Jurnal Teknik Informatika (JUTIF)
Vol. 5, No. 3, June 2024, pp. 843-853
DOI: https://doi.org/10.52436/1.jutif.2024.5.3.2057
p-ISSN: 2723-3863
e-ISSN: 2723-3871

COMBINATION OF LOGARITHMIC PERCENTAGE CHANGE-DRIVEN OBJECTIVE WEIGHTING AND MULTI-ATTRIBUTIVE IDEAL-REAL COMPARATIVE ANALYSIS IN DETERMINING THE BEST PRODUCTION EMPLOYEES

Sitna Hajar Hadad[*1], Subhan[2], Setiawansyah[3], Muhammad Waqas Arshad[4], Aditia Yudhistira[5], Yuri Rahmanto[6]

[1]Computer Engineering, Akademi Ilmu Komputer Ternate, Indonesia
[2]Informatics Management, Akademi Ilmu Komputer Ternate, Indonesia
[3,5]Informatics, Faculty Engineering and Computer Science, Universitas Teknokrat Indonesia, Indonesia
[4]Department of Computer Science and Engineering, University of Bologna, Bologna, Italy
[6]Computer Engineering, Faculty Engineering and Computer Science, Universitas Teknokrat Indonesia, Indonesia
Email: [1]sitna.hajar00@gmail.com, [2]suban01stimikamikom@gmail.com, [3]setiawansyah@teknokrat.ac.id, [4]muhammad.waqas.arshad.1@gmail.com, [5]aditiayudhistira@teknokrat.ac.id, [6]yurirahmanto@teknokrat.ac.id

(Article received: May 07, 2024; Revision: May 10, 2024; published: June 04, 2024)

Abstract

The problem that occurs in the selection of the best production employees is the lack of transparency and objectivity in the selection process. Without clear procedures and well-defined criteria, employee selection decisions can be influenced by subjective preferences or irrelevant non-performance factors. This can result in injustice in employee selection and lower the morale and motivation of unselected employees. The purpose of the combination of LOPCOW and MAIRCA in determining the best production employees is to provide a holistic and adaptive framework in the employee performance evaluation process. LOPCOW allows decision makers to dynamically adjust the weight of criteria according to the level of volatility or change in the relevant environment or situation. LOPCOW offers an adaptive and responsive approach in determining the weight of criteria, enabling decision makers to respond quickly to changes occurring in the relevant environment or situation. MAIRCA is an analytical method used to assist decision makers in evaluating and selecting alternatives based on several relevant criteria or attributes. MAIRCA provides a strong framework for decision makers to make more informed and informed decisions. Combining these two methods results in a more comprehensive and accurate understanding of production employee performance, thus enabling managers to identify the most effective employees and provide rewards or development accordingly. The final results of the ranking of the best production employees obtained by JR employees get 1st place, YP employees get 2nd place, and AJL employees get 3rd place.

Keywords: *Combination, Employees, LOPCOW, MAIRCA, Selection.*

1. INTRODUCING

Employees are valuable assets for every organization, they not only carry out the tasks assigned, but also become the main driver of the company's success. They stand out in a variety of ways, from high dedication to work, to quick adaptability, to the ability to innovate and collaborate effectively. The best employees not only meet expectations, but also inspire and motivate their peers to achieve high standards of performance. With their outstanding contributions, they form a solid foundation for the company's long-term growth and success. The best production employees are the backbone of any manufacturing or production operation. They not only master the technical skills necessary in the production process, but also have a strong desire to give the best results. With deep expertise in running machines, managing inventory, and adhering to strict safety procedures, they become key elements in maintaining quality, efficiency, and timeliness of production. The best production employees focus not only on their own tasks, but also pay attention to the overall workflow, look for ways to increase effectiveness and overcome emerging challenges. With their exceptional dedication and commitment, they make an important contribution in ensuring the company's long-term success in a competitive market. In the process of selecting the best production employees, organizations are often faced with a number of problems that require special attention. One of the main challenges is finding a balance between the necessary technical skills and personality characteristics that match the company's work culture. The problem that occurs in the selection of the best production employees is the lack of transparency and objectivity in the selection process. Without clear procedures and well-defined criteria, employee selection decisions can be influenced by subjective preferences or irrelevant non-performance factors. This can result in injustice in employee selection and lower the morale and motivation of unselected employees. In addition, lack of objectivity in the selection process can also reduce employee confidence in company management, which in turn can have a negative impact on the work culture and overall performance of the company. Therefore, it is important to implement a selection process that is transparent, objective, and based on clear criteria to ensure that the best production employees are selected according to the needs of the company and in a fair manner.

Related research in the selection of the best employees has been carried out by [1] the application of the Evaluation method based on Distance from Average Solution from Average Solution (EDAS) to determine the best employees using criteria of loyalty, discipline, activeness, responsibility, leadership, organization, and knowledge. Further research from [2] application calculations that have been obtained from the analytical hierarchy process and weighted product methods in determining the best employees provides an accuracy rate of 82.3% using the criteria of presence, performance, ability, attitude, and cooperation. The next research by [3] to determine the best employees is the Multi-Objective Optimization method based on Simple Ratio Analysis (MOORA), so that the application of the MOORA method can help companies determine their best employees effectively using five criteria. The latest research by [4] employee performance appraisal is influenced by several criteria, namely discipline, innovation, and responsibility, selection of the best employees using the Analytical Hierarchy Process (AHP) method. Based on previous research that has been carried out the selection of the best employees using a decision support system approach and using EDAS, AHP, WP, and MOORA methods.

A Decision Support System (DSS) is a tool or system designed to assist individuals or organizations in making complex decisions[5]–[7]. By utilizing certain technologies and algorithms, DSS is able to analyze data, present relevant information, and provide recommendations or solutions that can support the decision-making process. With its ability to process information quickly and accurately, DSS has become invaluable in fields ranging from business and management, to science and technology, helping decision makers explore alternatives and choose the best option to achieve their goals[8]–[10]. DSS plays an important role in helping individuals and organizations to make more precise, efficient, and evidence-based decisions. One method in DSS is Multi-Attributive Ideal-Real Comparative Analysis.

Multi-Attributive Ideal-Real Comparative Analysis (MAIRCA) is an analytical method used to assist decision makers in evaluating and selecting alternatives based on several relevant criteria or attributes[11], [12]. In MAIRCA, each alternative is judged on how close it is to two reference points: ideal (representing ideal or desired conditions) and real (representing actual or current conditions). Through comparison between these two reference points, MAIRCA enables decision makers to determine the alternative that best suits their needs and preferences[12]–[14]. With a systematic and structured approach, MAIRCA has proven effective in a variety of contexts, from business decision making to operations research. MAIRCA provides a strong framework for decision makers to make more informed and informed decisions. Although MAIRCA has many advantages, such as its ability to integrate various criteria and preferences of decision makers, it also has some disadvantages. One drawback is the complexity in the process of collecting data and determining weights for each criterion or attribute. Inaccurate data collection or unbalanced weighting can result in biased or unrepresentative results. One weighting method to cover the weaknesses of MAIRCA is to use Logarithmic Percentage Change-Driven Objective Weighting.

Logarithmic Percentage Change-Driven Objective Weighting (LOPCOW) is an approach to decision analysis that aims to give weight to criteria based on logarithmic percentage changes from historical data[15]–[17]. This method emphasizes on the relative change dynamics of each criterion over time, assuming that more significant changes have a greater impact on decision making. Using this approach, LOPCOW allows decision makers to dynamically adjust the weight of criteria according to the level of volatility or change in the relevant environment or situation. In this context, LOPCOW offers an adaptive and responsive framework, which enables decision makers to address the uncertainty and dynamics inherent in the decision-making process. The importance of using LOPCOW in decision analysis is increasingly felt in the midst of rapidly changing world conditions.[18] LOPCOW offers an adaptive and responsive approach in determining the weight of criteria, enabling decision makers to respond quickly to changes occurring in the relevant environment or situation.

The combination of LOPCOW and MAIRCA offers a comprehensive and innovative approach to the decision-making process. While LOPCOW provides an adaptive framework for adjusting the weighting of criteria based on the relative changing dynamics of historical data, MAIRCA allows the evaluation of alternatives based on some relevant criteria or attributes. By integrating these two methods, decision makers can combine the advantages of each approach, namely LOPCOW's ability to capture significant changes over time with the comprehensive and systematic analysis offered by MAIRCA. Through this combination, decision makers can gain deeper and more accurate insights, and make more informed decisions in the face of complex challenges and evolving dynamics in the business and decision environment. By integrating LOPCOW and MAIRCA, decision makers can gain a more holistic understanding of the dynamics of change affecting the alternatives evaluated.

The difference between previous research and the research conducted lies in the use of the LOPCOW weighting method, previous research used criteria weights based on the provision of criteria weights while this study used the LOPCOW method in determining the weight of criteria based on the data from the assessment results that have been carried out. The purpose of the combination of LOPCOW and MAIRCA in determining the best production employees is to provide a holistic and adaptive framework in the employee performance evaluation process. Combining these two methods results in a more comprehensive and accurate understanding of production employee performance, thus enabling managers to identify the most effective employees and provide rewards or development accordingly.

2. RESEARCH METHOD

The stages of research are an integral part of the scientific process that makes it possible to strategize, collect data, analyze findings, and generate new understandings in a field of knowledge. This stage not only includes planning and conducting research, but also evaluating the results of the research conducted. The stages of research carried out are as shown in Figure 1.

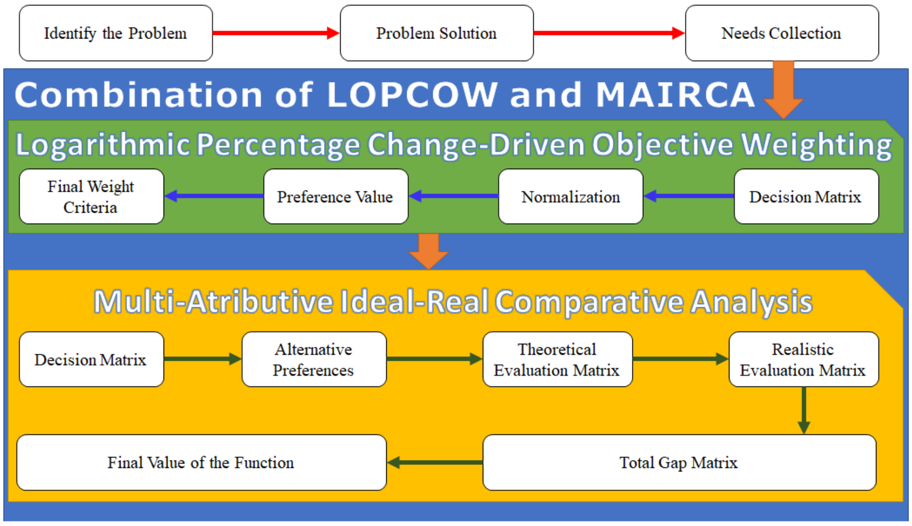

Figure 1. Research Framework

Research framework figure 1 is the steps taken in solving problems in this study using a combination of LOPCOW and MAIRCA that will produce a recommendation in the selection of the best production employees.

2.1. Identify the Problem

The problem that occurs in the selection of the best production employees is the lack of transparency and objectivity in the selection process. Without clear procedures and well-defined criteria, employee selection decisions can be influenced by subjective preferences or irrelevant non-performance factors. This can result in injustice in employee selection and lower the morale and motivation of unselected employees. In addition, lack of objectivity in the selection process can also reduce employee confidence in company management, which in turn can have a negative impact on the work culture and overall performance of the company. Therefore, it is important to implement a selection process that is transparent, objective, and based on clear criteria to ensure that the best production employees are selected according to the needs of the company and in a fair manner. Without an effective system for monitoring and evaluating the performance of production employees, it is difficult for companies to identify individuals who truly excel at their jobs. This can result in unfair promotions or rewards, as well as a lack of recognition of the real contributions of outstanding employees.

2.2. Problem Solution

In an era driven by technology, decision support systems have become an important tool in the process of selecting the best production employees. The system provides a structured and scalable framework for managing candidate information, analyzing relevant criteria, and generating recommendations based on objective data. By utilizing artificial intelligence and data analysis, companies can improve accuracy and efficiency in selecting production employees who have appropriate technical skills, company culture fit, and high-performance potential. This approach not only helps reduce subjectivity in decision making, but also allows companies to make decisions that are based on solid evidence, which in turn can improve productivity and quality of production output. With a decision support system, companies can integrate various sources of data and information needed to take the right decisions to become more accessible and manageable. In addition, the system can be used to analyze trends and patterns from historical data, allowing companies to refine employee selection strategies in the future. With a combination of advanced analytical capabilities and a deep understanding of a company's needs, decision support systems become an invaluable tool in ensuring that companies have the best production team to achieve their business goals effectively and efficiently.

2.3. Needs Collection

Requirements gathering is a crucial initial stage in the process of selecting the best production employees with a decision support system. In this stage, the company needs to carefully identify and collect information about the necessary criteria for the production position being opened. Requirements gathering also involves identifying the selection process to be used, the resources available, as well as the time frame required to fill the position. By structuring needs clearly and in detail, companies can ensure that the decision support system to be developed can produce recommendations that match their specific needs in selecting the best production employees.

Appraisal data is an important component in the decision support system for the selection of the best production employees, this data includes information obtained from various relevant sources. By analyzing appraisal data holistically, decision support systems can produce accurate and objective recommendations about production employees that best meet the company's needs.

2.4. LOPCOW Method

The LOPCOW method is a method used in multi-criteria decision making, this method is based on a logarithmic percentage change of the measured objective storm value against existing alternatives. The first stage in the LOPCOW method is to create a decision matrix based on assessment data, the decision matrix is made using the following equation.

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{2n} \\ x_{12} & x_{22} & x_{2n} \\ x_{m1} & x_{m2} & x_{mn} \end{bmatrix} \quad (1)$$

The second stage in the LOPCOW method is to calculate the normalization of the matrix based on the decision matrix using the following equation.

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

The third stage in the LOPCOW method is to calculate the preference value of the matrix normalization results using the following equation.

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

The last step in the LOPCOW method is to calculate the final weight of each criterion based on preference value using the following equation.

$$w_j = \frac{PV_{ij}}{\sum_{j=1}^{n} PV_{ij}} \quad (4)$$

The LOPCOW method has the advantage of overcoming the problem of complexity in decision making by integrating various criteria and taking into account logarithmic percentage changes.

2.5. MAIRCA Method

The MAIRCA method is a powerful approach to decision-making that allows a comprehensive evaluation of alternatives based on a different set of attributes. The first stage in the MAIRCA method, creating a decision matrix, is a systematic process that involves identifying criteria, determining the weight or importance of each criterion, and assessing alternatives based on those criteria. The decision matrix is created by the following equation

$$X = \begin{bmatrix} x_{11} & \cdots & x_{n1} \\ \vdots & \ddots & \vdots \\ x_{1m} & \cdots & x_{nm} \end{bmatrix} \quad (5)$$

The second stage in the MAIRCA method of determining preferences according to alternatives involves evaluating and comparing between various options to identify the one that best meets the needs or expectations. Alternative preferences are made by the following equation.

$$P_{ai} = \frac{1}{m} \sum_{i=1}^{m} P_{ai} = 1 \quad (6)$$

The third stage in the MAIRCA method, calculating the theoretical evaluation matrix, involves an analytical approach used to determine the theoretical value or weight of various criteria or variables relevant in a context. A theoretical evaluation matrix is created with the following equation

$$T_p = \begin{bmatrix} t_{p11} * w_1 & \cdots & t_{pn1} * w_n \\ \vdots & \ddots & \vdots \\ t_{p1m} * w_1 & \cdots & t_{pnm} * w_n \end{bmatrix} \quad (7)$$

The fourth stage in the MAIRCA method of calculating a realistic evaluation matrix involves a systematic process to evaluate the performance or characteristics of various alternatives or entities based on defined criteria or attributes. A realistic evaluation matrix is created with the following equation.

$$t_{rij} = t_{pij} \left(\frac{x_{ij} - x_i^-}{x_i^+ - x_i^-} \right) \quad (8)$$

$$t_{rij} = t_{pij} \left(\frac{x_{ij} - x_i^+}{x_i^- - x_i^+} \right) \quad (9)$$

Equation (8) for the criterion is benefit, and equation (9) for the criterion is cost.

The fifth stage in the MAIRCA method, the total gap matrix, involves a process of careful evaluation of the difference between the actual value and the target value on a number of specific attributes or criteria. The total gap matrix is created by the following equation.

$$G_{ij} = t_{pij} - t_{rij} \quad (10)$$

The last stage in the MAIRCA method, which is calculating the final value of a function, involves the process of evaluating and determining the final result of a mathematical function or modeling. The calculation of the final value of the function uses the following equation.

$$Q_i = \sum_{j=1}^{n} g_{ij} \quad (11)$$

The end result of these calculations is often used to make decisions, perform analyses, or describe the nature of the modeled system.

3. RESULT DAN DISCUSSION

The combination of LOPCOW and MAIRCA is an innovative method of determining the best production employees. The LOPCOW approach allows accurate measurement of changes in employee performance over time taking into account logarithmic calculated percentage changes. Meanwhile, MAIRCA allows a comprehensive evaluation of employees based on a number of different attributes, comparing their performance to ideal standards and actual conditions. By combining these two approaches, companies can assign objective weights to each attribute based on logarithmic changes, then use MAIRCA to evaluate employees based on those weights. This allows the identification of employees who not only achieve high performance, but also approach or even exceed the desired ideal standards, thus enabling companies to recognize and encourage employees who contribute the most to production. Using a combination of LOPCOW and MAIRCA, companies can objectively identify the best production employees based on relevant and dynamic criteria. LOPCOW ensures that changes in performance over time are considered proportionately, while MAIRCA provides a comprehensive framework for evaluating employees based on diverse attributes. Thus, companies can make more informed and informed decisions in recognition, development, and incentives for production employees, which in turn can improve the motivation and overall performance of the production team. This is an important step in the effort to improve the efficiency and quality of the company's production.

3.1. Identify the Problem

Identifying problems in selecting the best production employees often includes several challenges that include lack of transparency in the selection process, limited resources to thoroughly assess candidates, and difficulty in determining appropriate evaluation criteria. A lack of deep understanding of the specific needs of production positions can also lead to a gap between the expected qualifications and the qualifications possessed by the hired employee. In addition, subjective factors such as personal bias or individual preferences in the selection process can also affect objectivity and fairness in selecting the best employees. By correctly identifying these problems, companies can design more effective and objective selection strategies to ensure proper and productive placement in production positions.

3.2. Problem Solution

The solution to address this problem involves concrete steps such as the creation of clear and structured selection guidelines, including the necessary criteria and the evaluation methods used. One of the evaluation methods in selecting the best production employees using a decision support system model by applying the logarithmic percentage change-driven objective weighting and multi-attributive ideal-real comparative analysis methods in determining the best production employees.

3.3. Needs Collection

Requirements gathering to determine the best production employees is a key step in ensuring the fit between the required skills and characteristics with the desired profile. This process involves an in-depth analysis of the tasks to be performed, consultation with the existing production team, as well as the creation of appropriate selection criteria. By paying attention to aspects such as technical skills, interpersonal abilities, and resistance to pressure, companies can identify potential employees who have the potential to perform high in a production environment. Production employee assessment data as shown in table 1.

Table 1. Production Employee Assessment Data

Employee Name	**Criteria**					
	Technical Skills	**Consistency**	**Teamwork Ability**	**Responsibility**	**Creativeness**	**Communication**
Employee ARD	90	96	94	93	95	90
Employee YHS	93	92	90	94	94	94
Employee BS	92	91	92	93	92	90

Employee KRS	94	90	93	95	95	92
Employee JR	95	93	95	94	96	95
Employee TSH	93	94	93	93	94	91
Employee MGB	91	92	90	92	93	94
Employee RHA	90	94	91	90	96	95
Employee WS	93	94	92	91	95	96
Employee AJL	94	96	91	92	96	93
Employee YP	96	95	90	93	96	94
Employee MZ	95	93	90	90	95	93
Employee MAS	93	90	92	93	93	92

The appraisal data in table 1 is the result of collecting needs with the company in selecting the best production employees, the assessment data is always used by the company every year in selecting the best production employees.

3.4. Weighting Using LOPCOW Method

The LOPCOW method is an approach used to give weight to each attribute or criterion in an analysis. This approach involves measuring changes in performance relative to specific times or conditions using logarithmic calculated percentage changes. The first stage is to create a decision matrix based on table 1 assessment data using equation (1), the following is the result of the decision matrix.

$$X = \begin{bmatrix} 90 & 96 & 94 & 93 & 95 & 90 \\ 93 & 92 & 90 & 94 & 94 & 94 \\ 92 & 91 & 92 & 95 & 92 & 90 \\ 94 & 90 & 93 & 93 & 95 & 92 \\ 95 & 93 & 95 & 94 & 96 & 95 \\ 93 & 94 & 93 & 93 & 94 & 91 \\ 91 & 92 & 90 & 92 & 93 & 94 \\ 90 & 94 & 91 & 90 & 96 & 95 \\ 93 & 94 & 92 & 91 & 95 & 96 \\ 94 & 96 & 91 & 92 & 96 & 93 \\ 96 & 95 & 90 & 93 & 96 & 94 \\ 95 & 93 & 90 & 90 & 95 & 93 \\ 93 & 90 & 92 & 93 & 93 & 92 \end{bmatrix}$$

The second stage calculates the normalization of the matrix using equation (2), the following is the result of the normalization of the matrix.

$$n_{11} = \frac{x_{11}}{13 + \left(x_{1,1}^2 + x_{1,2}^2 + x_{1,3}^2 + x_{1,4}^2 + x_{1,5}^2 + x_{1,6}^2 + x_{1,7}^2 + x_{1,8}^2 + x_{1,9}^2 + x_{1,10}^2 + x_{1,11}^2 + x_{1,12}^2 + x_{1,13}^2\right)}$$

$$n_{11} = \frac{90}{13 + (90^2 + 93^2 + 92^2 + 94^2 + 95^2 + 93^2 + 91^2 + 90^2 + 93^2 + 95^2 + 96^2 + 95^2 + 93^2)}$$

$$n_{11} = \frac{90}{13 + (112492)} = 0{,}000800057$$

The overall result of the matrix normalization calculation is as in table 2.

Table 2. Overall Result of Matrix Normalization

Employee Name	Criteria					
	Technical Skills	Consistency	Teamwork Ability	Responsibility	Creativeness	Communication
Employee ARD	0.000800057	0.000851932	0.000858244	0.000835099	0.000816074	0.000800043
Employee YHS	0.000826725	0.000816435	0.000821723	0.000844079	0.000807484	0.0008356
Employee BS	0.000817836	0.000807561	0.000839983	0.000835099	0.000790303	0.000800043
Employee KRS	0.000835615	0.000798687	0.000849113	0.000853058	0.000816074	0.000817821
Employee JR	0.000844504	0.000825309	0.000867374	0.000844079	0.000824664	0.000844489
Employee TSH	0.000826725	0.000834184	0.000849113	0.000835099	0.000807484	0.000808932
Employee MGB	0.000808946	0.000816435	0.000821723	0.00082612	0.000798894	0.0008356
Employee RHA	0.000800057	0.000834184	0.000830853	0.000808161	0.000824664	0.000844489
Employee WS	0.000826725	0.000834184	0.000839983	0.00081714	0.000816074	0.000853379
Employee AJL	0.000835615	0.000851932	0.000830853	0.00082612	0.000824664	0.000826711
Employee YP	0.000853394	0.000843058	0.000821723	0.000835099	0.000824664	0.0008356
Employee MZ	0.000844504	0.000825309	0.000821723	0.000808161	0.000816074	0.000826711
Employee MAS	0.000826725	0.000798687	0.000839983	0.000835099	0.000798894	0.000817821

The next step is calculating the preference value using equation (3), the following is the results of calculating the preference value.

$$PV_1 = 100 * \left| \frac{\sqrt{n_{1,1}^2 + n_{1,2}^2 + n_{1,3}^2 + n_{1,4}^2 + n_{1,5}^2 + n_{1,6}^2 + n_{1,7}^2 + n_{1,8}^2 + n_{1,9}^2 + n_{1,10}^2 + n_{1,11}^2 + n_{1,12}^2 + n_{1,13}^2}}{\ln \frac{13}{\sigma}} \right|$$

$$PV_1 = 100 * \left| \frac{0.002981358}{\ln \frac{13}{0.005164161}} \right| = 100 * \left| \frac{0.002981358}{\ln \frac{13}{7.830961907}} \right| = 100 * \left| \frac{0.002981358}{\ln 2517.349664} \right| = 0.1674$$

The overall result of the preference value calculation is as in table 3.

Table 3. Overall Result of Preference Value

	Criteria					
	Technical Skills	**Consistency**	**Teamwork Ability**	**Responsibility**	**Creativeness**	**Communication**
Preference Value	0.1674	0.1674	0.1666	0.1675	0.1636	0.1674

The last stage calculates the weight of each criterion using equation (4), the following is the final weight calculation results.

$$w_1 = \frac{PV_1}{PV_1 + PV_2 + PV_3 + PV_4 + PV_5 + PV_6}$$

$$w_1 = \frac{0.010216585}{0.06101565} = 0.1674$$

The overall result weights of the criteria as shown in Table 3.

3.5. Application of the MAIRCA Method

The application of the MAIRCA method in determining the best production employees involves several key steps. First, identify relevant attributes for evaluating production employees. Next, determine the ideal standard for each of those attributes, reflecting the desired performance of the ideal employee. Then, evaluate the actual performance of employees based on predefined attributes. It involves collecting data regarding employee performance from various sources. After that, compare actual performance with the ideal standard for each attribute using MAIRCA, identifying gaps between expectations and reality. Finally, based on this analysis, identify and recognize employees who approach or even exceed ideal standards in various aspects of production. By using MAIRCA, companies can make more informed and objective decisions in recognizing the best production employees, as well as identifying areas for further development for employees who may need additional support. The first stage is to create a decision matrix based on table 1 assessment data using equation (5), the following is the results of the decision matrix.

$$X = \begin{bmatrix} 90 & 96 & 94 & 93 & 95 & 90 \\ 93 & 92 & 90 & 94 & 94 & 94 \\ 92 & 91 & 92 & 95 & 92 & 90 \\ 94 & 90 & 93 & 93 & 95 & 92 \\ 95 & 93 & 95 & 94 & 96 & 95 \\ 93 & 94 & 93 & 93 & 94 & 91 \\ 91 & 92 & 90 & 92 & 93 & 94 \\ 90 & 94 & 91 & 90 & 96 & 95 \\ 93 & 94 & 92 & 91 & 95 & 96 \\ 94 & 96 & 91 & 92 & 96 & 93 \\ 96 & 95 & 90 & 93 & 96 & 94 \\ 95 & 93 & 90 & 90 & 95 & 93 \\ 93 & 90 & 92 & 93 & 93 & 92 \end{bmatrix}$$

The second stage in the MAIRCA method of determining preferences according to alternatives involves evaluating and comparing between various options to identify the option that best suits the needs or expectations with equation (6), the following is the result of calculating alternative preferences.

$$P_{a1,1} = \frac{1}{13} = 0.0769$$

Then the result of $P_{a1,1}$ to $P_{a6,13}$ is 0.0769

The next process performs a theoretical evaluation matrix calculation using equation (7), the following is the calculation results are.

$$T_{p1,1;1,13} = P_{a1,1;1,13} * W_1$$
$$T_{p1,1;1,13} = 0.0769 * 0{,}1674 = 0.0129$$
$$T_{p2,1;2,13} = P_{a1,1;1,13} * W_2$$
$$T_{p2,1;2,13} = 0.0769 * 0{,}1674 = 0.0129$$
$$T_{p3,1;3,13} = P_{a1,1;1,13} * W_3$$
$$T_{p3,1;3,13} = 0.0769 * 0{,}1666 = 0.0128$$
$$T_{p4,1;4,13} = P_{a1,1;1,13} * W_4$$
$$T_{p4,1;4,13} = 0.0769 * 0{,}1674 = 0.0129$$
$$T_{p5,1;5,13} = P_{a1,1;1,13} * W_5$$
$$T_{p5,1;5,13} = 0.0769 * 0{,}1636 = 0.0127$$
$$T_{p6,1;6,13} = P_{a1,1;1,13} * W_6$$
$$T_{p6,1;6,13} = 0.0769 * 0{,}1674 = 0.0129$$

The next process performs a realistic evaluation matrix calculation, using equation (8), the following is the calculation results.

$$t_{r1,1} = t_{p1,1}\left(\frac{x_{1,1} - x_{1;13}^{-}}{x_{1;13}^{+} - x_{1;13}^{-}}\right)$$
$$t_{r1,1} = (0.0129)\left(\frac{90 - 90}{96 - 90}\right) = 0$$

The overall result of the calculation of the realistic evaluation matrix is as in table 4.

Table 4. Overall Result of Realistic Evaluation Matrix

Employee Name	Criteria					
	Technical Skills	Consistency	Teamwork Ability	Responsibility	Creativeness	Communication
Employee ARD	0	0.0129	0.0103	0.0077	0.0094	0.0000
Employee YHS	0.0064	0.0043	0.0000	0.0103	0.0063	0.0086
Employee BS	0.0043	0.0021	0.0051	0.0077	0	0
Employee KRS	0.0086	0.0000	0.0077	0.0129	0.0094	0.0043
Employee JR	0.0107	0.0064	0.0128	0.0103	0.0126	0.0107
Employee TSH	0.0064	0.0086	0.0077	0.0077	0.0063	0.0021
Employee MGB	0.0021	0.0043	0	0.0052	0.0031	0.0086
Employee RHA	0	0.0086	0.0026	0.0000	0.0126	0.0107
Employee WS	0.0064	0.0086	0.0051	0.0026	0.0094	0.0129
Employee AJL	0.0086	0.0129	0.0026	0.0052	0.0126	0.0064
Employee YP	0.0129	0.0107	0	0.0077	0.0126	0.0086
Employee MZ	0.0107	0.0064	0	0	0.0094	0.0064
Employee MAS	0.0064	0.0000	0.0051	0.0077	0.0031	0.0043

The next stage calculates the total gap using equation (10), the following is the result of calculating the total gap.

$$G_{1,1} = t_{p1,1} - t_{r1,1} = 0.0129 - 0 = 0.0129$$

The overall result of the total gap matrix calculation is as in table 5.

Table 5. Overall Result of Total Gap Matrix

Employee Name	Criteria					
	Technical Skills	Consistency	Teamwork Ability	Responsibility	Creativeness	Communication
Employee ARD	0.0129	0	0.0026	0.0052	0.0031	0.0129
Employee YHS	0.0064	0.0086	0.0128	0.0026	0.0063	0.0043
Employee BS	0.0086	0.0107	0.0077	0.0052	0.0126	0.0129
Employee KRS	0.0043	0.0129	0.0051	0	0.0031	0.0086
Employee JR	0.0021	0.0064	0	0.0026	0	0.0021
Employee TSH	0.0064	0.0043	0.0051	0.0052	0.0063	0.0107
Employee MGB	0.0107	0.0086	0.0128	0.0077	0.0094	0.0043
Employee RHA	0.0129	0.0043	0.0103	0.0129	0	0.0021
Employee WS	0.0064	0.0043	0.0077	0.0103	0.0031	0
Employee AJL	0.0043	0	0.0103	0.0077	0	0.0064
Employee YP	0	0.0021	0.0128	0.0052	0	0.0043
Employee MZ	0.0021	0.0064	0.0128	0.0129	0.0031	0.0064
Employee MAS	0.0064	0.0129	0.0077	0.0052	0.0094	0.0086

The last stage in the MAIRCA method is to calculate the final value of a function using equation (11), the following is the result of calculating the final value.

$$Q_i = G_{1,1} + G_{2,1} + G_{3,1} + G_{4,1} + G_{5,1} + G_{6,1}$$
$$Q_i = 0.0129 + 0 + 0.0026 + 0.0052 + 0.0031 + 0.0129$$
$$Q_i = 0.0366$$

The overall result of the final value calculation is as in table 6.

Table 6. Overall Result of Final Value

Employee Name	Final Value
Employee ARD	0.0366
Employee YHS	0.0410
Employee BS	0.0576
Employee KRS	0.0340
Employee JR	0.0133
Employee TSH	0.0380
Employee MGB	0.0536
Employee RHA	0.0425
Employee WS	0.0319
Employee AJL	0.0287
Employee YP	0.0244
Employee MZ	0.0439
Employee MAS	0.0502

The results of table 6 are the final results of the assessment of production employees using the MAIRCA method, the results of ranking the best production employees as shown in table 7.

Table 7. Best Production Employee Ranking Results

Employee Name	Rank
Employee JR	1
Employee YP	2
Employee AJL	3
Employee WS	4
Employee KRS	5
Employee ARD	6
Employee TSH	7
Employee YHS	8
Employee RHA	9
Employee MZ	10
Employee MAS	11
Employee MGB	12
Employee BS	13

The ranking results of table 7 are the final results of the ranking of the best production employees obtained by JR employees getting rank 1st, YP employees getting rank 2nd, and AJL employees getting rank 3rd.

4. DISCUSSION

In an effort to improve the efficiency of evaluation of production employees, the combined use of LOPCOW and MAIRCA has emerged as a promising approach. This approach offers a holistic framework for assessing production employees by considering changes in the relative performance of various metrics, while also considering the organization's subjective preferences towards specific criteria. By integrating objective and subjective aspects in the evaluation process, this approach has the potential to result in a more accurate and fair selection of production employees, allowing companies to identify and reward significant individual contributions to productivity and production quality more effectively.

Research on the selection of the best employees not only improves the efficiency of the selection process, but also ensures optimal placement of human resources to achieve the strategic goals of the company[19], [20]. By using DSS, managers can make more informed and efficient decisions in selecting the best employees, which will result in increased productivity and quality in a results-oriented production environment. The use of decision support systems also makes it possible to minimize subjective bias in the decision-making process. Based on structured data and algorithms, DSS can help in assessing employee performance objectively based on predetermined parameters.

The LOPCOW and MAIRCA approaches provide a solid methodological foundation for more closely measuring the performance of production employees, taking into account not only quantitative results but also quality, innovation, and relative contributions to the company's strategic objectives. In addition, the use of logarithmic percentage changes as objective weight drivers allows for more dynamic adjustments to changes in the work environment, while ideal-real comparative analysis provides a more holistic view of how employees perform relative to desired standards. The combination of these two approaches can be an effective tool for management in optimizing the placement of human resources and improving productivity and quality in a competitive production environment.

The use of a combination of LOPCOW and MAIRCA methods in determining the best production employees can produce highly informative and effective results. With LOPCOW, companies can account for logarithmic changes in employee performance over time, objectively identifying growth or decline in their performance. Meanwhile, MAIRCA allows companies to compare the ideal attributes desired from an employee with the actual attributes possessed by prospective employees, providing in-depth insight into their suitability to the specific needs of the production position. By using these two methods together, companies can make more informed recruitment decisions, ensure the placement of employees best suited to their production goals and needs, and enable sustainable development and growth within production teams.

5. CONCLUSION

The purpose of the combination of LOPCOW and MAIRCA in determining the best production employees is to provide a holistic and adaptive framework in the employee performance evaluation process. Combining these two methods results in a more comprehensive and accurate understanding of production employee performance, thus enabling managers to identify the most effective employees and provide rewards or development accordingly. The final results of the ranking of the best production employees obtained by JR employees get 1st place, YP employees get 2nd place, and AJL employees get 3rd place. The LOPCOW and MAIRCA approaches provide a solid methodological foundation for more closely measuring the performance of production employees, taking into account not only quantitative results but also quality, innovation, and relative contributions to the company's strategic objectives. In addition, the use of logarithmic percentage changes as objective weight drivers allows for more dynamic adjustments to changes in the work environment, while ideal-real comparative analysis provides a more holistic view of how employees perform relative to desired standards. The combination of these two approaches can be an effective tool for management in optimizing the placement of human resources and improving productivity and quality in a competitive production environment.

REFERENCES

[1] A. T. Priandika and A. D. Wahyudi, “Decision Support System for Determining Exemplary Employees Using the Evaluation Method based on Distance from Average Solution (EDAS),” *J. Ilm. Comput. Sci.*, vol. 1, no. 1, pp. 17–30, 2022, doi: 10.58602/jics.v1i1.3.

[2] S. Harjanto, S. Setiyowati, and R. T. Vulandari, “Application of Analytic Hierarchy Process and Weighted Product Methods in Determining the Best Employees,” *Indones. J. Appl. Stat.*, vol. 4, no. 2, p. 103, Nov. 2021, doi: 10.13057/ijas.v4i2.44059.

[3] D. C. P. Sinaga, P. Marpaung, and B. Sianipar, “The Application of the MOORA Method in the Decision Making System for the Selection of the Best Employees at CV. Lautan Mas,” *IJISTECH (International J. Inf. Syst. Technol.*, vol. 5, no. 2, pp. 233–239, 2021.

[4] A. Lia Hananto, B. Priyatna, A. Fauzi, A. Yuniar Rahman, Y. Pangestika, and Tukino, “Analysis of the Best Employee Selection Decision Support System Using Analytical Hierarchy Process (AHP),” *J. Phys. Conf. Ser.*, vol. 1908, no. 1, p. 012023, Jun. 2021, doi: 10.1088/1742-6596/1908/1/012023.

[5] H. Sulistiani, Setiawansyah, P. Palupiningsih, F. Hamidy, P. L. Sari, and Y. Khairunnisa, "Employee Performance Evaluation Using Multi-Attribute Utility Theory (MAUT) with PIPRECIA-S Weighting: A Case Study in Education Institution," in *2023 International Conference on Informatics, Multimedia, Cyber and Informations System (ICIMCIS)*, 2023, pp. 369–373. doi: 10.1109/ICIMCIS60089.2023.10349017.

[6] P. Rani, R. Kumar, N. M. O. S. Ahmed, and A. Jain, "A decision support system for heart disease prediction based upon machine learning," *J. Reliab. Intell. Environ.*, vol. 7, no. 3, pp. 263–275, Sep. 2021, doi: 10.1007/s40860-021-00133-6.

[7] Setiawansyah, A. A. Aldino, P. Palupiningsih, G. F. Laxmi, E. D. Mega, and I. Septiana, "Determining Best Graduates Using TOPSIS with Surrogate Weighting Procedures Approach," in *2023 International Conference on Networking, Electrical Engineering, Computer Science, and Technology (IConNECT)*, 2023, pp. 60–64. doi: 10.1109/IConNECT56593.2023.10327119.

[8] K. Govindan, H. Mina, and B. Alavi, "A decision support system for demand management in healthcare supply chains considering the epidemic outbreaks: A case study of coronavirus disease 2019 (COVID-19)," *Transp. Res. Part E Logist. Transp. Rev.*, vol. 138, p. 101967, Jun. 2020, doi: 10.1016/j.tre.2020.101967.

[9] V. I. Ivanoti, Megananda Hervita P., Gandung Triyono, and Dyah Puji Utami, "DECISION SUPPORT SYSTEM FOR PREDICTING EMPLOYEE LEAVE USING THE LIGHT GRADIENT BOOSTING MACHINE (LIGHTGBM) AND K-MEANS ALGORITHM," *J. Tek. Inform.*, vol. 4, no. 3, pp. 657–667, Jun. 2023, doi: 10.52436/1.jutif.2023.4.3.1084.

[10] S. Sukamto, A. Fitriansyah, and R. A. Nugrah, "DECISION SUPPORT SYSTEM FOR SELECTION OF PESTICIDES FOR CHILI PLANTS USING THE MABAC METHOD," *J. Tek. Inform.*, vol. 4, no. 5, pp. 1109–1118, Oct. 2023, doi: 10.52436/1.jutif.2023.4.5.977.

[11] S. Riahi, A. Bahroudi, M. Abedi, and S. Aslani, "Hybrid outranking of geospatial data: Multi attributive ideal-real comparative analysis and combined compromise solution," *Geochemistry*, vol. 82, no. 3, p. 125898, Sep. 2022, doi: 10.1016/j.chemer.2022.125898.

[12] S. Hadian, E. Shahiri Tabarestani, and Q. B. Pham, "Multi attributive ideal-real comparative analysis (MAIRCA) method for evaluating flood susceptibility in a temperate Mediterranean climate," *Hydrol. Sci. J.*, vol. 67, no. 3, pp. 401–418, Feb. 2022, doi: 10.1080/02626667.2022.2027949.

[13] G. Zhu, J. Ma, and J. Hu, "Evaluating biological inspiration for biologically inspired design: An integrated DEMATEL-MAIRCA based on fuzzy rough numbers," *Int. J. Intell. Syst.*, vol. 36, no. 10, pp. 6032–6065, Oct. 2021, doi: 10.1002/int.22541.

[14] M. C. Joe Anand, K. Kalaiarasi, N. Martin, B. Ranjitha, S. S. Priyadharshini, and M. Tiwari, "Fuzzy C-Means Clustering with MAIRCA - MCDM Method in Classifying Feasible Logistic Suppliers of Electrical Products," in *2023 First International Conference on Cyber Physical Systems, Power Electronics and Electric Vehicles (ICPEEV)*, Sep. 2023, pp. 1–7. doi: 10.1109/ICPEEV58650.2023.10391835.

[15] T. Van Dua, D. Van Duc, N. C. Bao, and D. D. Trung, "Integration of objective weighting methods for criteria and MCDM methods: application in material selection," *EUREKA Phys. Eng.*, no. 2, pp. 131–148, Mar. 2024, doi: 10.21303/2461-4262.2024.003171.

[16] S. Setiawansyah and A. Sulistiyawati, "Penerapan Metode Logarithmic Percentage Change-Driven Objective Weighting dan Multi-Attribute Utility Theory dalam Penerimaan Guru Bahasa Inggris," *J. Artif. Intell. Technol. Inf.*, vol. 2, no. 2, pp. 62–75, 2024, doi: 10.58602/jaiti.v2i2.119.

[17] S. Chatterjee and S. Chakraborty, "A study on the effects of objective weighting methods on TOPSIS-based parametric optimization of non-traditional machining processes," *Decis. Anal. J.*, vol. 11, p. 100451, Jun. 2024, doi: 10.1016/j.dajour.2024.100451.

[18] S. Korucuk, A. Aytekin, Ö. Görçün, V. Simic, and Ö. Faruk Görçün, "Warehouse site selection for humanitarian relief organizations using an interval-valued fermatean fuzzy LOPCOW-RAFSI model," *Comput. Ind. Eng.*, vol. 192, p. 110160, Jun. 2024, doi: 10.1016/j.cie.2024.110160.

[19] Y. Alkhalifi, M. R. Firdaus, D. Ismunandar, and I. Herliawan, "Analisis Perbandingan Metode SMART Dan MOORA Pada Pemilihan Karyawan Terbaik Klinik Kecantikan," *KLIK Kaji. Ilm. Inform. dan Komput.*, vol. 4, no. 4, pp. 1972–1982, 2024, doi: 10.30865/klik.v4i4.1620.

[20] V. H. Saputra and S. Setiawansyah, "Penerapan Metode SWARA dan Grey Relational Analysis Dalam Pemilihan Karyawan Terbaik," *J. Artif. Intell. Technol.*

Inf., vol. 2, no. 1, pp. 51–61, 2024, doi: 10.58602/jaiti.v2i1.107.