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Artificial Intelligence in Decision Support Systems for Job Promotions

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ABSTRACT

Educational Personnel have an important role in supporting the success of education. Educational Personnel have a role in carrying out administration, management, development, supervision, and technical services to support the educational process in educational units. The declining performance of education personnel at the junior high school level in West Jakarta, particularly due to the ineffectiveness of the promotion system, demonstrates the need for an objective, data-driven assessment mechanism. Education personnel play a crucial role in the administration, management, and technical services of education, thus a transparent promotion system is essential. This study aims to develop a promotion recommendation model using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method integrated with artificial intelligence (AI) to improve the accuracy, objectivity, and efficiency of the decision-making process. The study involved 112 civil servant education personnel respondents from 53 junior high schools in eight sub-districts in West Jakarta, selected through multistage random sampling. Analysis was conducted using five main criteria: educational background, performance, technical skills, length of service, and work motivation. AI was used to automate normalization, weighting, and pattern analysis. The results showed that TOPSIS was able to produce an objective candidate ranking, with respondent R099 having the highest Closeness Coefficient (≈ 0.7704), making him the most suitable for promotion. The integration of TOPSIS and AI has been proven to increase analysis speed, reduce human bias, and provide more consistent and accurate recommendations for education staff promotion.

1. INTRODUCTION

Laws No. 14 of 2005 and No. 20 of 2003 concerning the National Education System in Indonesia state that educational personnel need to develop themselves in carrying out their professional duties. Educational personnel have duties and functions in carrying out administration, management, development, supervision, and technical services to support the educational process in educational units. Educational personnel competencies include personality competencies, social competencies, and professional competencies to support the educational process in educational units.

Based on the Basic Education Data of the Directorate General of Early Childhood Education, Elementary Education and Secondary Education of the Ministry of Education, Culture, Research and Technology, the number of Education Personnel in Indonesia up to the odd period of 2024/2025 is 1,923 Data on Education Personnel at the Junior High School Level in West Jakarta City.

Educational personnel are required to be able to play an active role in order to improve the growth and development of the quality of the profession they are pursuing with the hope of gaining knowledge and new things based on Basri Research (Nasrun, Muh; Basri, Basri; Jam'an, 2022). Research Nirda that Educational personnel have a key role in ensuring the quality of education (Julianda, Nirda; Sabrina, Pasaribu, 2024). Research Budianto (Budianto & Setiadi, 2024) states that TOPSIS is used to obtain accurate results in the employee recruitment decision-making process. Another study states Ciardiello (Ciardiello & Genovese, 2023) that TOPSIS when combined with the Manhattan distance, produces a ranking that is very similar to the ranking produced by SAW and shows a level of similarity with experimental results confirming that the ranking produced by the TOPSIS method is closer to the SAW ranking when similar formal properties are met. Research Huang (Do et al., 2024) in Vietnamese Higher Education using TOPSIS can be used to improve the quality of the country's workforce and encourage economic progress as one of the institutional activities and a crucial component in human resource management in higher education institutions.

Research (Jacob Fernandes França et al., 2023) in Portugal confirms that the application of Artificial Intelligence (AI) in Human Resource Management (HRM) has great potential to transform human resource management practices. Research (Nugraha, 2024) states that this research shows that the application of the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method is an effective, systematic, and objective approach in the process of assessing employee performance in a transparent and accountable manner. Research (Fajar Agung Nugroho, 2025) using AHP and TOPIS in the developed SPK (Study Planning System) can simplify and accelerate the assessment process, increase accuracy, and minimize errors in decision-making. Therefore, this system can be an effective solution to support schools in determining the best teaching staff in a more fair and measurable manner, and has the potential to improve the quality of education at Al-Amanah Vocational High School.

Research (Situmeang & Fakhriza, 2024) demonstrates that integrating the Analytical Network Process (ANP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods can produce a more objective, accurate, and transparent employee performance evaluation system than traditional assessment methods. By weighting criteria using ANP and ranking performance using TOPSIS, assessor subjectivity can be significantly minimized. Research (Kurniawan et al., 2025) shows that a machine learning-based approach can provide more objective, transparent, and measurable promotion decisions, potentially reducing subjectivity in HR management. The developed model can serve as a foundation for organizations to build fairer, evidence-based employee promotion decision support systems. The application of the TOPSIS method for the promotion recommendation of elementary school principals in Bogor Regency based on (Sopyan & Miftahudin, 2024) research shows that the application of the TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution) has proven to be an appropriate and effective approach to addressing this problem. This method is able to provide a clear ranking of alternatives based on the proximity of each candidate's value to the ideal solution, so that promotion decisions can be made in a more structured, objective, and fair manner. Research Alawiah (Putri et al., 2021) uses the TOPSIS method, which is a multi-criteria method used to find the most ideal preference value in the decision-making process and obtains a score of 8.35 for Educational Unit Readiness, which means that the use of the Merdeka Mengajar Platform in its implementation requires the readiness

of educational units consisting of the Principal, Learning Committee and Teachers. Research (Rinny, 2022) entitled *The Influence of Compensation, Job Promotion, and Job Satisfaction on Employee Performance of Mercubuana University* resulted in findings that (6) obtained values ($\beta = 0.0370$ $p < 0.005$) meaning that there is a positive influence of job satisfaction and job promotion in higher education which can improve employee performance. In other research (Rahardja et al., 2020) (Utomo & Budiman, 2021) (Nuraini et al., 2022) it is stated that TOPSIS can be used to solve job promotion problems efficiently

In previous research, multicriteria problems can be solved using the TOPSIS method (Kumbum et al., 2020) (Pratiwi Sitanggang et al., 2025) (Denih et al., 2025) (An & Wang, 2025) (Khotimah et al., 2024) (Amudha et al., 2021) (Martins Queiroz et al., 2025) (Seifi et al., 2025). In the world of education, the success of education in schools is not only influenced by teachers, but also depends heavily on the performance of supporting educational staff who carry out administrative, technical, and additional service tasks. To maintain motivation and improve professionalism, it is important to provide an objective and fair promotion system for support staff. However, in reality, the promotion process is often still based on subjective considerations or does not fully utilize an approach based on accurate data and performance. Therefore, a structured and transparent decision-making method is needed, one of which is the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method to evaluate the promotion eligibility of educators based on various relevant criteria.

Previous studies have shown that technologies such as Artificial Intelligence (AI), machine learning, and multi-criteria decision-making methods like TOPSIS, AHP, ANP, and Decision Support Systems (DSS) can improve objectivity, accuracy, and transparency in human resource management processes, including performance evaluation and job promotions. However, several research gaps remain unaddressed. No study has compared the effectiveness of TOPSIS with other methods (AHP, ANP, machine learning, and artificial intelligence) in the context of job promotions for educational staff. Therefore, a structured and transparent decision-making method is needed, one of which is the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method to evaluate the feasibility of educator promotion based on various relevant criteria.

Junior high school education is also a crucial stage in preparing students for the future and plays a vital role in shaping individuals and preparing them for higher education and adult life. Based on data from the 2024 Education Report, it shows that there has been a decline in the performance of educational staff caused by the biggest factor being the lack of job promotions. In the field of Education, Educational Personnel have a crucial role in supporting the educational process. Educational Personnel carry out administration, management, development, supervision, and technical services to support the educational process in educational units. The Educational Personnel referred to in this study are Administrative, namely Educational Personnel who are tasked with the administrative field of educational units. The administrative areas managed include; Correspondence and archiving administration, Personnel Administration, Student Administration, Financial Administration, Inventory Administration and others.

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2. RESEARCH METHODS

The population in this study was the Civil Service Administrative Staff in the sub-districts of Cengkareng, Kalideres, Tambora, Tamansari, Grogol Petamburan, Palmerah, Kebon Jeruk, and Kembangan in West Jakarta. There are 53 schools within the West Jakarta City Administration. The sampling method used was multistage random sampling. Multistage random sampling is a sampling technique conducted on a population with stratified and clustered characteristics. Subsequently, samples are drawn from smaller clusters until the desired sample unit is reached. Random selection is carried out not only within the cluster but also within the selected cluster, considering the largest number of educational staff in Cengkareng, Kalideres, Grogol Petamburan, and Kebon Jeruk.

The research instrument used a Likert Scale with five response options: strongly agree, agree, unsure, disagree, and strongly disagree. Respondents were educational staff. The research stages using TOPSIS begin with creating a normalized decision matrix, which is a stage in the TOPSIS method that requires a performance rating for each alternative A_i on each normalized criterion C_i .

The TOPSIS method begins with the formation of a normalized decision matrix, which aims to transform the original data into a comparable scale by eliminating differences in units among criteria. Each value represents the performance of an alternative on a particular criterion after normalization, allowing fair comparison across all criteria. The normalized matrix is then multiplied by the weight of each criterion to obtain the weighted normalized matrix. This step incorporates the relative importance of each criterion into the evaluation, so criteria with higher weights have a greater influence on the decision-making process.

Next, the positive ideal solution and the negative ideal solution are determined. The positive ideal solution represents the best possible condition for each criterion, while the negative ideal solution represents the worst condition. These two solutions serve as benchmarks to assess the quality of each alternative. After that, the distance of each alternative from both ideal solutions is calculated using the Euclidean distance. An alternative is considered better if it is closer to the positive ideal solution and farther from the negative ideal solution. Finally, the preference value is computed to measure the relative closeness of each alternative to the ideal solution. This value, which ranges between 0 and 1, is used to rank the alternatives, where a higher value indicates a more preferred alternative.

3. RESULTS AND DISCUSSION

Based on educational qualifications, the majority of education personnel in DKI Jakarta province have graduated with less than a Diploma (D3) degree (49%). The remaining 31% have a Bachelor's degree (S1), and the remaining 20% have other educational qualifications. One way to assess the performance of educational staff is through the annual Education Report Card. Data from the 2024 Education Report Card,

specifically for junior high school teachers (PTK) in West Jakarta, indicates a decline in scores compared to the previous year. One component of this is ineffective job promotions.

Based on this, the research criteria were determined, namely C1 for Educational Background, 2. C2 for Educational Personnel Performance, C3 for Technical Skills, C4 for Length of Service, and C5 for Work Motivation. These five criteria were chosen because they are the most relevant indicators in assessing educational staffs promotion eligibility. The highest weighting was given to C1 (education) and C2/C3 (performance and technical skills), indicating that formal competencies and operational capabilities are considered the most important determinants of promotion readiness. Criteria C4 and C5, although weighted less heavily, still play a crucial role in ensuring the individual's continued employment and commitment to the institution. AI integration helps validate these weightings through automated weighting, pattern recognition, and scenario simulations that detect patterns in the contribution of each criterion to candidate performance.

This study aims to develop a promotion recommendation model for education personnel using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method, integrated with Artificial Intelligence (AI) to process and support data analysis. The results show that the TOPSIS method is capable of objectively ranking alternative education personnel based on the proximity of each candidate's score to the ideal solution. Integration with AI helps accelerate the analysis process, minimize human error, and produce recommendations that are more adaptive to large amounts of data.

The results show that combining the TOPSIS method with the support of Artificial Intelligence (AI) analysis can provide more objective, measurable, and consistent promotion recommendations for education personnel based on five main criteria: C1 Educational Background, C2 Education Personnel Performance, C3 Technical Skills, C4 Length of Service, and C5 Work Motivation. AI is used in the data processing, normalization, and pattern analysis processes, resulting in more accurate TOPSIS calculations and a freedom from assessor subjectivity. The initial stage in TOPSIS research is determining the criteria weights for each alternative to be calculated (Alawiah¹, Enok Tuti; Mardewi, 2023) . The following are the criteria weight values. Based on the research conducted, the following are the criteria weight values which is presented in the following table 1.

Table 1. Criteria Weighting Value Results

C1	C2	C3	C4	C5
5	4	4	3	3

The population in this study was civil servant administrative staff in the sub-districts of Cengkareng, Kalideres, Tambora, Tamansari, Grogol Petamburan, Palmerah, Kebon Jeruk, and Kembangan in West Jakarta. There are 53 schools within the West Jakarta City Government, with a sample size of 231 people. Sampling was carried out using a multistage random sampling technique, namely sampling carried out on a population that has stratification and grouping characteristics. To determine the sample size of the population, a 5% margin of error was used using the Slovin formula (Supardi, 2013). Based on this method, the population results were 112 respondents.

Artificial intelligence helps classify education level, field of study suitability, and the relationship between academic competencies and job requirements. The analysis shows that candidates with higher and

more relevant education levels receive higher preference scores. Data shows that 78% of candidates with a bachelor's or master's degree in educational administration and management contributed the highest to the final TOPSIS score. This demonstrates that a strong educational background significantly supports promotion eligibility.

Based on the research on respondents, the values used were calculated using TOPSIS. The important stage is calculating the normalized decision matrix by calculating the weights of each criterion C1, C2, C3, C4, and C5. Then, the value is calculated using the results of the criteria weights that have been obtained since the beginning of the study. Based on the data obtained above, the final stage is to determine the matrix of positive ideal solutions and negative ideal solutions. The most important stage in TOPSIS is knowing the ideal distance based on the criteria obtained, this distance is important to know so that the research obtains valid results. The results of the research on the distance between negative and positive ideal solutions and their preference values are presented in the following table 2.

Table 2. Negative and Positive Ideal Solution Distance and Preference Values

Criteria	Weight	Normalized	wj
C1	0.29	0.78	0.2262
C2	0.23	0.85	0.1955
C3	0.23	0.72	0.1656
C4	0.17	0.60	0.1020
C5	0.17	0.70	0.1190

The weight (W_j) comes from Table 1 (5, 4, 4, 3, 3) which is normalized so that the total = 1. The Average Normalized Value (R_j) is the average value of the normalized results per criterion for all respondents. The Preference Value = $W_j \times R_j$ shows how much each criterion contributes to the formation of the ideal solution.

The results of the study show that C1 (Education) has the highest preference value (0.2262), meaning this criterion has the most influence on determining the promotion eligibility of education personnel. C2 (Performance) is in second place (0.1955), indicating that daily work competency is the dominant factor. C3 (Technical Skills) also has a large influence (0.1656), illustrating the need to improve mastery of technology and administrative operations. C4 (Length of Work) has a lower influence (0.1020), indicating that length of service does not always determine promotion eligibility. C5 (Work Motivation) has a moderate contribution (0.1190).

The TOPSIS calculation produces two important parameters, namely the Positive Ideal Solution (A^+) and the Negative Ideal Solution (A^-) for each criterion. A^+ describes the best expected condition for each criterion. A^- describes the worst condition of the existing alternatives. The results of data processing show that the highest A^+ value is in the Performance (C2) and Educational Background (C1) criteria, which indicates the importance of both criteria in determining the ideal educational staff. Conversely, the highest A^- value is found in the Length of Service (C4) criterion, indicating a fairly varied difference in the level of service period.

The D^+ and D^- distance calculations indicate how close each respondent is to the ideal condition. A smaller D^+ indicates that the alternative is closer to the positive ideal. A larger D^- indicates that the alternative is further away from the negative ideal.

The results showed that respondent R099 had the smallest D^+ and the largest D^- value, indicating that this respondent is the educational staff member who most closely matches the profile of an ideal candidate for promotion. The preference value or Closeness Coefficient (CC) indicates the level of closeness of an alternative to the ideal solution. The CC value ranges from 0 to 1, with $CC > 0.70 \rightarrow$ highly feasible to promote, $0.50 \leq CC \leq 0.70 \rightarrow$ feasible to consider, and $CC < 0.50 \rightarrow$ requiring further development. Respondent R099 is the most ideal candidate based on all criteria considered. This finding is reinforced by the consistent D^+ and D^- distances indicating maximum closeness to the positive ideal solution.

Through a process of normalization, weighting, and distance calculation to positive and negative ideal solutions, TOPSIS generates a closeness coefficient (CC) for each respondent. The CC value indicates how close an education worker is to the ideal profile based on the criteria. Respondents with the highest CC value—for example, R099 with a $CC \approx 0.7704$ —indicate that the candidate possesses the most optimal combination of criteria for promotion. This ranking aligns with the basic concept of TOPSIS: the best alternative is the one closest to the ideal value and furthest from the non-ideal value. In the context of job promotions, this means that promotion decisions can be made in a measured and consistent manner.

The integration of AI into the TOPSIS calculation process offers several advantages: the speed with which artificial intelligence automatically processes data from 112 respondents, reduces the potential for manual errors, ensures consistent, bias-free normalization, weighting, distance calculations, and CC scores. The model can be developed to predict the best candidates in real time, and is capable of handling larger amounts of educational staff promotion data in subsequent implementations.

The findings of this study align with Fernando's research (Jacob Fernandes França et al., 2023) on the effectiveness of AI in transforming HRM toward greater objectivity and accuracy. Furthermore, the study also supports the findings of (Nugraha, 2024) and (Fajar Agung Nugroho, 2025) that TOPSIS and multi-criteria decision-making methods can improve accountability and transparency in the selection and promotion process. This study fills the research gap related to the integration of multi-criteria methods (TOPSIS) with AI analytical capabilities specifically in the context of educational staff job promotions, which has not been widely explored in previous research.

4. CONCLUSIONS AND RECOMMENDATIONS

Based on readily accessible previous research, research on decision support systems for promotions using artificial intelligence has never been conducted in educational institutions. TOPSIS uses multi-criteria alternatives to aid decision-making, generating preference scores with the help of artificial intelligence to assist stakeholders in the decision-making process more quickly and accurately. Analysis shows that a TOPSIS and AI-based promotion system can increase the objectivity of the promotion process, provide transparency in scores for each criterion, minimize subjective bias on the part of leaders, support faster decision-making, and produce consistent recommendations even when the candidate pool is large. This is particularly relevant for educational institutions, which require a fair and data-driven assessment process to determine which educational personnel are ready for higher-level positions. Other research on decision support systems has not comprehensively addressed research in the education sector, making this a potential research opportunity.

Research recommendations for educational institutions include encouraging the adoption of TOPSIS and AI-based decision support systems as standard tools for promotion assessments to ensure fairness, transparency, and accountability. School administrators should prioritize improving educational qualifications, performance management systems, and technical skills development, as these criteria have the greatest impact on promotion outcomes. Continuous training programs should be implemented to improve the digital and administrative competencies of education personnel. Future research should compare the effectiveness of TOPSIS with other methods such as AHP, ANP, machine learning, and pure AI models to determine the most optimal approach for a promotion system in education. Further studies could expand the model by incorporating additional criteria such as leadership skills, innovation, and adaptability to technological change.

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