Individual self-development information system based on the evaluation of civil servant performance appraisal with ELECTRE method and profile matching

A N F I Pertiwi¹, B Surarso² and Farikhin²

¹Magister of Information System, Faculty of Postgraduate School, Diponegoro University, Semarang, Indonesia
²Mathematics Department, Faculty of Science and Mathematics, Diponegoro University, Semarang, Indonesia

Corresponding author: intan.anfip@gmail.com

Abstract. Improvement Performance Appraisal of the Civil Servant (CS) is important in the field of Human Resource Development. Currently, conventional performance appraisal is still used even though it cannot provide an objective assessment. CS performance is important so it needs to be properly assessed. CS performance is influenced by working behavior and competence. Various methods have been carried out to improve the competence of CS. In this case, more directed to a formal way, Self-Development is less emphasized on each individual CS itself. Therefore, in this research, Profile Matching and ELECTRE method is recommended to measure the value of criteria weighting on CS Self-Development. Input from this Profile Matching are questioner data in the form of interest and talent ability from CS. Then the suitable measurement is used to determine the weight criteria using ELECTRE. Thus, the ELECTRE method will be used to calculate the values that have been obtained and adjusted to the existing rules. The output of this information system is a data list of recommendations for field competencies that can be selected by CS.

1. Introduction

Civil servants are executors of government duties in carrying out services that are inherent in the context of public administration and have the purpose of serving the public [1]. In the context of public administration, a person's ability to do and complete a job well is emphasized. The implementation of services to the community is balanced with the competencies possessed by the civil servants themselves, of the 4.7 million civil servants, 95% do not have the appropriate competence. In creating quality human resources and reforming the state bureaucratic public administration system, it is necessary to increase the competence of Civil Servants or State Civil Servants (ASN) [2]. Increasing the competence of civil servants has been carried out in various ways, namely the management of performance evaluation of PNS based on Employee Work Objectives (SKP) and work behaviour which are compiled based on government regulations (PP) and the Regulation of the Head of the Regional Personnel Board (PERKA-BKN) as a reference in order to improve organizational performance. one of which is the development of potential and career, which in turn can increase productivity and work motivation of civil servants in order to achieve optimal organizational performance. However, it cannot be denied that local government performance is not only affected by performance evaluation measures. Various methods have been used to improve the competence of civil servants. In this case, more towards a formal way,
self-development is less emphasized on each individual civil servant himself [3]. In determining the self-development of civil servants, it is necessary to use a method that can meet the needs of precise measurements for the weight value of the criteria, namely the ELECTRE method [4]. In addition, proper self-development of civil servants must be in accordance with their expertise or interests. The matching is related to the problem of determining how well the given profile matches the requested or required. Profile matching is widely used in various fields of work that require expertise [5]. From the explanation on the background, the problem formulation of this study is how to implement the ELECTRE method and Profile Matching in decision support systems so that the determination of self-development for ASN can be known precisely by looking at the results of the search for the field occupied and the interests that are owned according to the questionnaire filled out.

2. Method

2.1. Decision support system
Decision Support System (DSS) is only limited to helping managers make decisions and not making assessments and replacing manager positions and roles [6]. DSS is a further development of a computerized management information system designed in such a way that it is interactive with its users. Interactive with the aim of facilitating integration between various components in the decision-making process such as procedures, policies, analysis, experience [7].

2.2. Performance appraisal
Performance is a work performance or a person’s work based on the quantity and quality achieved in carrying out the duties and functions in accordance with the given responsibilities. Performance appraisal is a manager’s activity to evaluate employee work performance behaviour and determine further policies. Evaluation or assessment of behaviour includes assessments of loyalty, honesty, leadership, cooperation, loyalty, dedication, and employee participation [8]. Performance appraisal is a way of measuring the contributions of individuals in the organization. The important value of performance appraisal is related to determining the level of individual contribution to performance which is expressed in the completion of the tasks for which they are responsible [9].

2.3. Elimination and choice translating reality (ELECTRE)
ELECTRE (Elimination and Choice Translating Reality) is a method used for the ranking process or selecting the best alternative based on outranking relationships and using the suitability and non-conformity indexes to analyze the relationship between alternatives [10]. An alternative is said to dominate the other alternatives if one or more of its criteria exceeds (compared to the criteria from other alternatives) and is the same as the remaining criteria [11].

Data normalized aims to be comparable.

\[ R_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \]  
for 1, 2, 3, ... m and j = 1, 2, 3, ..., n

After being normalized, we look for the sector value from the average \( R_{ij} \) value using the geometric mean shown in equation (2.2) because it provides convenience and consistency in taking values from the set [12].

\[ G = \sqrt[n]{x_1 \cdot x_2 \cdot x_3 ... x_n} \]  
(2.2)

G is Geometry Mean and \( n \) is the number of sub criteria in one criterion and \( x \) is the value. Defined matrix:

\[ R = \begin{bmatrix} r_{11} & r_{12} & r_{1j} \\ r_{21} & r_{22} & r_{2j} \\ r_{i1} & r_{i2} & r_{ij} \end{bmatrix} \]  
(2.3)
R is a normalized matrix where i represents the alternative, j represents the criterion and $r_{ij}$ is the normalized measurement of the i-th alternative in relation to the j th criterion. Then the matrix R is multiplied by the weight of each criterion.

$$RW = \begin{bmatrix}
W_1 r_{11} & W_2 r_{12} & W_j r_{1j} \\
W_1 r_{21} & W_2 r_{22} & W_j r_{2j} \\
W_1 r_{i1} & W_2 r_{i2} & W_j r_{ij}
\end{bmatrix}$$ (2.4)

After determining the RW matrix, it can be continued by determining the concordance index and the discordance index. The criteria in an alternative including conformity are expressed by the equation:

\[
\begin{align*}
C_{kl} &= \{ j, y_{(kj)} > y_{ij} \}, \text{ for } j = 1, 2, 3, \ldots, n \\
D_{kl} &= \{ j, y_{(kj)} < y_{ij} \}, \text{ for } j = 1, 2, 3, \ldots, n
\end{align*}
\]

$C_{kl}$ = Conformity Index  \\
$D_{kl}$ = Non-Conformity Index

Then calculate the suitability and non-conformity value of each alternative. To determine the suitability value is to add the weights included in the suitability subset.

\[
\begin{align*}
C_{kl} &= \sum_{j \in C_k} w_j \\
D_{kl} &= \sum_{j \in D_k} w_j
\end{align*}
\]

(2.5)  (2.6)

2.4. Profile matching

Profile matching is a decision-making mechanism by assuming that there is an ideal predictor variable level that must be met by the subject under study, not a minimum level that must be met or passed [13]. Weighting in the Profile Matching method is a definite value that is firm on certain values because the values are members of a crisp set. In a strict set, the membership of an element in the set is expressly stated whether the object is a member of the set or not by using characteristic functions.

The steps for the profile matching method are:

a. Determine the variable data required.

b. Determine the aspects used for the assessment.

c. Mapping profile Gap.

d. After obtaining the Gap value, then the weight is given to each Gap value.

e. Calculation and grouping of Core Factors and Secondary Factors. After determining the weighting of the gap value, then they are grouped into 2 groups, namely:

a. Core Factor, which is the criterion (competency) that is the most important or prominent or most needed by an assessment that is expected to obtain optimal results.

\[
NFC = ENC / EIC
\]  (2.7)

b. Secondary Factor (supporting factors), which are items other than those in the core factor or in other words, supporting factors that are less needed by an assessment.

\[
NFS = ENS / EIS
\]  (2.8)

f. Calculation of Total Value. Total value is obtained from the percentage of core factor and secondary factor which are estimated to affect the results of each profile.

\[
N = (x)\% NCF + (x)\% NSF
\]  (2.9)

g. Calculation of ranking. The final result of the profile matching process is ranking. Ranking refers to the results of certain calculations.

\[
Rank = (x)\% NMA + (x)\% NSA
\]  (2.10)
3. Research Stages
The materials used are primary data and secondary data from research. Primary data is data that is obtained directly at the time of research, namely data from questionnaires and interviews with employees of the Kendari City Information and Communication Department, the data is then processed using the ELECTRE method and Profile Matching, while secondary data is data obtained indirectly through literature studies, references to international journals, and previous studies.

3.1. Evaluation criteria
Based on government regulations (PP) and Head of Regional Personnel Agency (PERKA-BKN) the elements and aspects of work performance appraisal by Appraisers include, among others, Employee Work Goals (SKP) and work behavior. This study uses 10 evaluation criteria. These criteria include:

3.1.1. Aspects in SKP:
- a. Quantity
- b. Quality
- c. Time
- d. Costs

3.1.2. Aspects of work behavior
- a. Service Orientation
- b. Integrity
- c. Commitment
- d. Discipline
- e. Cooperation
- f. Leadership

In the aspect of work behavior criteria, there are sub-criteria as follows:
- a. Service orientation (public service satisfaction, service friendliness)
- b. Integrity (Loyalty, Honesty, and Social Care)
- c. Commitment (responsibility, priority ability, professional)
- d. Discipline (mastery of work goals, time management)
- e. Cooperation (study skills, teamwork skills, communication skills)
- f. Leadership (being a motivator, being an example, being able to tolerate and innovate)

4. Result and discussion

4.1. System framework

![System framework diagram]

**Figure 1.** System framework
In this system, there is a framework to describe how the system works easily, there are 3 columns in the image, namely input, process and output. In the input column, the admin fills in the data according to the questionnaire that has been filled out by civil servants, then the data is placed by the system by matching the profile with the profile matching method, then the system suggesting recommendations for develop competencies needed according to what is needed with the ELECTRE method, the output from this system, namely the right recommendations to be carried out by civil servants in developing their competence.

4.2. Identify competency types

4.2.1. Technical competency
   a. Knowledge, skills, and attitudes / behaviors that can be observed, measured, and developed specifics related to the technical field of the position.
   b. measured by level and specialization education, functional technical training.

4.2.2. Managerial competency
   a. Knowledge, skills, and attitudes / behaviour that can be observed, measured, and developed for leading and / or managing organizational units
   b. measured from the level of education, structural training or management, and leadership experience.

4.2.3. Socio-Cultural competency
   a. Knowledge, skills, and attitudes / behaviors that can be observed, measured, and developed related to the experience of interacting with a pluralistic society in terms ofreligion, ethnicity & culture, behavior, national insight, ethics, moral values, emotionsand principles, which every incumbent must fulfill to get results work in accordance with the role, function, and position.
   b. measured from work experience related to a pluralistic society in terms of religion, ethnicity, and culture so that they have a national insight. and experience working technically.

4.2.4. GAP analysis data of office competency and employee competency
Table 1. GAP Analysis

| No. | Position                | Position Group | Analysis GAP                                                                                     | Follow Up          | Recommendation                              |
|-----|-------------------------|----------------|-----------------------------------------------------------------------------------------------|-------------------|--------------------------------------------|
| 1   | Head of Department      | JPT Pratama    | a. Educational Qualifications                                                               | Performance Training | Participate in Performance Training either independently or at local expense |
|     |                         |                | - S1                                                                                           |                   |                                            |
|     |                         |                | - Field of Science: Human Resource Management, Social Sciences                               |                   |                                            |
|     |                         |                | b. Education and training                                                                     |                   |                                            |
|     |                         |                | - Job Analysis Training                                                                       |                   |                                            |
|     |                         |                | - Training and Education needs analysis                                                        |                   |                                            |
|     |                         |                | - Performance Training                                                                       |                   |                                            |
|     |                         |                | c. Rank of supervisor IVa                                                                     |                   |                                            |
|     |                         |                | d. Managerial Competencies:                                                                  |                   |                                            |
|     |                         |                | - PIM II training                                                                             |                   |                                            |
|     |                         |                | e. Socio-Cultural Competencies:                                                               |                   |                                            |
|     |                         |                | f. Technical Competence / Job:                                                                |                   |                                            |
|     |                         |                | - Able to evaluate, develop regional staffing policy advocacy strategies                      |                   |                                            |
|     |                         |                | - Able to compile HR management technical guidelines and instructions                         |                   |                                            |
|     |                         |                | - Able to evaluate, prepare technical guidelines for the implementation of education and training |                   |                                            |
|     |                         |                | - Able to compile guidelines, develop performance management information systems             |                   |                                            |

5. Conclusion

Competency development recommendations given to civil servants based on the policies of the State Administration Agency (LAN). By using the calculation of the matching profile and matrix of the ELEKTRE system method, it can determine the increase in the competence of civil servants that is unbeatable with job competency standards. Profile adjustment is the right method for the management of human resources related to competence. Besides that method, ELECTRE can be a management problem because it can be implemented easily in the selection of decisions on objects that have many alternatives.

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