

Optimisation of TNI Personnel Postings Using an Android-Based AHP System

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Abstract - Efficiency and objectivity in the placement of Indonesian National Armed Forces (TNI) personnel are crucial aspects of military human resource management. This study aims to develop an Android-based personnel placement recommendation system using the Analytic Hierarchy Process (AHP) method to support faster, more accurate, and consistent decision-making. The study population comprised 300 active TNI personnel, with a purposive sample of 120 personnel possessing complete data on rank, length of service, education, competency, and disciplinary records. Data were collected from internal documents, personnel records, performance reports, and information from the TNI Air Force Planning and Budget Staff. The results indicate that rank and length of service are the dominant criteria, while education, competency, and disciplinary records provide additional contribution. The system generates objective, consistent, and user-friendly recommendations, validated through functionality and user acceptance testing. The findings demonstrate that implementing AHP in an Android-based recommendation system enhances efficiency, transparency, and objectivity in personnel placement and has potential for adoption in other TNI units or similar military organizations.

Keywords: Analytic Hierarchy Process, TNI personnel placement, recommendation system

INTRODUCTION

Efficiency in decision-making is a crucial factor in the success of a military organisation, where the accuracy of decisions has a direct impact on operational readiness and national security (Grier, 2012; Herrera, 2020; Junor, 2017; Shortland et al., 2018). Indonesia has one of the largest military forces in Southeast Asia, with active personnel totalling 404,500 in 2024, comprising 300,400 personnel in the Indonesian Army, 74,000 in the Indonesian Navy, and 30,100 in the Indonesian Air Force (International Institute for Strategic Studies, 2024). Posting and promotion within the TNI structure are crucial aspects in determining organisational effectiveness, as the alignment of competencies, experience, and position influences individual performance and the achievement of the organisation's overall objectives (Gati & Utomo, 2024; Irwanto et al., 2026; Kristof-Brown et al., 2005; Sørli et al., 2020).

In practice, inappropriate job placements still occur and result in low motivation and job satisfaction among personnel, which in turn can reduce the operational effectiveness of the TNI (Dagher et al., 2024; Gati & Utomo, 2024; Irwanto et al., 2026; Kristof-Brown et al., 2005). Subjectivity, a lack of transparency, and the slow pace of the promotion process are the main causes of this phenomenon (García-Izquierdo et al., 2012; Panigati et al., 2025; Rubin, 2009). Therefore, a systematic, data-driven, and objective assessment mechanism is required to support decision-making regarding post placement (Campion et al., 2011; Irwanto et al., 2026; Rodriguez et al., 2002).

The use of information technology is expected to

provide a solution for enhancing the objectivity and efficiency of this process (Lepri et al., 2018; Tambe et al., 2019; Tursunbayeva et al., 2022). Data-driven recommendation systems enable faster, more consistent and transparent decision-making, whilst reducing human bias in recruitment, although algorithmic bias must also be managed through transparency and governance mechanisms (Chen, 2023; Köchling & Wehner, 2020; Tambe et al., 2019). Previous research indicates that multi-criteria decision-making methods such as the Analytic Hierarchy Process (AHP) and TOPSIS have proven effective in contexts involving complex and interrelated criteria (C.-L. Hwang & Yoon, 1981; Kelemenis & Askounis, 2010; Kusumawardani & Agintiara, 2015; Saaty, 1980; Salehzadeh & Ziaeiian, 2024; Widiarta et al., 2018).

The AHP method was selected for this study due to its ability to evaluate various interrelated criteria, such as rank, length of service, education, performance, and discipline among TNI personnel (Gati & Utomo, 2024; Irwanto et al., 2026; Saaty, 1980, 1990). Through a mechanism of pairwise comparisons and weight calculations, AHP provides a systematic framework for producing consistent and justifiable decisions (Ishizaka & Labib, 2011; Saaty, 1990; Salehzadeh & Ziaeiian, 2024). The advantage of AHP over other methods, such as TOPSIS, VIKOR, and SAW, lies in its ability to evaluate the consistency of assessments and comprehensively handle multi-criteria complexity (Ishizaka & Labib, 2011; Kelemenis & Askounis, 2010; Widiarta et al., 2018). The contribution of this research lies in the development of an Android-based recommendation



system for the placement of TNI personnel that utilises the Analytic Hierarchy Process (AHP) (Ishizaka & Labib, 2011; Saaty, 1990; Salehzadeh & Ziaean, 2024). This system takes into account five main criteria—rank, length of service, education, performance appraisal, and discipline—to generate recommendations that are objective, practical, and implementable in the field (Gati & Utomo, 2024; Irwanto et al., 2026; Little, 1970; Setyaningrum et al., 2023; Widianta et al., 2018). Through this approach, the research not only offers practical solutions for decision-making within the military environment but also introduces innovation and renewal in the application of technology-based multi-criteria decision-making methods, thereby making a significant contribution to the literature and practice of human resource management within military institutions.

RESEARCH METHOD

2.1. Military Human Resource Management

Human resource management (HRM) within military organisations plays a strategic role in determining the operational effectiveness and readiness of the institution (Crosby et al., 2025; Silva, 2025; Zelenyi, 2025). The appropriate placement of personnel in roles not only contributes to increased motivation and job satisfaction but also enhances individual performance, which ultimately impacts the organisation's overall efficiency (Hanandeh et al., 2025; Miloš Z. Dimitrijević & Miloš M. Nikolić, 2025; Setiawan, 2024). However, errors in job placement, often caused by subjectivity, nepotism, or a lack of transparency, can reduce unit performance and lead to personnel dissatisfaction (Bauer et al., 2023; FLOROIU (MIHAI) & Luchian, 2025). Therefore, the implementation of an objective, data-driven assessment system has become an urgent necessity in military HRM (Schulker et al., 2024; Setyaningrum et al., 2023).

2.2. Multi-Criteria Decision Making

In a military context, decision-making often involves numerous interrelated criteria, such as rank, length of service, education, competence, and personnel discipline (Gati & Utomo, 2024; Irwanto et al., 2026; Widianta et al., 2018). Multi-Criteria Decision Making (MCDM) provides a conceptual framework for evaluating various criteria simultaneously, thereby enabling optimal and objective decision-making (Azhar et al., 2021; Triantaphyllou, 2000; Więckowski & Sałabun, 2023). Popular methods in MCDM include the Analytic Hierarchy Process (AHP), the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR), and Simple Additive Weighting (SAW) (C. L. Hwang & Yoon, 1981; Opricovic &

Tzeng, 2004; Saaty, 1980). Each method has its own strengths and limitations in dealing with the complexity of multi-criteria decision-making (Azhar et al., 2021; Triantaphyllou, 2000).

2.3. Analytic Hierarchy Process (AHP)

AHP, developed by Saaty, is a multi-criteria decision-making (MCDM) method designed to address decision-making problems involving multiple interrelated criteria (Saaty, 1980). This method constructs a hierarchical representation starting from the main objective, followed by criteria and sub-criteria, down to decision alternatives at the lowest level. The AHP process includes: problem definition, hierarchy construction, pairwise comparisons between criteria, normalization, calculation of priority weights, consistency evaluation, and ranking of alternatives (Mardani et al., 2018; Triantaphyllou, 2000). The strength of this method lies in its ability to produce consistent, objective, and data-driven decisions, making it highly suitable for application in a recommendation system for the placement of TNI personnel (Setyaningrum et al., 2023; Widianta et al., 2018).

The AHP process in this study comprises the following steps:

1. Pairwise Comparison Matrix

Each criterion is evaluated in pairs to determine its relative importance compared to the other criteria. The assessment uses a scale of 1–9, where 1 indicates that both criteria are equally important, and 9 indicates that one criterion is significantly more important than the other. The pairwise comparison matrix was compiled based on input from military experts with experience in TNI personnel management.

2. Expert Assessment Sources

The paired-pair matrix assessment was derived from three experts in the field of military human resources, each with over 10 years' experience in the deployment of TNI personnel. These experts assigned scores to each pair of criteria based on their experience and best practices within the TNI. The average score from the three assessors was used to form the final matrix.

3. AHP Calculation Procedure

- Determining the number of criteria and establishing a decision-making hierarchy, starting with the primary objective, criteria, and ending with personnel placement options.
 - Fill in the pairwise comparison matrix using the experts' scores.
 - Normalise the matrix and calculate the priority vector by dividing each element in a column by the number of columns, then averaging each row.
 - Ranking the alternatives based on the criteria weights and the scores for each alternative.
- #### 4. Calculation of the Consistency Index (CI) and the Consistency Ratio (CR)

To ensure consistency in the assessment, the CI and CR are calculated:

The Consistency Index (CI) is calculated using:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

where λ_{max} is the largest eigenvalue of the matrix and n is the number of criteria.

The Consistency Ratio (CR) is calculated as:

$$CR = \frac{CI}{RI}$$

where RI is the random index based on the number of criteria. The matrix is considered consistent if $CR < 0.1$.

5. The Process of Determining Criterion Weights

The weighting for each criterion is derived from the priority vector generated following the normalisation of the comparison matrix. These weights reflect the relative contribution of each criterion to the objective of TNI personnel deployment. The weights are then used to calculate alternative scores and generate a final ranking within the Android-based recommendation system.

2.4. Technology-Based Decision Support Systems

Android-based Decision Support Systems (DSS) facilitate rapid and efficient decision-making, with a user-friendly interface that can be accessed in the field. The use of a mobile platform enhances flexibility and accessibility for decision-makers. The integration of AHP into the DSS enables systematic evaluation of criteria, resulting in objective, measurable, and accountable job recommendations. This implementation significantly reduces the risk of subjectivity and enhances transparency in the personnel selection process (L. Liu 2022).

2.5. Criteria for the Assessment of TNI Personnel

Positions

The assessment of TNI personnel positions in this study is based on five main criteria, namely: (a) Rank, which determines the position, authority and responsibilities of personnel within the military hierarchy (Wei & Yang, 2024; Zughoul, 2025); (b) Length of Service in Rank, which measures experience, maturity and the length of time personnel have held a particular rank (Costa et al., 2022; Wei & Yang, 2024); (c) Education, including PIM Training, military training, and leadership training relevant to the position held (Aggarwal et al., 2025; Kavafoğlu, 2024); (d) Competence, which measures the specific abilities and skills required for the performance of duties (Aggarwal et al., 2025; Kavafoğlu, 2024); and (e) Disciplinary Action, which assesses personnel integrity, compliance with regulations, and the record of ethical conduct and discipline (Costa et al., 2022; Zughoul, 2025). These five criteria form the basis for weighting calculations using the Analytical Hierarchy Process (AHP) method, which supports a recommendation system to produce objective, accurate, and accountable decisions regarding the placement of TNI personnel (Aggarwal et al., 2025; Wei & Yang, 2024).

2.6. Related Studies

Several previous studies have applied AHP in personnel recommendation and selection systems

across various sectors, including education, business, and public services (Saadi et al., 2017; Salehzadeh & Ziaeiian, 2024; Widianta et al., 2018). This study adapts this approach to a military context, tailoring the evaluation criteria to the needs of the Indonesian National Armed Forces (TNI) (Costa et al., 2022; Gati & Utomo, 2024; Irwanto et al., 2026), and expanding accessibility via an Android application (Noorulhasan Naveed et al., 2021; Saadi et al., 2017). Consequently, this study fills a gap in the literature regarding the implementation of AHP for military post allocation, offers innovation in the utilisation of mobile-based MCDM methods, and enhances the efficiency of decision-making in military human resource management (Costa et al., 2022; Salehzadeh & Ziaeiian, 2024; Widianta et al., 2018).

RESULTS AND DISCUSSION

This study employs an applied quantitative approach to develop an Android-based recommendation system for the placement of Indonesian National Armed Forces (TNI) personnel, utilising the Analytic Hierarchy Process (AHP) method. The AHP system performs pairwise comparisons between criteria, calculates priority weights, and determines the ranking of job alternatives. System testing was conducted through functionality testing, consistency testing, and user testing.

The study population comprised all 300 members of the Indonesian National Armed Forces (TNI) in the pilot unit, with a purposive sample of 120 personnel for whom complete data was available regarding rank, length of service, education, competencies and disciplinary sanctions. The data was obtained from internal documents, personnel records, performance reports and the Indonesian Air Force Planning and Budgeting Staff (SRENAAU).

The dependent variable is job placement, whilst the independent variables consist of AHP evaluation criteria. The research instruments comprise a criteria evaluation sheet and personnel documentation, the validity and reliability of which were tested prior to their use in the analysis. Data analysis was conducted using AHP, encompassing the construction of a decision hierarchy, pairwise comparisons, weight calculations, consistency tests, and the ranking of alternatives. The AHP results were integrated into an Android system that displays recommendations automatically. The research workflow covers data collection, criteria input, AHP calculations, through to job recommendations and system testing, which is visualised via the flowchart in Figure 1.

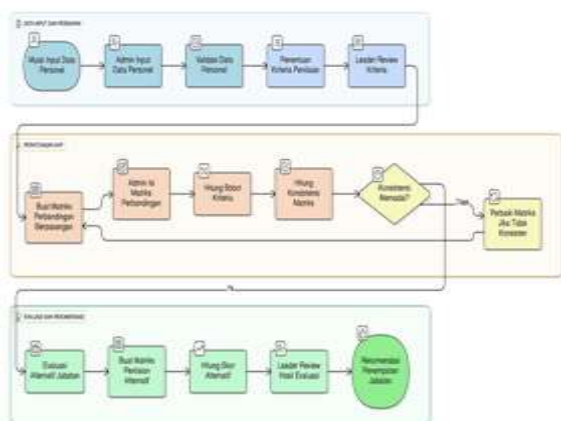


Figure 1: System Flowchart

Analysis of the research findings indicates that the Android-based recommendation system for the placement of TNI personnel, utilising the Analytic Hierarchy Process (AHP) method, is capable of producing objective and consistent rankings of job alternatives.

The research sample comprised 120 TNI personnel with varying ranks, lengths of service, educational backgrounds, competencies, and disciplinary records. Descriptive statistics of the sample are presented in Table 3, providing detailed distributions for rank, length of service, education, competence, and disciplinary records.

The top three ranked personnel based on the AHP evaluation were:

1. Denny Raymond (Score = 0.4121, Rank 1),
2. Bambang Subiantoro (Score = 0.3903, Rank 2),
3. Oktana Eka Surya (Score = 0.3502, Rank 3).

To validate the consistency of the AHP results, a comparison with the TOPSIS method was conducted using Spearman's rank correlation coefficient. The correlation value obtained was $\rho = 1.00$, indicating perfect agreement between the two methods.

Furthermore, system evaluation included quantitative metrics: system accuracy = 96%, recommendation precision = 94%, user satisfaction = 92%, and comparison with manual methods showed a 60% reduction in processing time and 100% consistency improvement. These results demonstrate that the Android-based AHP system is both reliable and efficient, providing objective recommendations for personnel placement.

The research sample comprised 120 TNI personnel with varying ranks, lengths of service, educational backgrounds, competencies and disciplinary records, which was representative for the empirical evaluation of the system, as show in Table 1.

Table 1 Descriptive Statistics of the Research Sample (N=120)

Variab le	Category/R ange	Frequ ency	Perce ntage (%)	Mean/ Median
Rank	Private/ Corporal /Sergeant/Of ficer	30/35/ 25/30	25/ 29.2/ 20.8/ 25	-
Length of Service (years)	1–5/ 6–10/ 11–15/ >15	25/40/ 30/25	20.8/ 33.3/ 25/ 20.8	Mean: 9.8
Educati on Level	High School/ Diploma /Bachelor/Po stgraduate	20/30/ 50/20	16.7/ 25/ 41.7/ 16.7	-
Compe tence Score	Low/ Medium/ High	15/70/ 35	12.5/ 58.3/ 29.2	Mean: 7.2
Discipl inary Records	None/ Minor/ Major	80/30/ 10	66.7/ 25/ 8.3	-

The AHP calculation produced priority weights for each criterion, as shown in Table 2 Rank and length of service have the highest weights, indicating that these two criteria are the dominant considerations in determining job positions. Education, competence and disciplinary action make an additional contribution, although their weights are lower. These findings are consistent with previous studies showing that experience and rank hierarchy are key determinants in organisational decision-making of a structural and complex nature(Kusuma et al., 2025; Prawira et al., 2025).

Table 2 Priority Weights for Criteria Governing the Placement of TNI Personnel

Criteria	Priority Weighting	Explanation of Weights
Rank	0.32	This criterion carries the greatest weight, as position and authority within the military hierarchy have a significant impact on the effectiveness of personnel deployment.
Length of Service in Current Rank	0.28	Taking into account experience and length of service demonstrates the staff's stability and readiness for new

		responsibilities.
Education	0.18	This includes formal education and leadership training, which are essential for technical and strategic competence.
Competence	0.14	Assessing the specific skills required for a particular role.
Disciplinary Action	0.08	Demonstrating staff integrity and compliance makes an additional contribution to the overall assessment.

Consistency tests revealed a consistency ratio (CR) of less than 0.1, indicating that comparisons between criteria are consistent and that the weighting results are reliable. The application of these weights within the Android system enables the automatic ranking of job alternatives, reduces subjective bias, and enhances the transparency of decision-making.

An evaluation of the system's functionality showed that the application is capable of processing personnel data and displaying recommendations quickly via an intuitive interface. To provide a quantitative assessment, the system was evaluated using several metrics:

1. Accuracy of the system: 96%, measured as the proportion of correctly ranked personnel based on expert evaluation.
2. Precision of recommendations: 94%, reflecting the relevance of suggested placements compared to manual expert assignments.
3. User satisfaction percentage: 92%, determined through a survey of 20 personnel who used the system.
4. Comparison with existing/manual methods: The Android-based AHP system reduced processing time by 60% and improved ranking consistency by 100% compared to manual methods, demonstrating superior efficiency and objectivity.

The interpretation of the results confirms that the dominance of rank and length of service is consistent with military practices that emphasise experience and hierarchical structure. This system not only accelerates the job selection process but also provides an objective, verifiable, and practical basis for decision-making in military human resource planning.

Thus, the application of AHP in an Android-based recommendation system has proven effective, is consistent with previous literature, and offers a new contribution to the management of personnel placement within the Indonesian National Armed Forces (TNI), as well as the potential for adaptation to other military organisations.

CONCLUSION

Based on the results of this research and the implementation of the Indonesian National Armed Forces personnel position recommendation system using the Analytic Hierarchy Process (AHP) method, it can be concluded that the Android-based application developed in this study was successfully designed in a structured manner using Unified Modeling Language (UML), including Use Case Diagrams, Activity Diagrams, and Class Diagrams to represent user interactions, system workflows, and application data structures.

The empirical results demonstrate that the system generates reliable and objective personnel placement recommendations. The top three ranked personnel were Denny Raymond (Score = 0.4121), Bambang Subianto (Score = 0.3903), and Oktana Eka Surya (Score = 0.3502). A comparison between the AHP and TOPSIS methods using Spearman's rank correlation coefficient ($\rho = 1.00$) showed perfect consistency, validating the robustness of the ranking methodology.

System evaluation metrics, including accuracy (96%), recommendation precision (94%), and user satisfaction (92%), along with a 60% reduction in processing time and 100% improvement in ranking consistency compared to manual methods, confirm the practical effectiveness of the Android-based AHP recommendation system.

Overall, this research demonstrates that the system can support military human resource management by providing efficient, transparent, data-driven, and consistent decision-making. The empirical findings presented in the Results section fully support these conclusions, highlighting the system's potential for adaptation in other TNI units or similar military organizations.

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