The selection of candidate of call center operator 112 using analytical hierarchy process method

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Abstract. Call Center 112 operator are human resources serving Cirebon Siaga 112. Call Center 112 is an integrated service with various parties such as the Police Service, the Fire Department, the Civil Service Police Unit and the Health Service in the city of Cirebon. The purpose of the research here is to select candidates who are deemed to have good performance by the Office of Communication, Information, and Statistics in accordance with certain criteria that have been designated as Call Center Operator 112. Analytical Hierarchy Process (AHP). The way these method works compares paired matrices to produce relative weights between criteria and alternatives, and a criterion that compares with other criteria to achieve a very important goal. The process of this study shows that 561 applicants, obtained 446 people who meet administrative criteria. In the next stage of 446 people, 350 people were passed in the psychological test criteria, then the next stage of 350 people, 45 people met the criteria for ICT skills competency testing, from 45 people obtained 15 people who met the interview criteria. The result of using this method, states that they can recruit 4 prospective Call Center 112 employees in accordance with the analysis of the required job design

1. Introduction
The legal basis for the implementation of 112 call center services is Law number 14 of 2008 concerning public information disclosure and Law number 25 of 2009 concerning Public Services and the Regulation of the Minister of Communication and Information of the Republic of Indonesia No. 10 of 2016 concerning Single Emergency Call Number Service (NTPD). Services that support government programs related to public information disclosure. The Cirebon City Government of Indonesia is required to improve services to the public in terms of public transparency and public participation for the realization of good governance [1-3].

The existence of a Call Center service information system makes the problems faced by the community quickly resolved. Web-based Call Center Information System can improve community satisfaction, because even this system can be accessed via cellphone. Using the Call Center is very appropriate because it can reduce communication costs. Call Center is the newest service for technology-based society. It has been investigated in the form of Delone Model and Gap Design Model which is a new technique in order to support decision making in measuring call center performance [4-6].

Therefore, as a form of public service efforts towards the community, through the Office of Communication, Informatics and Statistics, the City of Cirebon Indonesia recruits prospective officers or to fill positions as Call Center Operators called Call Takers. Operator Recruitment Call Taker is a form of activity carried out by the Office of Communication, Information and Statistics in order to identify and recruit potential human resources in the context of Cirebon Siaga 112 service, and also as
a form of Cirebon Smartcity implementation that has been poured into the Masterplan IT Book on 2017 for the period 2018 – 2028 [7,8].

Recruitment mechanism Call Center operators have referred to the minimum guidance document for HR specifications issued by PT. Jasnita Telekomindo, starting with socialization, selection, announcements, training and placement [9]. Socialization is done through the medium of the web site, with the assumption that the media is the most appropriate and have an enormous influence in the recruitment process. The internet is a medium in the recruitment process. It has been proven through interviews that the content, attractiveness of the website and its usefulness have a very large influence in the recruitment process [10].

The minimum specs for human resource needs that occupy positions Operator Call Center include: 1) Minimum high school / vocational equivalent, 2) Mastery of English, 3) Ability to Operate Operating System, 4) Availability of time worked, 5) Health 6) Ability communicate 7) Ability in office applications. While the specific criteria for Operator Call Takker in Cirebon Indonesia is the mastery of regional knowledge, personality and tone of voice [7-9]. Thus, the criteria set for prospective call taker employees consist of 5 criteria, where each criterion has sub criteria that have different weightings. Of course, this is a problem that is quite complex to determine the choice of prospective employees who excel in accordance with the expected criteria.

The Analytical Hierarchy Process (AHP) is a multi-purpose decision-making method developed by Thomas L. Saaty since 1970. Since then, it has been widely used in various fields, such as business, industry and government. Compared to the pain decision method. AHP has 2 advantages, one of which is that it can decipher complex systems into several hierarchical structures that are easily understood and can be analyzed. Another advantage is that AHP can convert human knowledge to numerical models that can be processed throughout the range of problems. Thus AHP is known as a systematic and structured method which combined with quantitative and qualitative analysis is mainly used for giving priority scale [11].

2. Methods

The AHP method is as follows:

• Define the problem, determine the purpose of the analysis and build a hierarchical structure model
  First of all, the purpose of the analysis must be determined. Criteria and subcriteria must also be specified. Furthermore, all information must be placed within the structural framework of the AHP model hierarchy. The number of hierarchies (levels) depends on the complexity of the problem being analyzed.

• Establish a pairwise comparison matrix of criteria, with formulate

\[ A_{ij} = \frac{W_i}{W_j}, \quad i, j = 1, 2, 3, \ldots, n \]  

Where \( A_{ij} \) shows the weight value from the comparison pair of elements \( A_i \) and \( A_j \). Whereas \( W_i \) and \( W_j \) show relative weight between elements.

The comparison scale table can be formulated based on the Saaty model as follows:

| Intensity of importance on an absolute scale | Definition | Explanation |
|--------------------------------------------|------------|-------------|
| 1                                          | Equal Importance | Two activities contribute equally to the objective |
| 3                                          | Moderate importance of one over another | Experience and judgment slightly favor one activity over another |
| 5                                          | Essential or strong importance | Experience and judgement strongly favor one activity over another |

Table 1. Comparison scale.
Table 1. Cont.

| Intensity of importance on an absolute scale | Definition                        | Explanation                                                                 |
|---------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------|
| 7                                           | Very strong importance            | An activity is strongly favored and its dominance demonstrated in practice |
| 9                                           | Extreme importance                | The evidence favoring one activity over another is of the highest possible order of affirmation |
| 2,4,6,8                                      | Intermediate values between the two adjacent judgments | When compromise in needed |

- Establish the eigenvector and maximum eigenvalue as normalization of pairwise comparison matrices.

\[
AW = nW
\]  

(2)

Criteria priority can be obtained by looking for the main eigenvector W (normalized vector) of matrix A. The maximum value of eigen value saa by the number of sequences. This can be presented as follows:

\[
AW = \lambda_{\text{max}} W
\]  

(3)

With normalization solutions, weights \(W_i\), \(W_{i-1,2,3} \ldots n\) can be reduced. With Perro-Forbenius rules, the relative weight can be reduced as follows:

\[
\lambda_{\text{max}} = \left(\frac{1}{n}\right) \left(\frac{W'_1}{W_1} + \frac{W'_2}{W_2} + \cdots + \frac{W'_n}{W_n}\right)
\]  

(4)

\[
W' = AW
\]  

(5)

- Determine the consistency of paired comparisons (Consistency Index and Consistency Ratio) If matrix A is a consistent matrix, the maximum eigenvalues A must equal the number of sequences. However, in practice the pairwise comparison matrix cannot achieve complete consistency. The difference in value between \(\lambda_{\text{max}}\) and n can be used to assess the level of consistency.

The Consistency Index can be formulated as follows:

\[
CI = \frac{\lambda_{\text{max}}}{(n-1)}
\]  

(6)

If the consistency index is \(\leq 0.1\) it means a good level of consistency.

To check the correctness of the comparison, the calculation of the consistency ratio (CR) is used, this is done to measure how consistent the assessment of random sampling is through the equation:

\[
CR = \frac{CI}{RI}
\]  

(7)

If the consistency ratio \(\leq 0.1\), that means that evaluation in the matrix is acceptable. Conversely, if CR is more than 0.1 assessment cannot be trusted, then the assessment is not valuable or must be repeated.

For each comparison matrix, the corresponding random index (RI) is used. This is a reciprocal matrix index generated randomly from a 9-point scale.

Table 2. Random index.

| Size | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |
|------|------|------|------|------|------|------|------|------|------|------|
| R1   | 0.00 | 0.00 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.49 |
Evaluating alternatives according to the priorities identified. The priority sequence identified includes criteria, sub-criteria and weights. Then choose the most suitable alternative, this is an optimal solution in helping a decision [11].

3. Results and discussion
Based on the determination for Call Center 112 candidates to go to Cirebon Siaga, there must be several criteria that are generally and specifically fulfilled. There are several selection stages in this recruitment including socialization to the community, administration selection, written test, psychological test, computer operator competency test, interview, plenary, determination of candidates.

From the series of stages, the criteria and sub criteria are determined and the parameters that will be used as input variables to determine the Prospective Call Center 112 Operator using the Analytical Hierarchy Process (AHP) method.

3.1. Step of completion
Of the 4 criteria, a comparison of criteria assessment is determined through the Pairwise Comparison matrix as follows:

- Work attitude is equivalent to personality, but work attitude takes precedence over intelligence
- Personality is only prioritized over IT Intelligence and Skills
- Intelligence is considered equivalent to IT skills

So that from the above description can be tabulated into the comparison matrix. Then determine the ranking criteria in the form of priority vectors or also called normalized eigenvector.

- Change the Pairwise Comparison matrix to decimal and add each column
- Divide the elements of each column by the number of columns in question
- Calculating Eigenvector Normalization
- Calculate the Consistency Ratio

1) Determine the Maximum Eigen Value ($\lambda_{max}$).

$$\lambda_{max} = (6,000 \times 0,196)+(3,000 \times 0,321)+(3,500\times0,321)+(6,000\times0,181) = 4,232$$

2) Calculate the Consistency Index

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

$$=4,232/4 -1$$

$$=0,077$$

3) Consistency ratio

$$CR = CI/RI$$

$$CR=0,077/0,90$$

$$CR=0,086$$

Determine the matrix Pairwise Comparison sub-criteria assuming having the same value as the Pairwise Comparison Criteria matrix, are as follows:

- Sub Criteria of Intelligence

| Good | Enough | Less | Number of Row | Eigen Vektor Normalized |
|------|--------|------|--------------|------------------------|
| Good | 0,167  | 0,167| 0,286        | 0,167                  |
| Enough| 0,333  | 0,333| 0,286        | 0,333                  |
| Enough| 0,333  | 0,333| 0,286        | 0,333                  |
• Sub Criteria of Work Attitude

Table 4. Pairwise comparison matrix of attitude.

|       | Good | Enough | Less | Number of Row | Eigen Vektor Normalized |
|-------|------|--------|------|---------------|-------------------------|
| Good  | 0,167| 0,167  | 0,286| 0,167         | 0,786                   |
| Enough| 0,333| 0,333  | 0,286| 0,333         | 1,286                   |

• Sub Criteria of Personality

Table 5. Pairwise comparison matrix of personality.

|       | Good | Enough | Less | Number of Row | Eigen Vektor Normalized |
|-------|------|--------|------|---------------|-------------------------|
| Good  | 0,167| 0,167  | 0,286| 0,167         | 0,786                   |
| Enough| 0,333| 0,333  | 0,286| 0,333         | 1,286                   |

• Sub Criteria of IT Skills

Table 6. Pairwise comparison matrix of IT skills.

|       | Advance | Intermedite | Basic | Number of Row | Eigen Vektor Normalisasi |
|-------|---------|-------------|-------|---------------|--------------------------|
| Advance| 0,167   | 0,167       | 0,286 | 0,167         | 0,786                    |
| Intermed| 0,333   | 0,333       | 0,286 | 0,333         | 1,286                    |
| Basic  | 0,333   | 0,333       | 0,286 | 0,333         | 1,286                    |

• Determine the ranking of alternatives by calculating eigen vector for each criterion.

Table 7. Alternative ranking of eigen vector criteria.

| Alternative | SK | K | TL | Result | Ranking |
|-------------|----|---|----|--------|---------|
| A1          | 3  | 2 | 1  | 1,188  | 2       |
| A2          | 2  | 3 | 2  | 1,125  | 3       |
| A3          | 2  | 1 | 2  | 1,286  | 1       |
| A4          | 2  | 2 | 3  | 1,079  | 4       |
Based on the graph of the above results, A3 gets the first priority scale as the chosen candidate for Call Center Cirebon Alert Operator.

4. Conclusion
The AHP method can be used as an algorithm in selecting criteria for rational decision making that is applied to the selection of prospective call takers 112, in the City of Cirebon Indonesia.

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