

The Measurement of Human Resources Employees by using Human Resources Score Card Method and Analytical Hierarchy Process Method

Sutrisno Sutrisno¹, Healthy Aldriany Prasetyo², Adriana Ina Faot³

^{1,2,3}Faculty of Engineering, Universitas Medan Area, Indonesia

sutrisno.uma@gmail.com

Abstract

In a company engaged in the maintenance of LPG gas cylinders, it is customary to check for Retest, Repaint, and Retest Repaint tubes. The operation is performed by checking and classifying the maintenance of LPG cylinders to determine whether they are defective. The company has 25 employees in the workshop section and 8 people in the administration or office division with working hours in this company from morning to evening. However, several problems can affect the performance of human resources including employees who work in this company lack of discipline, such as there are still employees who are not present on time or late and even absent more than the specified day. Thus, this study measures the performance of human resources to determine the indicators that need to be improved. The method used in this research is the Human Resources Scorecard method and the Analytical Hierarchy Process method. The employee performance measurement's calculation determined by the results of the HRSC method. The results of the questionnaire tested for validity and reliability testing. The result shows that the Compensation Perspective is the most important criterion for Human Resource Performance Measurement with a weighted value of 0.41 or 41%. Then, followed by the Personal Perspective criterion with a weighted value of 0.38 or 38%, then the Perspective Alignment criteria with a weight value of 0.14 or 14% while the Perspective High Performance criteria with a weight value of 0.07 or 7%.

Keywords

human resources score card; analytical hierarchy process; company; human resource employee; pairwise comparison



I. Introduction

The fastest-growing global economy resulting the competition between one company and another further maximize overall performance. The competition allows businesses to use resources effectively and efficiently to realize their vision and mission. One possible strategy is to improve the performance of available human resource. The role of human resources in an organization is very dominant as it is the main driving force of the organization. Human Resources (HR) is the most important component in a company or organization to run the business it does. Organization must have a goal to be achieved by the organizational members (Niati et al., 2021). Human resources need to add value to an organization, and measuring and assessing a company's performance evolves to support its corporate strategy. A concept or method for linking corporate strategy and talent strategy to achieve corporate performance known as a human resource scorecard (Phiong & Surjasa, 2018). A company that maintain 3 kg of Liquefied Petroleum Gas (LPG) cylinders typically go through the process of retesting, repainting, and retesting repainting cylinders. The target is 30,000 / month, and the normal operation is 330 days/year. Then, the review and grade LPG cylinder maintenance to confirm the pipes have been repainted, retested,

repainted, or discarded. However, an issue is affecting the performance of the Human Resource (HR) department, which is the lack of discipline in the company. Some employees are accustomed to being late or absent on weekdays. In addition to lack of discipline, employees in this company are also less motivated to work. This is because there is no reward for work performance for employees who work diligently. According to Dunggio (2013), if employees have open opportunities to excel, it will create a psychological impetus to increase dedication and utilize their potential to increase work productivity.

Hence, to address company issues, it is necessary to measure the human resource performance using the Human Resource Scorecard (HRSC) method. This method allows determining the indicators that need to be improved or improved, enabling competitive measurements to confirm the continuous performance improvement efforts in the future. In addition, the Analytic Hierarchy Process (AHP) method is used to get performance weights based on decision-making priorities at the level of importance of each perspective in a key performance indicator group. The weights obtained are consistent weights. That is, the requirement met if the Consistency Ratio value is 10% or less (Pratama & Ismail, 2018).

II. Review of Literature

2.1 Employee's Performance

Performance is the result of work in quantity and quality achieved by an employee in carrying out the functions in accordance with the responsibilities (Firdaus, 2016). Performance also can be defined as a description of the level of achievement from the implementation of a program, activities, or policies in realizing the goals, objectives, vision and mission of the organization as outlined through the strategic planning of an organization (Moehariono, 2012). Performance is not stand alone in carrying out its functions, but also related to the factors that affect performance, namely (Pratama & Ismail, 2018):

- a. Personal or individual factors, including knowledge, skills, abilities, self-confidence, motivation and commitment of each individual.
- b. Leadership factors, including: quality in providing encouragement, enthusiasm, direction, and support provided by the manager or team leader.
- c. Team factors, including: the quality of support and enthusiasm given by colleagues in a team, trust in fellow team members, cohesiveness and closeness of team members.
- d. System factors, including: work systems, work facilities or infrastructure provided by the organization, organizational processes, and performance culture within the organization.
- e. Contextual factors, including external and internal environmental pressures and changes.

2.2 HRSC

The Human Resources Scorecard (HRSC) was develop due to the dominance of human capital and intangible capital development of an organization. HRSC offers the essential steps for managing a human resource strategy. Human Resources Scorecard is a measurement of human resources that explains the role of human resources in detail as something intangible to measure the extent of their role in achieving the company's vision, mission, and strategy (Phillips et al., 2001). This measurement model is very important for human resource managers to face future challenges given the ever-changing environment. The advantages of implementing the Human Resources Scorecard are: 1) Describe the role

and contribution of human resources to the achievement of the company's vision in a clear and measurable manner. 2) Enabling human resource professionals to control costs incurred and value contributed. 3) Provide an overview of cause and effect relationships. 4) Enabling human resource professionals to manage their strategic responsibilities. 5) Flexible.

Becker et al. (2001) stated that there are 4 perspectives on the evolution of human resources as strategic assets as related to HRSC, namely:

- a. The Personal perspective, the company recruits the best employees and develops them.
- b. The Compensation perspective, namely the company uses bonuses, incentive payments, and significant differences in payments to reward employees with high and low achievers. This is the first step in trusting people as a source of competitive advantage, but the company has not yet fully exploited the benefits of the resource as a strategic asset.
- c. The Alignment perspective, namely senior managers see employees as strategic assets but they do not invest in improving human resource capabilities. Therefore, the human resource system cannot improve the management perspective.
- d. The High performance perspective, namely human resource executives and others who view human resources as a system that is inherent in a larger system than the implementation of corporate strategy. The company manages and measures the relationship between the two systems and the company's performance (Linking people, strategy, and performance).

2.3 Analytical Hierarchy Process

The Analytical Hierarchy Process (AHP) method is a very popular method for decisions making and usually used as a tool for weighting the criteria and sub-criteria, as well as structuring the problem into a structured and built two principles, namely the principle of determining priorities and the principle of logical consistency that be a prerequisite. The AHP method is a general theory of measurement used in determining the ratio scale in discrete or continuous pairwise comparisons, also in multi-criteria and multi-factor problems (Brunelli, 2014).

The AHP method has the several steps in solving a problem that conducted regularly. The steps for the Analytical Hierarchy Process method are (Saaty & Vargas, 2012):

- a. Define the problem and determine the goal.
- b. Create a hierarchy of problems that have been defined arranged, starting with making general goals, followed by sub-goals that affect, criteria, and possible alternatives at the lowest level of criteria.
- c. Arrange pairwise comparison matrices for each level below it, a matrix for each element that is exactly at the level above it.
- d. Perform pairwise comparisons, comparisons are created based on "judgment" in a matrix, where decisions are made by assigning a value of importance to one point compared to other points.
- e. Conduct consistency testing using eigenvalues for pairwise comparisons between elements obtained at each hierarchical level.
- f. Perform a synthesis to compile the eigenvector weights of each element of the problem at each level of the hierarchy.
- g. Evaluate the consistency of the hierarchy, if the value is greater than 0.1 then there is an inconsistency, the data quality must be improved. The rules for assigning the level of importance between points compared in the matrix are

1. If $a_{ij} = \alpha$, then $a_{ji} = 1/\alpha$, $\alpha \neq 0$
2. If A_i has the same relative importance as A_j , then $a_{ij} = a_{ji} = 1$
3. In particular, $a_{ii} = 1$, for all i

The comparison value used is on a scale of 1 to 9. The point comparison is carried out until a total judgment is obtained as many as the number of columns or $t = n * [(n-1)/2]$, which n is the number of elements being compared. Measurement of the consistency of a matrix is based on a maximum eigen value.

The formula for the consistency index (CI) as follows.

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (1)$$

Where:

λ_{max} : the largest eigenvalue of a matrix of order
 n : number of criteria

Moreover, The formula for consistency or inconsistency (CR) can be written as follows.

$$CR = \frac{CI}{RI} \quad (2)$$

Where:

CR = Consistency Ratio

CI = Consistency Index

RI = Random Index

h. Value Weighting

Prioritization is carried out for each problem element at the hierarchical level. This process will result in the weight or contribution of the criteria to the achievement of goals.

i. Setting Priorities

Priority is determined by the criteria that have the highest weight, which is sorted based on a predetermined value.

There are three principles that underlie the AHP method (Kulakowski, 2020), namely:

1. Principles of Developing a Hierarchy, by describing and describing in a hierarchical manner by breaking the problem into separate elements. The trick is to break down knowledge, our complex thoughts into parts of its main elements, then this part into its parts, and so on hierarchically.
 The elaboration of the lower hierarchical objectives is aimed to obtaining measurable criteria. The lower in describing a goal, the easier it is to determine objective measures and criteria. Thus, one way to express the measure of achievement is to use a subjective scale.
2. Principles of Prioritizing Decisions, namely how the role of the matrix in determining priorities and how to establish consistency. Prioritize elements by making pairwise comparisons, with the comparison scale already set.
3. Principle of Logical Consistency, the weight matrix obtained from the pairwise comparison results must have a cardinal and ordinal relationship, as follows:

- a) Cardinal relationship : $a_i \times a_{jk} = a_{jk}$
- b) Ordinal relationship : $A_i > A_j > A_k$, then $A_i > A_k$

For the AHP model, the comparison matrix can be accepted by referring to the Consistent Ratio (CR) value, that is, if the criteria and alternatives have been assessed consistently, the CR value should be < 0.10 . If there is an inconsistency in the assessment, it is still necessary to revise the assessment.

III. Research Method

3.1 Data Collection Method

The data in this study is the primary data. The data obtained directly from the company by distributed the pairwise comparison questionnaires to company leaders regarding the importance of statements from each HRSC perspectives. The design of the Human Resources Scorecard measurement will explain some of the objectives of each perspective, which is the actualization of the company's strategy, such as the benchmark, which is the actualization of the achievement of the company's goals. In addition, there are also targets, and assessments, which are the range of success, set by the company's management, as well as the score value, which is a measure of the success of a critical success factor used in achieving the target. The questionnaire results are then compiled in a Pairwise Comparison Matrix.

3.2 Determining the Reference Levels of Pairwise Comparison

The reference level of pairwise comparison is the value used to compare HRSC perspectives, namely Personal perspective, Alignment perspective, Compensation perspective, and High performance perspective. The AHP method applies to each criterion and alternative, pairwise comparisons are required.

The relative comparison values are then processed to determine the ranking of alternatives from all alternatives. Both qualitative criteria and quantitative criteria were compared according to predetermined assessments to produce weights and priorities. The weights or priorities are calculated by manipulating the matrix or by solving mathematical equations (Saaty & Vargas, 2012). The weighting of the AHP method uses pairwise comparison by comparing in pairs something homogeneous with priority is obtained through a number of pairwise comparisons made in the form of matrices. The pairwise comparison matrix is filled with numbers that represent the relative importance of an element to other elements. The comparison uses a preference scale from AHP experts. Table 1 shows the preference level in this study.

Table 1. Preference Level (Saaty & Vargas, 2012)

Preference Level	Score
<i>Equally preferred</i>	1
<i>Equally to moderately preferred</i>	2
<i>Moderately preferred</i>	3
<i>Moderately to strongly preferred</i>	4
<i>Strongly preferred</i>	5
<i>Strongly to very strongly preferred</i>	6
<i>Very strongly preferred</i>	7
<i>Very strongly to extremely preferred</i>	8
<i>Extremely preferred</i>	9

3.3 Determining the Pairwise Comparison Matrix

The Pairwise Comparison Matrix (PCM) is used to calculate the relative priority of criteria or alternatives. The value of pairwise comparisons is obtained from the questionnaire that has been distributed to stakeholders by choosing most important of HRSC perspectives.

IV. Results and Discussion

4.1 AHP Questionnaire Data Processing

The results of the calculation from the AHP questionnaire paired comparison matrix for the indicators of each criterion are shown in Table 2.

Table 2. Results of the Comparison Questionnaire Indicator criteria

Criteria	Scoring																Criteria	
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8		9
Personal Perspective									1									Compensation Perspective
Personal Perspective							3											Alignment Perspective
Personal Perspective					5													High Performance Perspective
Compensation Perspective					5													Alignment Perspective
Compensation Perspective						4												High Performance Perspective
Alignment Perspective							3											High Performance Perspective

4.2 Pairwise Comparison Matrix

Based on the Table 2, the study arranged the result in a pairwise comparison matrix between perspectives as in Table 3.

Table 3. Hierarchical Weighting Factor Matrix for All Criteria

Criteria	Personal	Compensation	Alignment	High Performance
Personal	1	1	3	5
Compensation	1	1	5	4
Alignment	1/3	1/5	1	3
High Performance	1/5	1/4	1/3	1

Table 3 shows the comparison between all the criteria. The value of comparison between personal perspective and compensation perspective is 1, thus it indicates that personal perspective is *equally preferred* towards compensation perspective. Moreover, the value of comparison between personal perspective and alignment perspective is 3, hence it is expressed that personal perspective is *moderately preferred* than alignment perspective. On the other hand, the value of comparison between high performance perspective and

compensation perspective is 1/4. It is explained that compensation perspective is *moderately to strongly preferred* than high performance perspective.

The next step is to convert the pairwise comparison values in Table 3 into decimal form and then add them up. The results is illustrated in Table 4

Table 4. Hierarchical Weighting Factor Matrix for All Decimal Value Criteria

Criteria	Personal	Compensation	Alignment	High Performance
Personal	1	1	3	5
Compensation	1	1	5	4
Alignment	1/3	1/5	1	3
High Performance	1/5	1/4	1/3	1
Total	2.53	2.45	9.33	13

The next step is to calculate the eigenvalues and eigenvectors by means of matrix normalization, which comes from the elements in each column. The elements are divided by the number of columns concerned to obtain the normalized relative weight. The normalized eigenvector values are generated from the average of the relative weights for each row. The results are shown in Table 5.

Table 5. Hierarchical Weighting Factor Matrix All Normalized Criteria and Eigenvectors

Criteria	Personal	Compensation	Alignment	High Performance	Normalized Eigenvector
Personal	0.395	0.408	0.321	0.385	0.377
Compensation	0.395	0.408	0.536	0.308	0.412
Alignment	0.131	0.082	0.107	0.231	0.138
High Performance	0.079	0.102	0.036	0.077	0.073

Table 5 shows that the compensation perspective has the highest value rather than other with the value of 0.412 for Human Resource Performance Measurement. Moreover, personal perspective is the second rank for Human Resource Performance Measurement with the value of 0.377. Then, the alignment perspective has the value of 0.138, followed by the high performance perspective with the value of 0.073.

4.3 Consistency Index and Consistency Ratio

Consistency index is used to discover how consistence the stakeholder in determining the value of pairwise comparison between the HRSC perspectives. The first step is to determine the row value from each criteria by conduct the matrix multiplication of all elements in Table 3 and the values of Normalized Eigenvector in Table 5. Furthermore, the row value from each criteria divided by the values of Normalized Eigenvector in Table 5. The results of the division are then added up and divided by the number of criteria (i.e. HRSC criteria = 4 criteria) to get the value of λ_{max} . The calculations are as follows.

$$Row\ Value = \begin{vmatrix} 1 & 1 & 3 & 5 \\ 1 & 1 & 5 & 4 \\ 1/3 & 1/5 & 1 & 3 \\ 1/5 & 1/4 & 1/3 & 1 \end{vmatrix} * \begin{vmatrix} 0.377 \\ 0.412 \\ 0.138 \\ 0.073 \end{vmatrix}$$

Row 1 = $1 \times 0.377 + 1 \times 0.412 + 3 \times 0.138 + 5 \times 0.073 = 1.5680$
 Row 2 = $1 \times 0.377 + 1 \times 0.412 + 5 \times 0.138 + 4 \times 0.073 = 1.7710$
 Row 3 = $1/3 \times 0.377 + 1/5 \times 0.412 + 1 \times 0.138 + 3 \times 0.073 = 0.5651$
 Row 4 = $1/5 \times 0.377 + 1/4 \times 0.412 + 1/3 \times 0.138 + 1 \times 0.073 = 0.2974$

$$\lambda_{max} = \frac{(1.5680 / 0.377) + (1.7710 / 0.412) + (0.5651 / 0.138) + (0.2974 / 0.073)}{4}$$

$$\lambda_{max} = 4.1566$$

The next step is determine the CI value by using equation (1) as follows.

$$CI = \frac{4.1566 - 4}{4 - 1}$$

$$CI = 0.0522$$

Random index is used to determine the level of the inconsistency is accepted. The value of RI shows in Table 6.

Table 6. The value of RI (Saaty & Vargas, 2012)

n	2	3	4	5	6	7	8	9	10
RI	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.51

Furthermore, the calculation of CR is conducted by using equation (2) as follows.

$$CR = \frac{0.0522}{0.9}$$

$$CR = 0.0580$$

The result of the calculations above generally illustrates that stakeholders are quite consistent in determining the value of pairwise comparisons between perspectives as indicated by the CR value less than 0.1 (Saaty & Vargas, 2012).

V. Conclusion

Employees' performance is the crucial thing in a company. A good performance drives the company to be more productive and more prepared in the business competition among others. Human Resource Score Card is a method to assist in managing the human resource strategy in a company. The method proposes 4 perspectives, including personal, compensation, alignment, and high performance. The study used the Analytical Hierarchy Process to determine which perspective was suitable to the Human Resource Performance Measurement. The result shows that compensation came as the best perspective between others. Bonuses, incentive payments, and significant differences in payments to reward employees is the strategy to improve the human resource in the company. The result is similar to the study of Ermayanti and Ro'ifah (2016), which concluded that financial has the highest score of the performance assessment of human resources.

References

- Aryza, S., Lubis, Z., & Khairunizam, W. (2019, February). Analisis hubungan antara daring dan revolusi industri didalam penerapan ilmu keteknikan. In Seminar Nasional Teknologi Komputer & Sains (SAINTEKS) (Vol. 1, No. 1).
- Becker, B. E., Huselid, M. A., Huselid, M. A., & Ulrich, D. (2001). *The HR scorecard: Linking people, strategy, and performance*. Harvard Business Press.
- Brunelli, M. (2014). *Introduction to the Analytic Hierarchy Process*. Springer International Publishing. <https://books.google.co.id/books?id=u0DVBQAAQBAJ>
- Dunggio, M. (2013). Semangat dan disiplin kerja terhadap produktivitas kerja karyawan pada PT. Jasa Raharja (persero) cabang Sulawesi Utara. *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, 1(4).
- Ermayanti, D., & Ro'ifah, A. (2016). Human Resource Scorecard (HRSC) as Performance Measurement Method to Optimize Organization Performance. *International Research Journal of Engineering, IT and Scientific Research*, 2(11), 11–21.
- Firdaus, A. (2016). *Analisis Pengukuran Kinerja Perusahaan menggunakan metode Hrsc*.
- Kulakowski, K. (2020). *Understanding the Analytic Hierarchy Process*. CRC Press. <https://books.google.co.id/books?id=6zMGEAAAQBAJ>
- Moehariono. (2012). *Pengukuran Kinerja, Berbasis Kompetensi*. Rajawali Pers.
- Niati, D. R., Siregar, Z. M. E., & Prayoga, Y. (2021). The Effect of Training on Work Performance and Career Development: The Role of Motivation as Intervening Variable. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, 4(2), 2385–2393. <https://doi.org/10.33258/birci.v4i2.1940>
- Phillips, J. J., Ron D., S., & Phillips, P. P. (2001). *The Human Resources Scorecard: Measuring the Return on Investment. Improving Human Performance Series*. Taylor & Francis.
- Phiong, S., & Surjasa, D. (2018). Pengukuran Kinerja Sumber Daya Manusia dengan Pendekatan Human Resources Scorecard dan Alat Ukur OMAX (Objective Matrix) pada Bagian Produksi PT. Fajarindo Faliman Zipper. *Jurnal Teknik Industri*, 8(3), 213–227.
- Pratama, S., & Ismail, I. (2018). Mengukur Kinerja dengan HR Scorecard (Studi Pada PT BPRS Bhakti Sumekar, Sumenep). *Sustainable Competitive Advantage (SCA)*, 8(1).
- Saaty, T. L., & Vargas, L. G. (2012). *Models, Methods, Concepts & Applications of the Analytic Hierarchy Process*. Springer US. <https://books.google.co.id/books?id=FJLWhG5mWncC>