Application of AHP Analysis to Increase Employee Career Paths in Decision Support Systems

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Abstract. Employee career paths are one way for companies to improve employee performance in educating their students. The problem of manager in decision making uses the selection of methods and assessment processes subjectively so that the process is not in accordance with the goals of the career path. Therefore, an Analytical Hierarchy Process (AHP) method is needed to help make decisions. In this study, using the criteria of Planning, Teaching, Evaluating and Learning. Ranking results obtained that Learning criteria are very important criteria with calculation results of 0.602 when compared to the other three criteria. The Decision Support System (DSS) application provides the final results obtained from testing the calculation that the alternative Employee C is the best employee with a calculation of 0.227 compared to the other alternatives. The DSS application using the AHP method has a data accuracy rate of 86.67% and can be used as a support for manager decisions to make recommendations for increasing employee career paths.

1. Introduction
The increase career is the stage where a company identifies a candidate that fits the needs for a job position. Improving the lives of the employees is the main aim of the increase in the level of an employee's career, from which a good work ethic and working lives insufficient needed, so when it was owned by a company then he would be able to survive in the competitive full competition and changes [11].

Bilal’s Play House (BPH) is a government agency in the field of education with a limited number of employees that will be difficult for the leadership in the process of ascension career path of each employee, because the leadership does not necessarily recognize the ability of employees overall. Career path system is one way to improve the performance of employees BPH in educating students and motivate employees to work more optimally in an effort to advance the BPH. This will be a significant obstacle in the context of the rise of each employee's career, because it should be done in accordance with the level and ability of each employee. The problems that arise when the process is done in decision-making leadership career rise, tends to be subjective and sometimes at odds with the vision and mission of the company. As for the other problems that occur in the process of ascension career employees who become quite complex, especially if there are employees who have the capability and other considerations that are not much different.

In everyday life, every human being is faced with the problem of making decisions manifold. From an easy decision, and the decision will be taken after consideration of all sorts of aspects very carefully, there are decisions that the results are only consequences for those who take the decision, there are also
decisions about the fate of many. While the decision support system itself is part of a computer-based information system (including a knowledge-based systems / management knowledge) that is used to support decision making in an organization or company. Can also be regarded as a computer system that processes data into information for decision-making on issues of specific semi-structured [5].

One method that can be used for decision support system is using AHP [3]. AHP method is selected because it can choose the best alternative from a number of alternatives that deserve promotion and employee value. Performance expected by the company based on the criteria specified [10]. AHP is a method widely used in the case of the weighting of the criteria and priorities of each criterion based on pairwise comparison matrix. The process of ascension career level employees should have the criteria that have been determined by BHP them, Planning, Teaching, Learning and Evaluating. And the alternative is used there are 15 employees.

2. Data and Method

2.1. Data

Data that has been obtained from the process obtained is then collected and analyzed. Then the data that has been analyzed is grouped so that later the author is easy to analyze the next data. In this study, the alternative data used were 15 employees, the level used for career path increases was the green level and the assessment criteria for career path improvement were Planning, Teaching, Evaluating and Teaching. The data that has been obtained will be tested using the AHP method.

2.2. Method

The hierarchy structure used can be seen in Figure 1.

After applying the criteria, the value or weight of each criterion is carried out for each alternative, the next step is to conduct an analysis process of the system being created, the results or output system is information about the value of alternative employees and the criteria they have to serve as employee career path.

\[
(A) = \begin{pmatrix}
1 & 5 & 3 & 1/5 \\
1/5 & 1 & 1/2 & 1/7 \\
1/3 & 2 & 1 & 1/5 \\
5 & 7 & 5 & 1
\end{pmatrix}
\]

a. Calculate criteria weights

Normalize matrix (A) and calculate the weight vector.
So after normalization becomes:

$$\begin{bmatrix}
0.153 & 0.333 & 0.316 & 0.130 & 0.233 \\
0.031 & 0.067 & 0.053 & 0.093 & 0.061 \\
0.051 & 0.133 & 0.105 & 0.130 & 0.105 \\
0.765 & 0.467 & 0.526 & 0.648 & 0.602 \\
\end{bmatrix}$$

So that the value of the vector weights obtained is:

$$W = [0.233; 0.061; 0.105; 0.602]$$

b. Check Consistency

1. Calculate $$(A)(W^T)$$

$$A(W^T) = \begin{bmatrix}
1 & 5 & 3 & 1/7 \\
1/5 & 1 & 1/2 & 1/7 \\
1/3 & 2 & 1 & 1/5 \\
7 & 7 & 5 & 1 \\
\end{bmatrix} \begin{bmatrix}
0.233 \\
0.061 \\
0.105 \\
0.602 \\
\end{bmatrix} = \begin{bmatrix}
0.9708 \\
0.2456 \\
0.4240 \\
2.7148 \\
\end{bmatrix}$$

2. Calculate $\lambda_{max}$ by formula:

$$\lambda_{max} = \frac{1}{n-1} \sum_{i=1}^{n} \left( \text{element in } A \text{ from } (A)(W^T) \right)$$

$$\lambda_{max} = \frac{1}{4} (0.9708 + 0.2456 + 0.4240 + 2.7148) = \frac{1}{4} (6.39) = 1.6$$

3. Calculate the consistency index with the formula:

$$CI = \frac{\lambda_{max} - n}{n-1} = 0.065$$

4. Calculate the Consistency Ratio:

For $n = 4$, obtained $RC_A = 0.09$ (List of Saaty Random Index)

$$Consistency Ratio = \frac{CI}{RC_A} = \frac{0.065}{0.09} = 0.072$$

Consistency Ratio $(0.072) \leq 0.1$ then matrix $A$ is quite consistent.

From the calculation results in the formula above shows that Evaluating criteria is the most important criterion in the decision to increase employee career paths for Learning to be the first priority with a weight value of 60.2%, then Planning criteria become the second priority with a weighted value of 23.3%, then Evaluating criteria becomes the 3rd priority with a weight value of 10.5% and Teaching criteria becomes the 4th priority with a weighting value of 6%.

The next step is the alternative comparison matrix process for each criteria. This step is the same as the step carried out with the criteria. The results of comparison of alternative matrix and criteria can be seen in Table 1.

**Table 1. The Final Result all weights/priorities Criteria and Alternatives**

| Criteria/Alternative | Planning | Teaching | Evaluating | Learning | Final Weight |
|----------------------|----------|----------|------------|----------|--------------|
| Weight               | 0.233    | 0.061    | 0.105      | 0.602    |              |
| Employee C           | 0.239    | 0.251    | 0.222      | 0.220    | 0.227        |
Employee A: 0.134 0.126 0.106 0.108 0.115
Employee B: 0.065 0.086 0.078 0.127 0.105
Employee D: 0.111 0.098 0.136 0.084 0.097
Employee I: 0.038 0.043 0.074 0.085 0.070
Employee E: 0.082 0.084 0.079 0.059 0.068
Employee G: 0.079 0.058 0.054 0.054 0.060
Employee F: 0.052 0.054 0.044 0.053 0.052
Employee H: 0.046 0.046 0.045 0.046 0.046
Employee J: 0.033 0.032 0.039 0.038 0.036

3. Result and Discussion
Based on the results of the analysis and design of the system that has been carried out, the implementation of the Analytical Hierarchy Process method is implemented in an increase in the career path of employees using the PHP and HTML programming languages. When the admin accesses the admin page, the admin will automatically be directed to the login page, which means the admin must login first to be able to enter the admin page.

![Figure 2. Login Menu](image)

Figure 3 is a page display when making a goal in the AHP method, namely the Selection menu. Users can make more than one goal according to their needs.
Figure 3. Selection Menu

Figure 4 is a display of the Criteria Data menu. In this page there is a list of criteria used in accordance with the specified selection. Later it will be grouped according to each selection.

List of Criteria

To get the results of the AHP calculation process, the admin first fills in the criteria and alternative data. After the data is filled in by the admin, the next step is by clicking the save button, the data will be stored in the database and admin will go to the Selection Results menu. The results page with the ranking form from the highest to the lowest value. Table display results can be seen in Figure 5.

Figure 5. The Result of Selection.
Based on figure 5 above it can be observed that the results of determining the increase in employee career levels in real terms with an increase in the career path of employees on a system there are differences in the ranking of rankings by using:

\[
\text{Accuracy} = \frac{\text{Amount of data correct}}{\text{Amount of data tested}} \times 100\%
\]

\[
\text{Accuracy} = \frac{13}{15} \times 100\% = 86.67\%
\]

With a success of 86.67% of the 15 alternative data, where in the real career determination of employee rank-4 employee is Hariadi, S.Psi and in the determination of the system chosen was Sri Husnul Hayati Iskandar P., S.Pd. The accuracy of the data using the system can increase according to the amount of data used.

4. Conclusion

The Decision Support System using the AHP method in this study was used as a tool for decision making for the career advancement of Bilal’s Play House employees. The application of the AHP method can provide the right decision in determining the increase in the career path of employees with predetermined criteria, namely Planning, Teaching, Evaluating and Learning. Ranking results obtained that Learning criteria are very important criteria with calculation results of 0.602 when compared to the other three criteria. The DSS application provides the final results obtained from testing the calculation that the alternative Employee C is the best employee with the calculation of 0.227 when compared to the other fourteen alternatives. The DSS application using the AHP method has 86.67% data accuracy rate of fifteen alternatives and can be used as a support for manager decisions to make recommendations for increasing employee career paths.

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References

[1] T D Puspitasari, E O Sari, P Destariantio and H Y Riskiawan. 2017. Decision Support System For Determining Scholarship Selection Using An Analytical Hierarchy Process. The 2nd International Joint Conference On Science And Technology. Conf. Series 953.
[2] Werner Toth and Harald Vacik. 2018. A Comprehensive Uncertainty Analysis Of The Analytical Hierarchy Process Methodology Applied In The Context Of Environmental Decision Making. J Multi-Crit Decis Anal. 25:142-161
[3] A. Alesyanti, R. Ramlan, H.Hartono and Robbi Rahim. 2018. Ethnical Decision System Based On Hermeneutic View Focus On Social Justice. International Journal of Engineering and Technology. 7(2.9) : 74-77.
[4] Oktafianto, Muhammad Rizqi Al Akbar, et.al. 2018. Dismissal Working Relationship Using Analytical Hierarchy Process Method. International Journal of Pure and Applied Mathematics. Volume 118 No.7 : 177-184.
[5] Satria Abadi, Miftachul Huda, et.al. 2018. Implementation of Fuzzy Analytical Hierarchy Process On Notebook Selection. International Journal of Engineering and Technology. 7(2.27) : 238-243.
[6] Rahul Baidya, Prasanta Kumar Dey, Sadhan Kumar Ghosh and Konstantinos Petridis. 2018. Strategic Maintenance Technique Selection Using Combined Quality Function Deployment, The Analytical Hierarchy Process And The Benefit of Doubt Approach. Int J Adv Manuf Technol. 94:31-44.
[7] Kauf Sabina, Tłuczak Agnieszka. 2018. Solving The Problem Of Logistics Center Location Based On The Ahp Method. Matec Web Of Conferences. 23(8): 1123-1135.
[8] Li-Rong Wan., Yan-Jie Lu., Qing-Liang Zeng., Kui-Dong Gao., Shou-Bo Jiang. 2018 The Research On Comprehensive Performance Evaluation Of Axial Piston Pump Based On Ahp, Mathematical Problems In Engineering, Vol. 2018, Article Id 9469064, 13pages.
[9] Marcela M., Dominik P. 2018. *The Ahp Method Implementation For Erp Software Selection With Regard To The Data Protection Criteria*. Tem Journal. 7(3): 607-611.

[10] Muhammad Dharma T.P.N., Yossie Rossanty, Achmad Daengs G.S, Et.Al. 2018. *Decision Support Rating System With Analytical Hierarchy Process Method*. International Journal Of Engineering And Technology. 7(2.3): 105-108.

[11] urhan Sozer, Sultan Kocaman, at.al. 2018. *Preliminary Investigations On Flood Susceptibility Mapping In Ankara (Turkey) Using Modified Analytical Hierarchy Process (M-AHP)*. The International Archives of The Photogrametry, Remote Sensing and Spatial Information Sciences. Volume XLII-5.

[12] atasa Prascevic And Zivojin Prascevic. 2017 *Application Of Fuzzy Ahp For Ranking And Selection Of Alternatives In Construction Project Management*. Journal Of Civil Engineering And Management. 23(8): 1123-1135.

[13] ushpitha Kalutara, Guomin Zhang, Sujeeva Setunge, Ron Wakefield. 2018. *Prioritising Sustainability Factors For Australian Community Buildings’ Management Using Analytical Hierarchy Process (Ahp)*. International Journal Of Strategic Property Management. 22(1): 37-50.

[14] ibangun Bamban J., Wiwik S. 2018. *Analysis Of The Decision On The Fresh Milkfish Purchase By Using Analytic Hierarchy Process Method (Ahp)*. Matec Web Of Conferences. 197.

[15] uhas Machhindra G., Rahul Raghvendra J. Dan Anand Jayant K. 2016. *Cohort Intelligence And Genetic Algorithm Along With Ahp To Recommend An Ice Cream To A Diabetic Patient*. Swarm, Evolutionary, And Memetic Computing 2015, Lncs 9873, Pp. 40-49.