identifying Assessment Criteria Based on the identification of the problem, it is necessary to identify a series of assessment criteria. The assessment criteria sought is what forms the basis for decision making. The criteria in making the decision to determine the status of contract employees to become permanent employees are as follows:

Table 1. Assessment

Criteria	Assessment
C1	Discipline
C2	Work performance
C3	Work Experience
C4	Behavior

The suitability ranking of each alternative on each criterion is assessed by 1 to 5, namely:

Table 2. Ranking

Ranking	Information
1	Not enough
2	Enough
3	Good

Criteria weight data is determined by CV. Armas Suan Sejahtera with a total weight of 100 criteria. The table of weight criteria is as follows:

Table 3 Criteria Weight

Criteria	Weight Criteria Value
C1	15
C2	20
C3	10
C4	15

The table of employees who will get an assessment is as follows:

Table 4 Employee Data

NIK	Name	Criteria (Bobot)			
		C1	C2	C3	C4
458843	Fajrul	75	75	75	80
434349	Fadillah	80	80	90	75
493489	Wili	75	80	80	0
495876	Janter	70	80	70	60
4762893	James	75	80	75	60

Calculations Using the AHP Method

The assessment process begins with identifying a problem, determining the need for a need, analyzing and selecting alternatives that can solve the problem, and implementing the alternative, and ends with evaluating the effectiveness of the decision. The stages involved in the process are as follows:

Table 5 Employee Rankings

NIK	Name	Criteria (Bobot)				NP
		C1	C2	C3	C4	
458843	Fajrul	3	3	3	4	0,198
434349	Fadillah	4	4	5	3	0,547
493489	Willi	2	3	4	5	0,507

Table 6 Paired Comparison Matrix of Job Performance Criteria

Job Performance	Good	Enough	Not enough
Good	1	2	6
Enough	0,5	1	2
Not enough	0,17	0,5	1
Amount	1,67	3,5	9

Table 7 Matrix of Job Performance Criteria

Job Performance	Good	Enough	Not enough	Line	Priority	Subcriteria Priority
Good	0,60	0,57	0,67	1,84	0,61	1
Enough	0,30	0,29	0,22	0,81	0,27	0,44
Not enough	0,10	0,14	0,11	0,36	0,12	0,19

Table 8. Matrix of Addition of Each Row of Work Performance Criteria

Work Performance	Good	Enough	Not enough	Amount
Good	0,61	0,54	0,71	1,86
Enough	0,31	0,27	0,24	0,81
Not enough	0,10	0,13	0,12	0,36

Table 9 Calculation of the Performance Criteria Consistency Ratio

	Row Amount	Priority	Results
Good	1,86	0,61	2,47
Enough	0,81	0,27	1,08
Not enough	0,36	0,12	0,48

Amount (the sum of the result values): 4,03
n (number of criteria) : 3
λ maks (Amount/n): 1,34,55

C1 ((λ maks –n)(n-1)): -0,55
CR (CI/IR): -0,95

Therefore CR < 0,1, then the consistency ratio of the calculation is acceptable.

Tabel 10 Paired Comparison Matrix of Job Performance Criteria

	Good	Enough	Not enough
Good	1	2	6
Enough	0,5	1	2
Not enough	0,17	0,5	1
Amount	**1,67**	**3,5**	**9**

Table 11 Matrix of Job Performance Criteria

	Good	Enough	Not enough	Line	Priority	Subcriteria Priority
Good	0,60	0,57	0,67	1,84	0,61	1
Enough	0,30	0,29	0,22	0,81	0,27	0,44
Not enough	0,10	0,14	0,11	0,36	0,12	0,19

Table 12 Matrix of Addition of Each Row of Work Performance Criteria

	Good	Enough	Not enough	Amount
Good	0,61	0,54	0,71	1,86
Enough	0,31	0,27	0,24	0,81
Not enough	0,10	0,13	0,12	0,36

Table 13 Consistency Ratio Calculation

	Amount Per Line	Priority	Result
Good	1,86	0,61	2,47
Enough	0,81	0,27	1,08
Not enough	0,36	0,12	0,48

Sum (sum of the resulting values): 4.03
n (number of criteria): 3
λ max (sum/n): 1.34
CI (λ max - n)/(n-1): -0.55
CR (CI/IR): -0.95

Calculating priority sub-criteria from work experience criteria.

Table 14 Paired Comparison Matrix of Work Experience Criteria

	Good	Enough	Not enough
Good	1	3	4
Enough	0,33	1	3
Not enough	0,25	0,33	1
Amount	1,58	4,33	8

Table 15 Work Experience Criteria Value Matrix

	Good	Enough	Not enough	Line	Priority	Subcriteria Priority
Good	0,63	0,69	0,50	1,83	0,61	1
Enough	0,21	0,23	0,38	0,81	0,27	0,45
Not enough	0,16	0,08	0,13	0,36	0,12	0,20

Table 16 Matrix of Addition of Each Line of Work Experience Criteria

	Good	Enough	Not enough	Amount

Good	0,61	0,81	0,48	1,90
Enough	0,20	0,27	0,36	0,83
Not enough	0,15	0,09	0,12	0,36

Table 17 Calculation of Consistency Ratio of Work Experience Criteria

	Row Amount	Priority	Result
Good	1,90	0,67	2,51
Enough	0,83	0,27	1,10
Not enough	0,36	0,12	0,48

Sum (total of the resulting values): 4.10
n (number of criteria): 3
λ max (sum/n): 1.37
CI (λ max - n)/(n-1): -0.54
CR (CI/IR): -0.94

Calculating the priority of the sub-criteria from the behavioral criteria

Table 18 Paired Comparison Matrix of Behavioral Criteria

	Good	Enough	Not enough
Good	1	2	5
Enough	0,5	1	4
Not enough	0,2	0,25	1
Amount	**1,7**	**3,25**	**10**

Table 19 Matrix of Behavior Criteria Values

	Good	Enough	Not enough	Line	Priority	Subcriteria Priority
Good	0,59	0,62	0,50	1,70	0,57	1
Enough	0,29	0,31	0,40	1,00	0,33	0,59
Not enough	0,12	0,08	0,10	0,29	0,10	0,17

Tabel 20 Behavior Criteria Value Matrix

	Good	Enough	Not enough	Mount
Good	0,57	0,67	0,49	1,73
Enough	0,28	0,33	0,39	1,01
Not enough	0,11	0,08	0,10	0,30

Tabel 21 Calculation of the Behavior Criteria Competence Ratio.

	Row Amount	Priority	Result
Good	1,73	0,57	2,29
Enough	1,01	0,33	1,34
Not enough	0,30	0,10	0,39

Sum (sum of result values):4,03
n (number of criteria) :3
λ maks (amount/n) : 1,34
CI (λ maks –n)/(n-1) : -0,55
CR (CI/IR): -0,95

Table 22 Result Matrix

Discipline	Work performance	Work experience	Behavior
0,42	0,27	0,19	0,12

Good	Good	Good	Good
1	1	1	1
Enough	Enough	Enough	Enough
0,41	0,44	0,45	0,59
Not enough	Not enough	Not enough	Not enough
0,17	0,19	0,2	0,17

Table 23 Employee Value

	Discipline	Work performance	Work experience	Behavior
Fadillah	Enough	Enough	Good	Good
Fajrul	Good	Not enough	Enough	Enough
Willi	Enough	Good	Good	Good
James	Enough	Enough	Enough	Good
Janter	Good	Good	Good	Good

Table 24 Final Results

	Discipline	Job Achievement	Work Experience	Behavior	Total
Fadillah	0,17	0,12	0,19	0,12	0,60
Fajrul	0,42	0,05	0,08	0,07	0,63
Willi	0,17	0,27	0,19	0,12	0,75
James	0,17	0,15	0,6	0,12	0,60
Janter	0,42	0,30	0,25	0,70	0,80

The next step is to create a pairwise comparison matrix that describes the relative contribution or influence of each element to the objectives or criteria at the level above it. If RC < 0.1 then the paired matrix comparison value on the criteria matrix is inconsistent.

If CR > 0.1, then the pairwise comparison values on the criteria matrix are inconsistent. So if the criteria matrix is not consistent, then filling in the paired matrix values for elements and alternatives must be repeated. The first thing to do to determine the weight of the criteria is where in AHP terminology it is called pair-wire-comparation.

The definition is as follows:

a. Knowledge is obtained 4 times from the calculation of knowledge or systematic work weights which are given as many as 20. Then the value is divided by 2 according to the criteria to be discussed, namely knowledge or systematic work. The total value of the total weight is divided by the total number of determination criteria.
   100 x 20 = 2000
   2000 : 2 = 1000
   1000 : 250 = 4
b. Discipline 3 times is obtained from calculating the weight of work planning and work results which are given as many as 20. Then the value is divided by 3 according to the type of criteria to be discussed, namely work planning, diligent and work results. The total value of the whole weight is divided by the total number of determination criteria.
   100 x 20 = 2000
   2000 : 3 = 666
   666 : 222 = 3
c. Honest 2 times is obtained from the calculation of work planning and work results which are given a value of 17.5. Then the value is divided by 2 according to the type of criteria to be discussed. The total value of the total weight divided by the total number of determination criteria.
   100 x 17.5 = 1750
   1750:2 = 875
   875 : 437 = 2

d. Quality of work 1.5 times is obtained from the calculation of Cooperation and Attitude which is given a value of 15. Then the value is divided by 2 according to the type of criteria to be discussed. The total value of the total weight divided by the total number of determination criteria.
   100 x 15 = 1750
   1750:2 = 875
   875 : 583 = 1.5
e. 1 time cooperation is obtained from the calculation of Capability and Control which is given a value of 10. Then the value is divided by 2 according to the type of criteria to be discussed. The total value of the total weight divided by the total number of determination criteria.
   100 x 10 = 1000
   1000:2 = 500
   500 : 500 = 1
f. Initiative 2 times is obtained from the calculation of work planning and work results which are given a value of 17.5. Then the value is divided by 2 according to the type of criteria to be discussed. The total value of the total weight divided by the total number of determination criteria.
   100 x 17.5 = 1750
   1750:2 = 875
   875 : 437 = 2
g. Discipline 3 times is obtained from calculating the weight of work planning and work results which are given as many as 20. Then the value is divided by 3 according to the type of criteria to be discussed, namely work planning, diligent and work results. The total value of the total weight divided by the total number of determination criteria.
   100 x 20 = 2000
   2000 : 3 = 666
   666:222 = 3

If RC < 0.1 then the value of pairwise comparisons on the criteria matrix is given consistency. If CR > 0.1, then the pairwise comparison values on the criteria matrix are inconsistent. So if the criteria matrix is not consistent, then filling in the paired matrix values for elements and alternatives must be repeated.

Table 25 Criteria Calculation Results

Kriteria	P	D	KK	J	KS	I	K
P	1	1	2	2	1	3	0.5
D	1	1	1,5	1,5	0,5	3	1
KK	0,5	0,667	1	1	1,5	3	1,5
J	0,5	0,667	1	1	0,5	3	2
KS	1	2	0,667	2	1	3	1,5
I	0,333	0,333	0,333	0,333	0,333	1	2
K	2	1	0,5	0,5	0,667	0,5	1
Jumlah	6,333	6,667	7	7,33	5,5	16,5	9,5
Kriteria	P	D	KK	J	KS	I	K
P	1	1	2	2	1	3	0.5
D	1	1	1,5	1,5	0,5	3	1
KK	0,5	0,667	1	1	1,5	3	1,5
J	0,5	0,667	1	1	0,5	3	2
KS	1	2	0,667	2	1	3	1,5
I	0,333	0,333	0,333	0,333	0,333	1	2
K	2	1	0,5	0,5	0,667	0,5	1
Jumlah	6,333	6,667	7	7,33	5,5	16,5	9,5

Information:
a. Total is the sum of all the numbers in the row above it in one column.
b. The Priority Vector shows the weight of each criterion, so in this case it is the highest/most important weight in the permanent employee candidate.

c. After getting the weights for each criterion (in the Priority Vector column), we then check whether the weights made are consistent or not. For this, the first thing to do is to calculate the Principal Eigen Value (λmax) matrix.
d. The Principal Eigen Value (λmax) matrix is calculated by adding up the multiplication results between the number and the priority vector.
e. Principal Eigen Value (λmax) = (1.95×0.5143)+(2.83×0.3620)+(8×0.1232)=3.0
f. Calculating the Consistency Index (CI) with the formula CI = (λmax-n)/(n-1), for n = 3
g. CI = (3.0-3) / (3-1) = 0, CI equal to zero means that the weighting is very consistent.

Table 26 List of Consistency Random Indices

Matrix Size	IR value
1,2	0,00
3	0,58
4	0,90
5	1,12
6	1,24
7	1,32
8	1,41
9	1,45
10	1,49
11	1,51
12	1,48

So for n=3, RI=0.58.
CR=CI/RI = 0/5.8 = 0.0
a. If the results of the CR calculation are less than or equal to 10%, the discrepancy is still acceptable, otherwise if it is greater than 10%, it cannot be accepted.
b. The second provides an assessment of the appointment of permanent employees, called pair-wire comparison.
c. The columns (Discipline, Diligence, Quality of work, Teamwork, Initiative, Presence, Honesty and Responsibility) are taken from the priority vector columns of the three matrix of prospective Recipients.

After entering data, the value for dividing the number of columns is generated, the formula is for each cell in table 26 divided by the number of columns for each criterion.
a. Weight is taken from the Priority Vector column in the criteria matrix.
b. The columns (Discipline, Diligence, Quality of work, Cooperation, Initiative, Presence, Honesty and Responsibility) are taken from the priority vector column of the three matrix of prospective recipients. Composite weight is obtained from the result of the number of multiplication above it with the weight.

From Global Priority, it can be seen that the biggest value is Fadillah, namely 2.531439, so Fadilah is an employee who will be appointed among other employees, which is the first choice when determining permanent employees.

4. CONCLUSION

The Decision Support System for Appointment of Permanent Employees Using the Analytical Hierarchy Process (AHP) Method is one of the solutions to increase the efficiency and effectiveness of the employee hiring process. This system can help CV. Armas Suan Sejahatera in providing an overview of the company's decision support in assessing employees. The author draws the following conclusions It is more appropriate to complete the assessment of the criteria for hiring permanent employees at CV. Armas Suan Sejahatera. The implementation of the Analytical Hierarchy Process (AHP) method in hiring permanent employees has weaknesses in hiring permanent employees at CV. Armas Suan

Sejahatera is not usually used to conduct an assessment if only one candidate is assessed. Factors that influence the results of calculations using the Analytical Hierarchy Process (AHP) method are designing a decision support system for hiring prospective permanent employees.

REFERENCE

[1] S. K. Asmawati S, "Sistem Pendukung Keputusan," *Sist. Pendukung Keputusan*, 2022.
[2] H. Pratiwi, "Sistem Pendukung Keputusan," *Sist. Pendukung Keputusan*, no. 1960, 2022.
[3] Denni M Rajagukguk, "Rekomendasi Penerima Bantuan Siswa Miskin (BSM) dengan Metode Simple Additive Weighting (SAW). Studi Kasus : SMP N 1 Lintongnihuta," *JUKI J. Komput. dan Inform.*, vol. 1, no. 2, 2021, doi: 10.53842/juki.v1i2.17.
[4] v. M. buyanov, *Analisis dan Desain Sistem Informasi. Yogyakarta: Graha ilmu.* 1967.
[5] T. Limbong, J. Simarmata, M. Rofendi Manalu, A. Rikki, and D. M. Rajagukguk, "Implementation of Multi Factor Evaluation Process (MFEP) in Assessment of Employee Performance Achievement," in *Journal of Physics: Conference Series*, 2020, vol. 1573, no. 1, doi: 10.1088/1742-6596/1573/1/012022.
[6] . Murdani, F. A. Sianturi, H. D. Hutahaean, S. B. Sinaga, and D. M. Rajagukguk, "Implementation of the Weighted Product Method in the Best Student Selection Decision Making System Application," 2020, doi: 10.5220/0009495900990104.
[7] Oktarino A, "ANALISIS DAN PERANCANGAN SISTEM INFORMASI PEMBELIAN DAN PENJUALAN PADA APOTEK PEMBINA JAMBI 2015," *Sci. J.*, vol. 5, no. 02, 2015.
[8] A. Irawan, *Perbandingan Metode Ahp Dan Saw Untuk Seleksi Penerimaan Siswa Baru*, vol. 2, no. 9. 2022.
[9] Marsono, *Penggunaan Metode Analytical Hierarchy Process (AHP) Dalam Penelitian*. 2020.
[10] T. Triatmojo and M. Rifqi, "Implementasi Aplikasi Keberangkatan Pelaut Berbasis Web Menggunakan Metode AHP (Analytic Hierarchy Process)," *Komputika J. Sist. Komput.*, vol. 11, no. 1, 2022, doi: 10.34010/komputika.v11i1.4598.
[11] Rajagukguk, Denni M., and Indra S. Ritonga. "Sistem Pendukung Keputusan Pemilihan Kepala Sekolah Berprestasi Menggunakan Metode SAW (Simple Additive Weighting)." Jurnal Teknik Informatika Unika Santo Thomas, vol. 5, no. 2, 2020, pp. 202-210, doi:10.17605/jtiust.v5i2.998.