

Designing a Human Resources Performance System in a Company Using the Analytical Hierarchy Process (AHP) Method

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Abstract

PT. Melinia Nusa Wisata is a company engaged in the field of travel tourism services. As a result of problems from the human factor, namely delays in attendance in the field, the company's scheduled travel departures are inappropriate. This study aims to analyze how to improve the human resource performance system from the three criteria and three alternatives by using the Analytical Hierarchy Process (AHP) method with the help of Expert Choice software. The nature of this research is qualitative descriptive and exploratory research. The results of the study obtained the weight of each criterion, namely on work motivation by 26.6%, work discipline by 24.4%, work skills by 46%, and the alternative is an increase in welfare by 21.6%, an increase in human resource training 44.7%, an increase in facilities 33.7%. These results identify the highest weight, namely work skills and human resource training improvement, meaning that to improve the human resource performance system, the two highest criteria require special attention in their implementation..

Keywords: Human Resources, Performance, Quality

I. INTRODUCTION

Human resources in a company is the dominant factor in achieving a company goal [1]. So overall, the definition of Human Resources is an individual who works as a driver of an organization, both an institution and a company and functions as an asset that must be trained and developed [2]. In work, the performance of human resources is very concerned to get the quality expected by the company [3]. [4] Fatimah (2019) evaluating the quality of human resources is a measure that states how far various requirements, specifications and expectations have been fulfilled

The Analytical Hierarchy Process (AHP) function is used as a tool that will evaluate complex multi-factor or multi-criteria problems into a hierarchy [5]. [6] Riodano et al (2019) classify hierarchy as a representation of a complex problem in a multi-level structure where the first level is the goal, followed by the level of factors, criteria, sub-criteria, and so on down to the last level of the alternatives. With a hierarchy, a complex problem can be broken down into groups which are then arranged into a hierarchical form so that the problem will appear more structured and systematic [7].

PT. Melinia Nusa Wisata is a company engaged in the field of travel tourism services. As a result of problems from the human factor, namely delays in attendance in the field, the company's scheduled travel departures are inappropriate. Analyzed, the performance of existing human resources has not met the standards expected by the company. Here, it is not only delays that cause travel scheduling not according to miscommunication, it is also an obstacle when traveling. The following is data on trip delays that occurred in the field, as shown in Table 1.

TABLE 1. Departure Delay Data

Date	Destination	Departure Time	Delay Time
15 January 2022	Bandung	22.00 WIB	23.00 WIB
22 January 2022	Bandung	21.00 WIB	21.30 WIB
19 February 2022	Bandung	21.00 WIB	21.40 WIB
5 March 2022	Bandung	22.00 WIB	22.40 WIB
19 March 2022	Bandung	21.00 WIB	22.00 WIB
26 March 2022	Bandung	22.00 WIB	22.50 WIB
23 April 2022	Bandung	22.00 WIB	22.30 WIB
14 May 2022	Bandung	21.00 WIB	21.40 WIB
28 May 2022	Bandung	22.00 WIB	22.55 WIB

In a company, human resource management has a function so that managers are able to fulfill various organizational / company goals that come from other parties, by carrying out activities or work needed, or doing various jobs themselves [8].

Many studies have proven that the Analytical Hierarchy Process (AHP) method is able to meet and assist companies in performance appraisal and decision making. Like the example, [9] Rakasiwi (2018) evaluating the AHP method is able to design decision support systems and employee performance appraisals that already meet clear performance appraisal standards. In other words, able to help companies in decision making [10].

The purpose of this study is to determine the priority weight of each criterion and its alternatives and to synthesize the priorities as a determining factor in improving the quality of human resource performance..

II. RESEARCH METHOD

The method used in this research is a descriptive statistical analysis method with a quantitative approach. This quantitative approach is used to examine specific samples and is static to test established hypotheses. With this method, it will be known a significant influence between the criteria studied. The collected data will be described as is without any purpose of making conclusions for generalization. The research flow is described in the Figure 1.

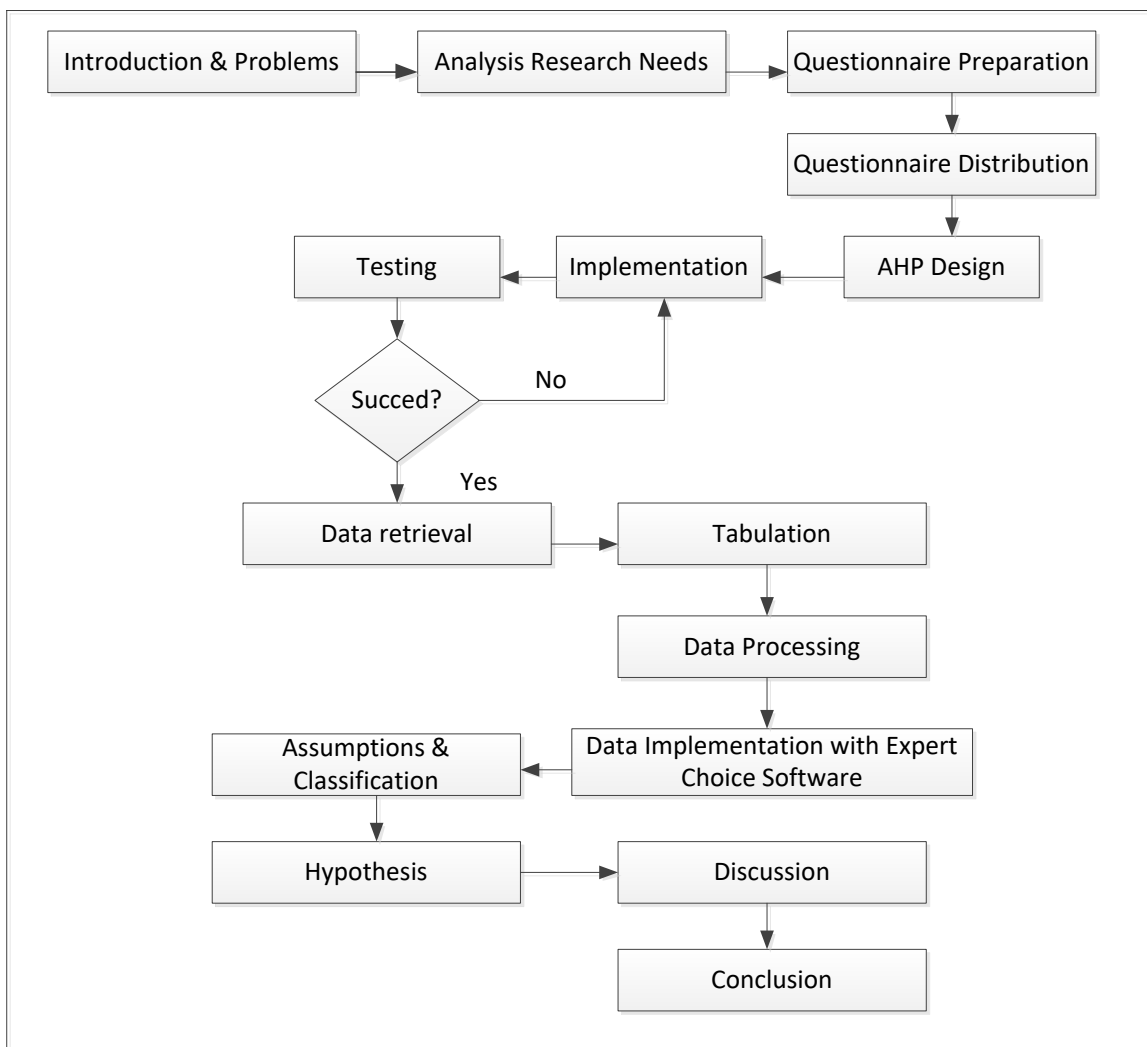


FIGURE 1. The Research Flows

As the beginning of the research, the company's human resource problems were identified by observation, interviews, and direct questionnaires. There are three criteria listed, namely work motivation, work discipline, and work skills. Then, the alternatives are welfare, training, and facilities. The three criteria and alternatives were chosen because they are factors that can support the determination of the quality of human resource

performance. Therefore, the Analytical Hierarchy Process (AHP) method is used to obtain rational decisions [11]. With the help of Expert Choice software tools. The stages of AHP processing are represented in Figure 2.

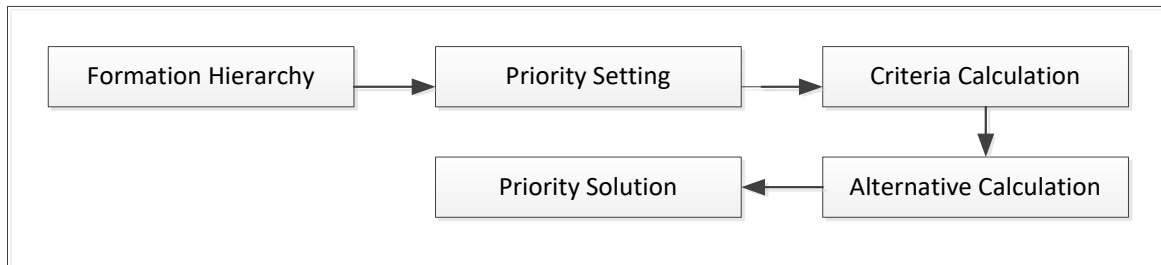


FIGURE 2. Processing Stages of AHP Method

In determining the desired solution to the existing problems, usually the solution is determined to be more than one, then create a hierarchical structure according to the main goal [12]. Next, create a pairwise comparison matrix (comparing all hierarchical sub-systems that have been made in the form of pairwise comparisons based on the decision maker by assessing the level of importance of an element with other elements) [13]. Pairwise comparisons are transformed into matrix form so that numerical calculations can be carried out (see Table 2 and Table 3).

TABLE 2. Criteria Pairwise Comparison Matrix

Criteria	C1	C2	...	Cm
C1	a11	A	...	A1m
C2	a21	A	...	A2m
...
Cm	am1	am2	...	Amm

TABLE 3. Alternative Pairwise Comparison Matrix

C1	A1	A2	...	An
A1	a11	a12	...	a1n
A2	a21	a22	...	a2n
...
An	an1	a2n	...	Ann

This matrix is simple, has a strong position for the consistency framework, obtains other possible information and is able to analyze the overall priority sensitivity for changes in considerations. In the matrix, formula (1) is used as a comparison value between alternative A_i and alternative A_j which states the relationship [14].

$$A_{ij} = \frac{1}{a_{ij}} \quad (1)$$

Here: $A_{ij} \sim 1$, in the situation $i = j$. Then, formula (2) is used to make all values equal.

$$Normalization = \frac{Questionnaire\ Results}{Total\ Results\ Per\ Row} \quad (2)$$

Here: Normalization \sim depending on the collected data divided by the number of results in the matrix of each row, which is then continued by calculating the Total Weight Matrix using the formula to add up each criterion in the same column. Then, formula (3) is used to calculate the value of the eigen vector.

$$Eigen\ Vector = \frac{Total\ weight\ matrix\ criteria}{\sum Total\ weight\ matrixs} \quad (3)$$

Here: Eigen Vector ~ is the weight of each element determining the priority of its elements in each pairwise comparison matrix. Then, formulas (4), (5), and (6) are used to calculate the Consistency Ratio, namely how consistent a person is in answering the questionnaire.

$$Eigen\ Value = \frac{Matrix\ Multiplication}{Eigen\ Vector} \quad (4)$$

Here: Eigen Value ~ the value that shows how much influence the variable has on the formation of matrix characteristics.

$$\lambda = \frac{\sum Eigen\ Value}{\sum Total\ Weight\ Matrixs} \quad (5)$$

Here: λ ~ the largest eigenvalue of a matrix of order n

$$CI = \frac{\lambda - n}{n - 1} \quad (6)$$

Here: CI ~ consistency index. Then, formula (7) is used to determine the random index value from the number of criteria.

$$CR = \frac{Number\ of\ criteria}{non\ criteria} \quad (7)$$

Here: CR ~ Consistency Ratio, if $CR < 0.1$, then the data calculation is justified or consistent.

After calculating the consistency ratio, assign weights to each hierarchy through an iterative process three times. Then, determine the best alternative by calculating the criteria and weighting the alternatives based on the criteria. Thus, from the alternative values that are formed after being sorted based on the value, it is the order of priority that is sought [15].

III. RESULT AND DISCUSSION

Criteria and alternatives are arranged in a hierarchical form (see Figure 3), using the Analytical Hierarchy Process (AHP) method. The preparation was carried out with many considerations from the results of discussions with company owners, with the aim of determining a good system in improving the performance of human resources.

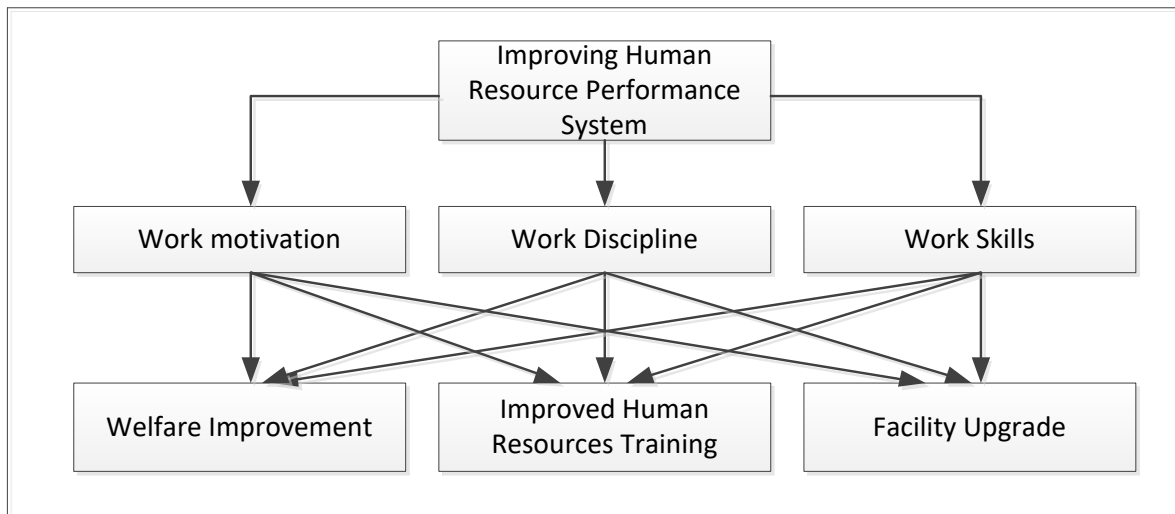


FIGURE 3. Structure Hierarchy

There are three hierarchical levels arranged in this method, level 1 (that is, the main objective of the research), level 2 (ie the criteria proposed to improve the quality of human resource performance), and level 3 (ie the alternative chosen must be appropriate, because the alternative has a very influential weight and is in accordance with the root causes that exist in the company). After data collection, the calculation of pairwise comparisons between the criteria of each respondent, represented in Tables 4, 5, 6, 7, and 8.

TABLE 4. Facilitator Questionnaire Results

No	Criteria	Scale																Criteria	
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8		9
1	Work Motivation								√										Work Discipline
2	Work Discipline											√							Work Skills
3	Work Skills									√									Work Motivation

TABLE 5. Respondents Questionnaire Results 1

No	Criteria	Scale																Criteria	
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8		9
1	Work Motivation						√												Work Discipline
2	Work Discipline											√							Work Skills
3	Work Skills										√								Work Motivation

TABLE 6. Respondents Questionnaire Results 2

No	Criteria	Scale																Criteria	
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8		9
1	Work Motivation											√							Work Discipline
2	Work Discipline									√									Work Skills
3	Work Skills								√										Work Motivation

TABLE 7. Respondents Questionnaire Results 3

No	Criteria	Scale																		Criteria
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
1	Work Motivation											√							Work Discipline	
2	Work Discipline											√							Work Skills	
3	Work Skills									√									Work Motivation	

TABLE 8. Respondents Questionnaire Results 4

No	Criteria	Scale																		Criteria
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
1	Work Motivation								√										Work Discipline	
2	Work Discipline										√								Work Skills	
3	Work Skills								√										Work Motivation	

From the results of the questionnaire comparison of criteria from each respondent, then the data is inputted and gets the average result or the combined results of all respondents, the results (see Figure 4 and Table 9).



FIGURE 4. Comparison Between Criteria Using Expert Choice

TABLE 9. Combination Results Comparison Between Criteria

	Motivation	Discipline	Skills
Motivation		1,12196	1,43097
Discipline			2,04767
Skills	Incon 0,01		

Figure 4 and Table 9 above explain the scale of the importance of the pairwise comparisons, with the results obtained. The criteria for motivation to work together are important from the criteria for work discipline, the criteria for work discipline are important, the criteria for work skills, and the criteria for work skills are slightly more important than work discipline, with an inconsistency value of 0.01 which means the results can be continued. Then, calculate the priority weight of each alternative against each of the criteria. First, make a pairwise comparison between alternatives (shown in Figure 5 and Table 10).



FIGURE 5. Comparison of Alternative Work Motivation Criteria Using Expert Choice

TABLE 10. Results Combination Comparison of Alternatives, Criteria for Work Motivation

	E. Well-being	E. Human Resource Training	E. Facility
E. Well-being		1,1487	1,51572
E. Human Resource Training			1,02384
E. Facility	Incon 0,03		

E (Escalation) abbreviated to make it easier to write, in table 10 shows a comparison between alternatives in the criteria of work motivation that has been combined from each respondent to obtain an alternative welfare improvement is as important as the alternative of increasing human resource training with value (1,1487).

Alternatives to increasing human resource training are also as important as improving work facilities to get value (1,02384), and increasing welfare is as important as increasing work facilities with value (1,51572), so that the inconsistency value obtained is 0,03. The data is continued, (ie processing alternative comparison data in the Work Discipline criteria) seen in Figure 6 and Table 11.



FIGURE 6. Comparison of Alternative Work Discipline Criteria Using Expert Choice

TABLE 11. Combination Results of Alternative Comparison, Work Discipline Criteria

	E. Well-being	E. Human Resource Training	E. Facility
E. Well-being		2,22064	1,31951
E. Human Resource Training			1,7411
E. Facility	Incon 0,00		

Table 11 explains, the comparison between alternatives in the work discipline criteria that have been combined from each respondent obtained an alternative to increase welfare that is slightly more important than the alternative to increase human resource training with a value (2,22064), the alternative of increasing HR training is as important as improving work facilities, getting value (1,7411), and increasing welfare is as important as increasing work facilities with value (1,31951), the inconsistency value is 0.00. The data is continued, (ie processing alternative comparison data in the Job Skills criteria) represented in Figure 7 and Table 12.



FIGURE 7. Comparison of Alternative Job Skills Criteria Using Expert Choice

TABLE 12. Combination Results Comparison of Alternatives, Criteria for Job Skills

	E. Well-being	E. Human Resource Training	E. Facility
E. Well-being		3,80731	2,49146
E. Human Resource Training			1,7411
E. Facility	Incon 0,00		

Table 12 explains, the comparison between alternatives in the criteria for work skills that have been combined from each respondent obtained that an alternative to improving welfare is slightly more important than the alternative to increasing HR training with a value of (3,8073), alternatives to increase HR training are as important as improving work facilities to get value (1,7411), and increasing welfare is as important as increasing work facilities with value (2,49146), so that the value of inconsistency is obtained 0,00.

From here, in Figure 8, namely calculating the Consistency Ratio or whether someone is consistent in answering the questionnaire comparing criteria and alternatives, here is the value of the inconsistency.

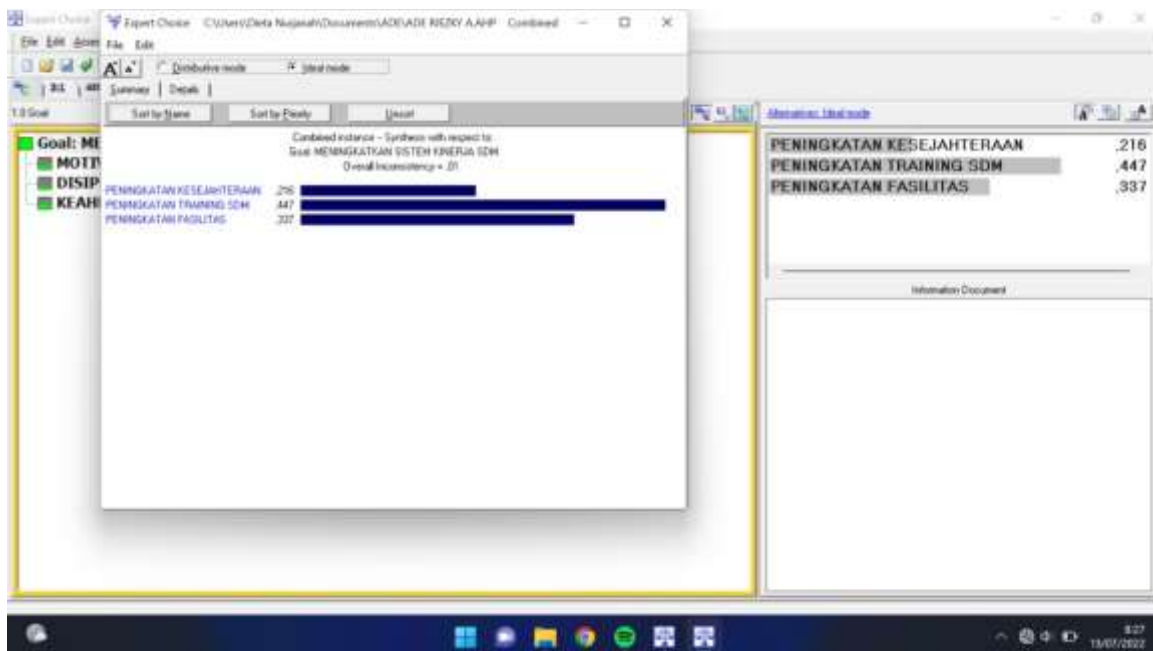


FIGURE 8. Value Inconsistency

From the results obtained, the value of inconsistency in processing this data is 0,01, it means that the inconsistency value is good because it is not more than 0,10 and the data from the questionnaire is declared valid, meaning that it can continue to determine the priority weight value (the value of each criterion and its alternatives) see Figure 9.

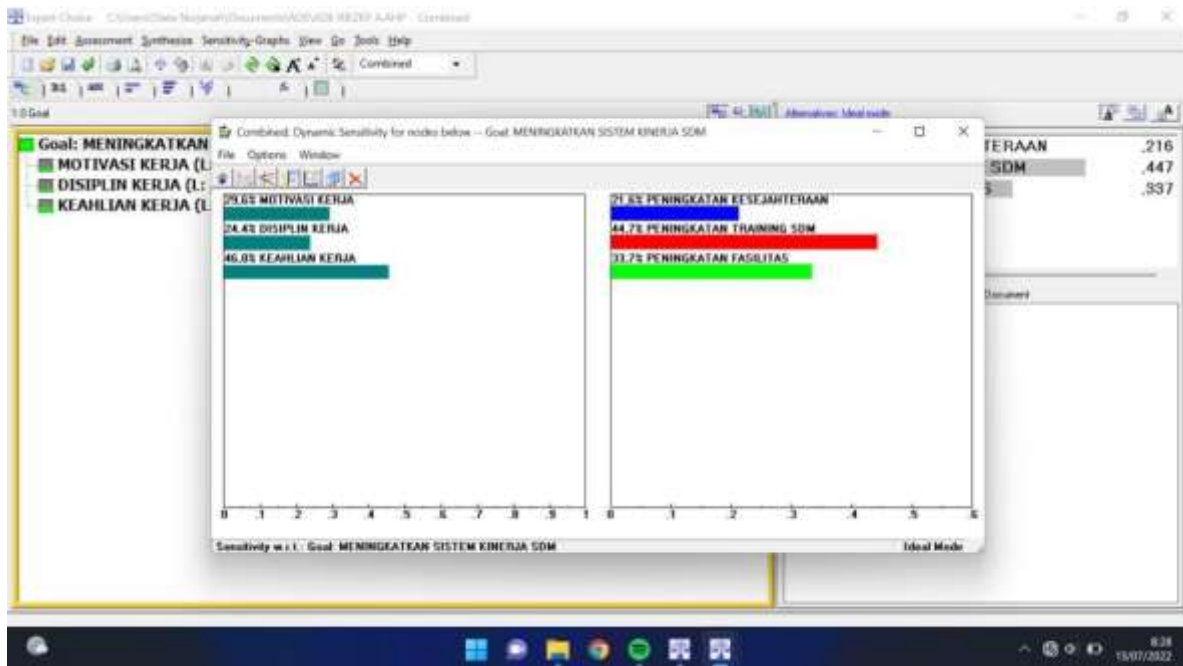


FIGURE 9. Priority Weight Value

. From the results obtained, the priority weight of each hierarchical arrangement is, the priority weight value of the work motivation criteria 26,6%, Work discipline criteria are 24.4%, and the value of work skills criteria is 46.0%, while the value of each alternative results in an increase in welfare with a value of 21.6%, an increase in human resource training 44.7%, and an increase in facilities 33.7%. Represented in Figure 10.

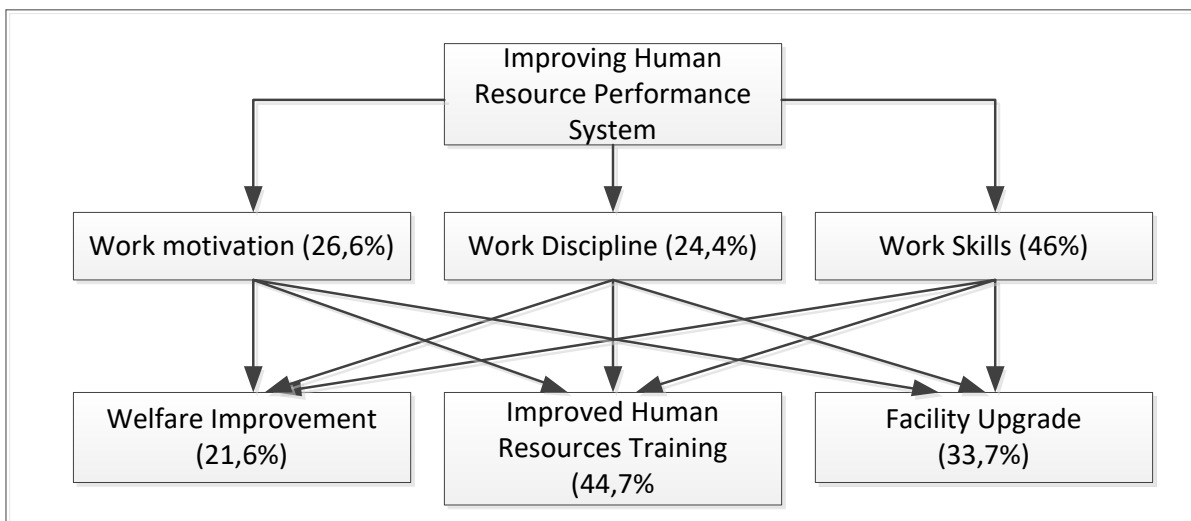


FIGURE 10. Priority Weight of Each Criterion and Alternatives

Based on the results of using the AHP method with the help of expert choice software in an effort to improve the human resource performance system, the real hypothesis obtained is Job Skills Criteria and Alternatives to Increasing Training Human Resources have the highest priority weight.

With the high priority value of increasing human resource training in improving the performance of human resources at PT Melinia Nusa Wisata, it can be interpreted that this alternative is the main solution to increase human resources with a value (44.7%).

Furthermore, for the second rank, which is an alternative to improving facilities, this alternative is equally important in improving the performance of human resources, the value is obtained (33.7%), and for the alternative that is at the last level, namely increasing welfare, this alternative has little effect. in improving the human resource performance system with a value (21.6%).

IV. CONCLUSION

Based on this research, it can be concluded that the priority weight of the work motivation criteria is 26.6%, work discipline is 24.4%, work expertise is 46%. Then, alternative priority weights are increasing welfare by 21.6%, increasing human resource training by 44.7%, and increasing facilities by 33.7%. Analyzed, the highest weight on the criteria is work skills and the highest weight on the alternative is an increase in human resource training, then to improve the quality system of human resource performance in the company, meaning that the two highest weights must require special attention in their implementation so that the objectives are carried out. because by increasing these criteria and alternatives, the quality and performance of HR can increase according to the desired company standards.

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REFERENCE

- [1] Iskandar, D. (2018). Strategi Peningkatan Kinerja Perusahaan Melalui Pengelolaan Sumber Daya Manusia Dan Kepuasan Kerja Dan Dampaknya Terhadap Produktivitas Karyawan. *Jurnal Ilmiah Bisnis dan Ekonomi Asia*, 12(1), 23-31.
- [2] Zaenal, M., *et al.* (2021). Peningkatan Sumber Daya Manusia dalam Program Pemberdayaan Masyarakat di Yayasan Anak Shaleh Rt 06 Kota Bandung. *PROCEEDINGS UIN SUNAN GUNUNG DJATI BANDUNG*, 1(42), 27-33.
- [3] Donra, Sihaloho. R. & Siregar, H. (2019). Pengaruh Lingkungan Kerja Terhadap Kinerja Karyawan pada PT Super Setia Sagita Medan. *Jurnal Ilmiah Socio Secretum*, 9(2), 273-281.
- [4] Fatimah, Maulyan. F. (2019). Peran Pelatihan Guna Meningkatkan Kualitas Sumber Daya Manusia dan Pengembangan Karir: Theoretical Review. *Jurnal Sain Manajemen*, 1(1), 40-50.
- [5] Rianto, Bayu. (2016). Sistem Pendukung Keputusan Penerimaan Karyawan Menggunakan Metode Analytical Hierarchy Process (AHP) Studi Kasus : RB . Nilam Sari Tembilahan. *Riau Journal of Computer Science*, 2(2), 29-38.
- [6] Riodano, L. A. *et al.* (2019). Sistem Pendukung Keputusan Pemberian Bantuan Program Keluarga Harapan (Pkh) Pada Orang Miskin Di Kota Ternate Menggunakan Metode AHP. *JIKO (Jurnal Informatika dan Komputer)*, 2(1), 34-60.
- [7] Darmanto, Eko. (2014). Penerapan Metode Ahp (Analythic Hierarchy Process) Untuk Menentukan Kualitas Gula Tumbu. *Simetris : Jurnal Teknik Mesin, Elektro dan Ilmu Komputer*, 5(1), 75-82.
- [8] Nazar, Almasri. M. (2013). Manajemen Sumber Daya Manusia: Imlementasi Dalam Pendidikan Islam. *Kutubkhanah: Jurnal Penelitian Sosial Keagamaan*, 19(2), 133-151.
- [9] Rakasiwi, Sindhu. (2018). Sistem Pendukung Keputusan Dalam Menentukan Penilaian Kinerja Guru Dengan Metode Analytical Hierarchy Process (AHP). *Simetris: Jurnal Teknik Mesin, Elektro dan Ilmu Komputer*. 9(2), 1001-1008.
- [10] Lestari, G. Neneng. & Savitri, P. A. (2021). Sistem Pendukung Keputusan Pemberian Tunjangan Karyawan Menggunakan Metode Analytical Hierarchy Process (Ahp) Studi Kasus: Pt Mutiara Ferindo Internusa. *Jurnal Teknologi dan Sistem Informasi (JTSI)*, 2(3), 38-48.
- [11] Hartati, Saragih. S. (2013). Penerapan Metode Analitycal Hierarchy Process (Ahp) Pada Sistem Pendukung Keputusan Pemilihan Laptop. *Pelita Informatika Darma*, 4(2), 82-88.
- [12] Vermaysha, A. *et al.* (2022). Sistem Pemilihan Laptop dengan Metode Analytical Hierarchy Process. *In Prosiding Seminar Nasional Teknologi Informasi dan Bisnis*. p. 427-433.
- [13] Rimantho, Dino. *et al.* (2016). Aplikasi Analytical Hierarchy Process Pada Pemilihan Metode Analisis Zat Organik Dalam Air. *Jurnal Ilmiah Teknik Industri*, 15(1), 47-56.
- [14] Asfi, Marsani. & Sokibi, Petrus. (2015). Analytical Network Process (Anp) Sebagai Metode Penentuan Prioritas Pengembangan Sistem Informasi Akademik. *JURNAL DIGIT*, 5(1), 103-107.
- [15] Astutik, Yuni. & Budi, Santoso. Eko. (2013). Prioritas Wilayah Pengembangan Industri Pengolahan Perikanan di Kabupaten Sumenep. *JURNAL TEKNIK POMITS*, 2(1), 20-24.