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COMBINATION OF LOGARITHMIC PERCENTAGE CHANGE AND GREY RELATIONAL ANALYSIS FOR BEST ADMINISTRATION STAFF SELECTION

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Abstract— The best administrative staff are individuals who are able to maintain the smooth operation of the organization with high efficiency and precision. One of the main problems is subjectivity in assessment that can cause dissatisfaction among employees. Sometimes, assessments are based more on personal relationships than objective performance, thus creating a sense of unfairness. The purpose of this study, using a combination of LOPCOW and GRA in determining the best administrative staff to develop a holistic and data-driven evaluation approach for the optimal administrative staff selection process. This process involves a comprehensive assessment based on various criteria, including work efficiency, accuracy, multitasking ability, and excellence in communication and problem solving. LOPCOW provides a strong objective basis by considering significant changes in performance data through logarithmic percentage changes, while GRA helps in identifying and understanding the relationship of similarities and differences between alternatives based on given criteria. By integrating these two methods, organizations can combine the advantages of LOPCOW's objectivity with the power of GRA's relational comparison analysis, resulting in a more comprehensive and accurate performance evaluation. The results of the ranking of the selection of the best administrative staff show that the first best administrative staff was obtained by Staff Name AH with a GRG value of 0.1666, the second best administrative staff was obtained by Staff Name RW with a GRG value of 0.1569, the third best administrative staff was obtained by Staff Name ES with a GRG value of 0.1266.

Keywords: best administrative staff, combination, evaluation, GRA, LOPCOW.

Intisari— Tenaga administrasi terbaik adalah individu yang mampu menjaga kelancaran operasional organisasi dengan efisiensi dan presisi yang tinggi. Salah satu masalah utama adalah subjektivitas dalam penilaian yang dapat menyebabkan ketidakpuasan di antara karyawan. Terkadang, penilaian lebih didasarkan pada hubungan pribadi daripada kinerja objektif, sehingga menimbulkan rasa ketidakadilan. Tujuan dari penelitian ini, menggunakan kombinasi LOPCOW dan GRA dalam menentukan tenaga administrasi terbaik untuk mengembangkan pendekatan evaluasi holistik dan berbasis data untuk proses seleksi tenaga administrasi yang optimal. Proses ini melibatkan penilaian komprehensif berdasarkan berbagai kriteria, termasuk efisiensi kerja, ketelitian, kemampuan multitasking, dan keunggulan dalam komunikasi dan pemecahan masalah. LOPCOW memberikan landasan objektif yang kuat dengan mempertimbangkan perubahan signifikan dalam data kinerja melalui perubahan persentase logaritmik, sementara GRA membantu dalam mengidentifikasi dan memahami hubungan persamaan dan perbedaan antara alternatif berdasarkan kriteria yang diberikan. Dengan mengintegrasikan kedua metode ini, organisasi dapat menggabungkan keunggulan objektivitas LOPCOW dengan kekuatan analisis perbandingan relasional dari GRA, sehingga menghasilkan evaluasi kinerja yang lebih komprehensif dan akurat. Hasil pemeringkatan pemilihan staf administrasi terbaik menunjukkan bahwa staf administrasi terbaik pertama diperoleh oleh Nama Staf AH dengan nilai GRG sebesar 0,1666, staf administrasi terbaik kedua diperoleh oleh Nama Staf RW



dengan nilai GRG sebesar 0,1569, staf administrasi terbaik ketiga diperoleh oleh Nama Staf ES dengan nilai GRG sebesar 0,1266.

Kata Kunci: staf administrasi terbaik, kombinasi, evaluasi, GRA, LOPCOW.

INTRODUCTION

The best administrative staff are individuals who are able to maintain the smooth operation of an organization with high efficiency and precision. They are not only proficient in managing documents and data, but also excel in interpersonal communication, both with colleagues and with external parties[1]. Good multitasking skills, mastery of the latest technology, as well as initiative in solving problems are their distinctive characteristics. Additionally, their dedication to detail and timeliness ensures that all administrative tasks are completed optimally, thus supporting the overall productivity and success of the organization.

The best administrative staff also always strive to continuously improve their skills and knowledge in order to make maximum contributions to the company. The selection of the best administrative staff is an important process that aims to recognize and reward the outstanding contributions of individuals who play a crucial role in the smooth operation of the organization. This process involves a comprehensive assessment based on a variety of criteria, including work efficiency, rigor, multitasking ability, and excellence in communication and problem-solving. In addition, initiative, discipline, and the ability to adapt to the latest technology are also determining factors. By involving colleagues and superiors in the evaluation process, organizations can ensure that the selection is conducted objectively and fairly.

This award not only motivates administrative staff to continuously improve their performance, but also encourages a more productive and harmonious work culture in the work environment. One of the main problems is subjectivity in assessments, which can lead to dissatisfaction among employees. Sometimes, judgments are based more on personal relationships than objective performance, creating a sense of injustice. In addition, the lack of clear and consistent assessment standards can also be an obstacle, making the success criteria ambiguous. An evaluation process that is not transparent and a lack of constructive feedback can also reduce the credibility of this election. To overcome this problem, a more structured and transparent assessment method is needed, as well as the fair involvement of all parties in the evaluation process.

The implementation of a decision support system or often known as DSS can increase the objectivity and efficiency of the evaluation process in selecting the best administrative staff [2]–[4].

DSS enables thorough data collection and analysis, covering various aspects of performance such as productivity, timeliness, communication skills, and multitasking capabilities. With the use of algorithms in the decision support system, it can produce a consistent and accurate assessment based on the criteria that have been set. DSS can present transparent and easy-to-understand reports, thereby minimizing subjectivity and increasing employee confidence in the results of assessments.

The implementation of DSS also allows for more constructive feedback, helping administrative staff to understand areas that need improvement and continue to improve in their work. DSS allows for more dynamic and adaptive evaluations, where assessment criteria can be adjusted to the evolving needs of the organization. The use of DSS also facilitates the involvement of various parties in the evaluation process, ensuring that every voice is heard and taken into account[5]–[7]. Ultimately, the implementation of DSS in the selection of the best administrative staff not only improves accuracy and fairness, but also promotes a more transparent, collaborative, and continuous performance-oriented work culture.

The Grey Relational Analysis (GRA) method is a multi-criteria analysis technique used to overcome uncertainty and incomplete information in decision-making[8]–[10]. The GRA works by comparing a series of alternatives based on various criteria, ranking them based on a gray relational grade that measures the degree of similarity or divergence between the alternatives. This method is particularly effective in situations where data is limited or incomplete, as it is able to evaluate and make the best choice by considering a variety of factors at once[11], [12].

In the context of selecting the best administrative staff, the GRA can be used to assess individual performance based on criteria such as productivity, rigor, communication skills, and initiative, resulting in an objective and comprehensive assessment. As such, GRA help organizations make more accurate and fair decisions, even though the information available may not be entirely perfect. One of the main

problems in the use of GRA is the determination of the right weighting of the criteria. The weight of the criteria is very important because it affects the final result of the analysis, determining how much influence each criterion has in the overall evaluation. If the weights are not accurately determined, the GRA results can become unrepresentative. In overcoming the weaknesses of the GRA method in the weight of criteria, Logarithmic Percentage Change Driven Objective Weighting or often known as LOPCOW is used.

LOPCOW is a technique that aims to overcome subjectivity in determining criterion weighting by basing the weighting on objective changes in data[13]–[15]. This approach uses a logarithmic percentage change from the criterion value to determine its weight, ensuring that the weight given reflects proportionally the significant change in the performance of each criterion. The LOPCOW method offers a number of significant advantages in determining the weight of the criteria. By basing the weight on the logarithmic change of the percentage, LOPCOW reduces subjectivity and increases objectivity in the evaluation process. This technique ensures that the weights reflect significant changes in performance data, making them more responsive to the actual dynamics occurring in the organization[16]–[18]. In addition, this method facilitates faster adaptation to changing conditions by providing more accurate and proportionate assessments. By normalizing logarithmic percentage changes, LOPCOW also ensures that the total weight is always consistent, increasing transparency and trust in the decision-making process. This is especially beneficial in a fast-changing business environment, where decisions backed by objective data are key to success.

Performance evaluation using a combination of LOPCOW to determine criteria weighting and GRA in alternative assessment provides a robust and holistic approach to criterion weighting. LOPCOW provides a solid objective foundation by considering significant changes in performance data through logarithmic percentage changes, while GRA assists in identifying and understanding the relationship of similarities and differences between alternatives based on the given criteria. By integrating these two methods, organizations can combine the objectivity advantages of LOPCOW with the power of relational comparative analysis from GRA, resulting in a more comprehensive and accurate performance evaluation. The synergy between LOPCOW and GRA also makes it possible to adjust the weighting of criteria more precisely, ensuring that decisions are based on in-depth and

balanced analysis, as well as improving the organization's ability to overcome the uncertainty and dynamics of the business environment. The collaboration between LOPCOW and GRA not only improves accuracy and objectivity in evaluation, but also enriches the organization's understanding of the factors that contribute to superior performance.

The determination of the best administrative personnel is to develop a holistic and data-based evaluation approach for the optimal administrative employee selection process using a combination of LOPCOW and GRA. Through the merger of the two methods, the research was conducted to identify the most relevant and significant performance criteria, while ensuring that the weights of the established criteria reflected substantial changes in the performance data. In addition, the study is also to measure and compare the performance of individuals based on their similarities or differences with the established criteria, thus allowing the identification of the best administrative staff in a more objective and comprehensive way. The main objective of this study is to contribute to the development of a more effective, efficient, and evidence-based administrative staff selection process, which in turn is expected to improve the overall performance and productivity of the organization.

MATERIALS AND METHODS

A. Research Stage

The stages of research that are carried out systematically and structured will provide results under the research process that is carried out to obtain valid and reliable results[19]. By identifying a clear research problem or question, it can focus on specific issues that require solutions or explanations. Figure 1 is the research stage carried out in the selection of the best administrative staff.



Source: (Research Results, 2024)

Figure 1. Research Stages



The research stage has 4 stages that are carried out, namely collecting needs, LOPCOW method, assessing the performance of administrative staff using the GRA method, and ranking the best staff.

B. Data Collection

Data collection is a process in research or evaluation to collect relevant and accurate information to solve problems in research. This process includes a variety of techniques and methods, such as surveys, interviews, observations, experiments, and data collection from secondary sources such as documents or databases. Good data collection should follow the principles of validity and reliability, ensuring that the data collected truly depicts the phenomenon being studied and can be replicated under the same conditions. This stage is very important in any research or evaluation because the quality of the data collected will affect the accuracy and reliability of the results of the analysis and conclusions drawn.

C. Determining the Weight of Criteria Using the LOPCOW Method

The LOPCOW method is a multi-criteria decision-making technique based on changes in logarithmic percentages in determining relative weights, equation (1) is a decision matrix made in the first process of the LOPCOW method.

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Equation (2) is the calculation of the matrix normalization value in the second process of the LOPCOW method.

$$n_{ij} = \frac{x_{ij}}{m + \sum_{i=1}^m x_{ij}^2} \quad (2)$$

Equation (3) is the calculation of the preference value in the third process of the LOPCOW method.

$$PV_i = 100 * \left| \frac{\sqrt{\sum_{i=1}^m n_{ij}^2}}{\ln \frac{m}{\sigma}} \right| \quad (3)$$

Equation (4) is the calculation of the final weight of the criteria in the final process of the LOPCOW method.

$$W_i = \frac{PV_i}{\sum_{j=1}^n PV_i} \quad (4)$$

This final weight is used to evaluate the available decision alternatives, by multiplying the criterion

value of each alternative by the corresponding criterion weight, and then summing the results to get the final score of each alternative.

D. Grey Relational Analysis Method

The Grey Relational Analysis (GRA) method is a technique in multi-criteria decision-making used to analyze and evaluate the complexity of systems with incomplete or uncertain data. The calculation using equation (5) is the process of calculating the matrix normalization value in the first process of the GRA method.

$$x_{ij} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (5)$$

The calculation using equation (6) is the process of calculating the alternative weight value of each criterion in the second process of the GRA method.

$$v_{ij} = x_{ij} * W \quad (6)$$

The calculation using equation (7) is the process of calculating the final value of GRG for each alternative in the final process of the GRA method.

$$GRG_i = \frac{1}{n} \sum_{j=1}^n v_{ij} \quad (7)$$

The final value in the GRA method is the Grey Relational Grade (GRG) which describes the degree of proximity of each alternative to the ideal solution or reference.

E. Best Administrative Staff Ranking

The ranking of the best administrative staff is carried out using multi-criteria methods such as Grey Relational Analysis (GRA) to ensure an objective and comprehensive evaluation. This process begins by identifying relevant evaluation criteria. Data for each criterion is collected and normalized for scale consistency. Furthermore, the gray relational coefficient is calculated to measure the proximity of each staff to the ideal solution, followed by the calculation of the Grey Relational Grade (GRG) which averages the coefficient. Staff with the highest GRG values are considered the best, as they demonstrate performance that is closest to the ideal standards set. This method ensures that decisions are based on a systematic and objective analysis of various aspects of staff performance.

RESULTS AND DISCUSSION

The combination of LOPCOW and GRA is an effective approach in selecting the best administrative staff. This method leverages logarithmic percentage changes to dynamically



determine objective weights based on each candidate's performance. In the performance assessment of administrative staff, some important criteria include work efficiency, thoroughness, multitasking ability, and excellence in communication and problem solving. Of the four criteria, excellence in communication and problem solving is often considered the best. This ability helps staff communicate effectively and address challenges with appropriate solutions, making them more valuable to the organization. While work efficiency, thoroughness, and multitasking ability are also important, excellence in communication and problem-solving has a greater impact in ensuring optimal performance.

Furthermore, the GRA is used to measure the degree of relationship between various assessment criteria and the actual performance of the candidates. By combining these two methods, the selection process becomes more accurate and objective, allowing the identification of the best performing administrative staff across the board, based on measurable data and in-depth analysis. This approach not only increases fairness in judgment, but also ensures that decisions taken are based on comprehensive and reliable evaluations.

A. Data Collection

Data collection in the selection of the best administrative staff is a systematic process that involves the identification of evaluation criteria such as work quality (C01), productivity (C02), discipline (C03), communication skills (C04), and initiative and creativity (C05). Table 1 is the result of data collection carried out in the performance assessment of administrative staff.

Table 1. Data Collection

Staff Name	Criteria				
	C01	C02	C03	C04	C05
DF	95	98	93	96	90
ES	93	99	94	96	97
AH	94	99	95	98	98
RW	96	98	95	98	97
HS	90	97	94	95	97
YP	95	99	93	94	92
SB	92	98	97	95	93

Source: (Research Results, 2024)

This assessment data will be used in the LOPCOW method to determine the weight of the criteria, and the GRA method for assessment in the selection of the best administrative staff.

B. Determining the Weight of Criteria Using the LOPCOW Method

Equation (1) is a decision matrix made in the first process of the LOPCOW method based on assessment data from alternatives in table 1.

$$X = \begin{bmatrix} 95 & 98 & 93 & 96 & 90 \\ 93 & 99 & 94 & 96 & 97 \\ 94 & 99 & 95 & 98 & 98 \\ 96 & 98 & 95 & 98 & 97 \\ 90 & 97 & 94 & 95 & 97 \\ 95 & 99 & 93 & 94 & 92 \\ 92 & 98 & 97 & 95 & 93 \end{bmatrix}$$

Equation (2) is the calculation of the matrix normalization value in the second process of the LOPCOW method.

$$n_{11} = \frac{95}{7 + 61315} = 0.4172$$

Table 2 shows the results of matrix normalization in the LOPCOW method as a whole.

Table 2. The Result Matrix Normalization Value

Staff Name	Criteria				
	C01	C02	C03	C04	C05
DF	0.1472	0.1420	0.1385	0.1428	0.1285
ES	0.1410	0.1449	0.1415	0.1428	0.1492
AH	0.1441	0.1449	0.1445	0.1488	0.1523
RW	0.1503	0.1420	0.1445	0.1488	0.1492
HS	0.1321	0.1391	0.1415	0.1399	0.1492
YP	0.1472	0.1449	0.1385	0.1369	0.1342
SB	0.1380	0.1420	0.1507	0.1399	0.1372

Source: (Research Results, 2024)

Equation (3) is the calculation of the preference value in the third process of the LOPCOW method based on the results of the normalization of the matrix that has been calculated.

$$PV_1 = 100 * \frac{0.3782}{7.0934} = 100 * 0.05332 = 5.332$$

$$PV_2 = 100 * \frac{0.378}{8.1452} = 100 * 0.0464 = 4.64$$

$$PV_3 = 100 * \frac{0.3781}{7.4842} = 100 * 0.05052 = 5.052$$

$$PV_4 = 100 * \frac{0.3781}{7.4145} = 100 * 0.05099 = 5.099$$

$$PV_5 = 100 * \frac{0.3786}{6.695} = 100 * 0.05655 = 5.655$$

Equation (4) is the calculation of the final weight of the criteria in the final process of the LOPCOW method based on the results of the preference value that has been calculated.

$$w_1 = \frac{5.332}{25.779} = 0.207$$

$$w_2 = \frac{4.64}{25.779} = 0.18$$

$$w_3 = \frac{5.052}{25.779} = 0.196$$

$$w_4 = \frac{5.099}{25.779} = 0.198$$



$$w_5 = \frac{5.655}{25.779} = 0.219$$

C. Assessment of Administrative Staff using the GRA Method

The calculation using equation (5) is the process of calculating the matrix normalization value in the first process of the GRA method based on the assessment data from the alternatives in table 1.

$$x_{11} = \frac{95 - 90}{96 - 95} = 0.833$$

The result of the overall matrix normalization value in table 3.

Table 3. The Result Matrix Normalization Value

Staff Name	Criteria				
	C01	C01	C01	C01	C01
DF	0.833	0.5	0	0.5	0
ES	0.5	1	0.25	0.5	0.875
AH	0.667	1	0.5	1	1
RW	1	0.5	0.5	1	0.875
HS	0	0	0.25	0.25	0.875
YP	0.833	1	0	0	0.25
SB	0.333	0.5	1	0.25	0.375

Source: (Research Results, 2024)

The calculation using equation (6) is the process of calculating the alternative weight value of each criterion in the second process of the GRA method.

$$v_{11} = 0.207 * 0.833 = 0.1725$$

The result of the multiplication of the matrix normalization with the weight of the criteria in table 4.

Table 4. The Result Multiplication of Weights

Staff Name	Criteria				
	C01	C02	C03	C04	C05
DF	0.1725	0.09	0	0.099	0
ES	0.1035	0.18	0.049	0.099	0.1916
AH	0.138	0.18	0.098	0.198	0.219
RW	0.207	0.09	0.098	0.198	0.1916
HS	0	0	0.049	0.0495	0.1916
YP	0.1725	0.18	0	0	0.0548
SB	0.069	0.09	0.196	0.0495	0.0821

Source: (Research Results, 2024)

The calculation using equation (7) is the process of calculating the final value of GRG for each alternative in the final process of the GRA method.

$$GRG_1 = \frac{1}{5} * (0.1725 + 0.09 + 0 + 0.099 + 0)$$

$$GRG_1 = 0.0723$$

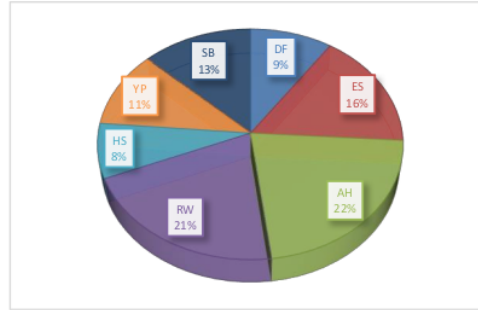
The result of the value of the grey relationship in table 5.

Table 5. The Result Value of the Grey Relationship

	GRG Value
DF	0.0723

ES	0.1246
AH	0.1666
RW	0.1569
HS	0.058
YP	0.0815
SB	0.0973

Source: (Research Results, 2024)



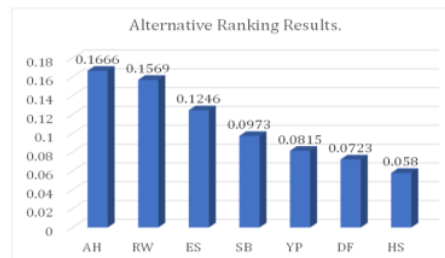
Source: (Research Results, 2024)

Figure 2. The Result Value of the Grey Relationship.

The final score of each alternative will be used in ranking the best administrative staff.

D. Best Administrative Staff Ranking

Ranking in the selection of the best administrative staff is an important process to determine the order or ranking of administrative staff based on the evaluation criteria that have been set. The steps in the ranking involve identifying relevant evaluation criteria, collecting data using various methods, and processing data to produce accurate rankings. The use of analysis methods such as Grey Relational Analysis (GRA) helps in ranking administrative staff based on their performance, with staff with the highest Grey Relational Grade (GRG) values considered to be the best. This ranking process helps organizations in making better decisions in selecting the best administrative staff, by considering various aspects of performance objectively and systematically. Figure 3 is the result of alternative ranking.



Source: (Research Results, 2024)

Figure 3. Alternative Ranking Results.

The GRG value is the result of a calculation that measures the degree of closeness between each staff alternative and the ideal solution. The higher the GRG value, the closer the staff performance is to the expected ideal performance. In the example ranking results, it can be seen that the first best administrative staff is AH with a GRG value of 0.1666, the second best administrative staff is RW with a GRG value of 0.1569, and the third best administrative staff is ES with a GRG value of 0.1266. These values indicate that AH has the performance closest to the predetermined ideal criteria, followed by RW and ES. Thus, this interpretation of GRG values provides a clear and quantitative basis for organizations to objectively determine the best administrative staff.

The application of the LOPCOW and GRA methods in ranking for the selection of the best administrative staff results in a comprehensive and objective approach. The LOPCOW method is used to determine the relative weights of various criteria based on logarithmic percentage changes, which allows for weight adjustments based on the sensitivity of data changes. Meanwhile, GRA is used to evaluate the complexity of systems with uncertain data, such as the performance of administrative staff, by measuring the degree of proximity between each alternative and the ideal solution. With the combination of these two methods, the ranking of administrative staff can be done in a more holistic and accurate manner, allowing organizations to select the best administrative staff based on in-depth and comprehensive analysis.

However, there are certain limitations to this approach. The effectiveness of the LOPCOW method can be influenced by the selection of criteria and the initial weight distribution, which may introduce subjectivity. Additionally, the GRA method's sensitivity to data variations and its reliance on precise data can pose challenges when dealing with incomplete or noisy datasets. Future research should focus on addressing these limitations by exploring hybrid methods that integrate other decision-making techniques, enhancing data preprocessing methods to handle noise and incompleteness, and developing automated systems for dynamic criteria weighting. This would further refine the accuracy and reliability of the ranking process, ensuring even more robust and objective selection of administrative staff.

CONCLUSION

The purpose of the study using a combination of LOPCOW and GRA in determining the best administrative staff is to develop a holistic and data-based evaluation approach for the optimal administrative personnel selection process. Through the merger of the two methods, the research was conducted to identify the most relevant and significant performance criteria, while ensuring that the weights of the established criteria reflected substantial changes in the performance data. The application of the LOPCOW and GRA methods in ranking for the selection of the best administrative staff results in a comprehensive and objective approach. The LOPCOW method is used to determine the relative weights of various criteria based on logarithmic percentage changes, which allows for weight adjustments based on the sensitivity of data changes. Meanwhile, GRA is used to evaluate the complexity of systems with uncertain data, such as the performance of administrative staff, by measuring the degree of proximity between each alternative and the ideal solution. With the combination of these two methods, the ranking of administrative staff can be done in a more holistic and accurate manner, allowing organizations to select the best administrative staff based on in-depth and comprehensive analysis. The results of the ranking of the best administrative staff selection show that the first best administrative staff is obtained by the AH Staff Name with a GRG value of 0.1666, the second best administrative staff is obtained by the RW Staff Name with a GRG value of 0.1569, the third best administrative staff is obtained by the ES Staff Name with a GRG value of 0.1266.

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