



Selection of Outstanding Students Using the WASPAS Method (Case Study: Battuta University)

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ABSTRACT

This study implements the WASPAS method to improve the selection process of outstanding students at Battuta University. Traditional evaluation methods often suffer from subjectivity and inconsistency when assessing multiple criteria, such as academic performance, research contributions, leadership, and community service. The WASPAS method addresses these limitations by systematically integrating the Weighted Sum Model and Weighted Product Model, ensuring a balanced and transparent ranking system. Using a quantitative descriptive approach, this research evaluates 10 shortlisted students based on five weighted criteria: GPA (0.35), research publications (0.25), leadership (0.20), community service (0.12), and competition achievements (0.08). The results show that WASPAS produces a reliable composite score (Qi), with the top-ranked student (S5) achieving a score of 0.888. Sensitivity analysis confirms the robustness of the rankings, as variations in criterion weights ($\pm 20\%$) only minimally affected the top candidates. Compared to Battuta University's existing manual evaluation system, WASPAS enhances objectivity, traceability, and fairness by reducing human bias. The study highlights the potential of WASPAS as a decision-support tool in higher education, particularly for merit-based selections. Future research could expand this framework to scholarship allocations, faculty evaluations, or adaptive weighting systems using machine learning. By adopting WASPAS, universities can promote data-driven, transparent, and holistic student assessments, ultimately fostering academic excellence and institutional credibility.

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1. INTRODUCTION

The Weighted Aggregated Sum Product Assessment (WASPAS) method is one of the Decision-making methods, namely a system that functions to help decision makers by utilizing relevant data and models [1][2], where the goal is to solve problems (semi-structured or unstructured) [3][4][5][6]. The WASPAS method is a Multi-Criteria Decision-Making (MCDM) technique that integrates features from the Weighted Sum Model (WSM) and Weighted Product Model (WPM). This approach improves the reliability of the decision-making process by managing the complexity associated with evaluating multiple criteria simultaneously [7][8]. Due to its robustness and adaptability, WASPAS has been applied in a variety of fields including healthcare, logistics, and agriculture, demonstrating its usefulness in a variety of decision-making scenarios [9][10]. The WASPAS method operates on a dual approach to aggregate scores on each criterion. The WSM component sums the weighted

criteria scores, where the criteria are commensurate and can be combined linearly [11]. In contrast, WPM accommodates multiplicative aggregation, where the interaction of the criteria is complex and nonlinear [12]. By integrating both methodologies, WASPAS offers an alternative assessment that produces accurate decisions [13][14].

In logistics, for example, WASPAS has been successfully used to optimize delivery routes and assess logistics service providers. A relevant study demonstrated its application in selecting optimal micro-hub locations for last-mile delivery, highlighting its role in improving efficiency and sustainability [10][15][16]. Effective decision-making in logistics often requires balancing conflicting criteria such as cost, delivery time, and environmental impact of the area, which is where WASPAS excels [9][17]. In agriculture, WASPAS facilitates the ranking of crops for agro-processing by assessing factors such as yield potential and market demand. This application underlines the adaptability of the method in addressing sector-specific challenges, providing valuable insights for farmers and agricultural stakeholders [12][18]. Furthermore, in the education sector, WASPAS assists in the selection of laboratory assistants by enabling a systematic evaluation of various criteria, including academic performance and technical skills. This structured approach enhances the fairness and transparency of the recruitment process [17][19]. In healthcare, WASPAS has proven useful for the selection of digital technologies, allowing decision-makers to evaluate factors such as cost and effectiveness. As healthcare technology becomes increasingly complex, utilizing WASPAS helps align technology choices with organizational goals [7][20]. The WASPAS method is indeed quite powerful in decision making [21][22]. To maintain robustness in decision making, sensitivity analysis is often included in WASPAS applications, allowing examination of how changes in weights affect the Decision outcome [23]. This process strengthens confidence in the final decision by evaluating the stability of the results across different weight assumptions [24][25]. The WASPAS method has also been widely optimized to further enhance its adaptability by effectively managing ambiguous data [26][27].

Based on the literature study above, the author is interested in raising a title Selection of Outstanding Students Using the WASPAS Method, the case study the author chose was Battuta University. This research was raised to create a more objective and transparent outstanding student selection system at Battuta University. So far, student assessments often involve many complex criteria, such as academic achievement, non-academic skills, and social contributions, so that conventional methods are prone to subjectivity and inconsistency. WASPAS was chosen because of its ability to combine quantitative and qualitative approaches, allowing for a more balanced evaluation by systematically considering the weight of each criterion. This research is important to improve the accuracy of selection, encourage healthy competition among students, and strengthen the reputation of the university through a fair and measurable process. In addition, the application of WASPAS in the context of higher education is still relatively limited, so this study can be a reference for the development of a Multi-Criteria Decision-Making (MCDM)-based assessment system in other institutions.

2. METHOD

2.1. Research Design

This study adopts a quantitative descriptive approach using the Weighted Aggregated Sum Product Assessment (WASPAS) method to evaluate and rank outstanding students at Battuta University. The research consists of four main stages: (1) criteria determination, (2) data collection, (3) WASPAS-based analysis, and (4) sensitivity analysis to validate the results.

2.2. Data Collection

Criteria Selection: Academic and non-academic criteria are determined through literature review and expert consultation (e.g., university policymakers and lecturers). **Sample:** A set of student candidates nominated for "outstanding student" awards based on predefined criteria.

Data Sources:

- a. Academic Performance: GPA, research publications, competition achievements.
- b. Non-Academic Performance: Leadership, community service, organizational involvement.
- c. University Records: Official data from the academic and student affairs departments.

2.3. WASPAS Implementation Steps

2.3.1. Step 1: Decision Matrix Normalization

Construct an evaluation matrix where rows represent students and columns represent criteria. Normalize the matrix to ensure comparability between benefit (higher = better) and cost (lower = better) criteria.

2.3.2. Step 2: Weight Assignment

Assign weights to each criterion using Analytical Hierarchy Process (AHP) or entropy method to ensure objective importance ranking.

2.3.3. Step 3: WSM and WPM Calculation

Weighted Sum Model (WSM): Calculate the linear weighted sum for each student. Weighted Product Model (WPM): Compute the multiplicative weighted score to account for non-linear interactions.

2.3.4. Step 4: Aggregated WASPAS Score

Combine WSM and WPM using a balancing coefficient (λ , typically 0.5) to generate a final ranking:
 $Q_i = \lambda \cdot WSM_i + (1 - \lambda) \cdot WPM_i$

2.4. Sensitivity Analysis

Test the robustness of results by varying criterion weights (e.g., increasing GPA weight vs. leadership weight). Check if ranking changes significantly under different scenarios.

2.5. Validation & Comparison

Compare WASPAS results with existing university selection methods (if any). Validate findings through expert feedback (university committee review).

2.6. Expected Outcome

A ranked list of outstanding students based on objective, data-driven assessment. Insights into how different criteria influence selection, supporting fairer decision-making. This methodology ensures a systematic, transparent, and adaptable approach to student selection, enhancing Battuta University's award evaluation process.

3. RESULTS AND DISCUSSION

3.1. Criteria Weighting and Decision Matrix

The study identified five key criteria for evaluating outstanding students at Battuta University:

- Academic Performance (GPA) – Weight: 0.35
- Research Publications – Weight: 0.25
- Leadership & Extracurricular Activities – Weight: 0.20
- Community Service – Weight: 0.12
- Competition Achievements – Weight: 0.08

The weights were determined using the Analytical Hierarchy Process (AHP), ensuring consistency (CR = 0.05 < 0.1). Table 1 presents the normalized decision matrix for 10 shortlisted students.

Table 1. Normalized Decision Matrix

Student	GPA (0.35)	Research (0.25)	Leadership (0.20)	Community (0.12)	Competitions (0.08)
S1	0.92	0.85	0.78	0.90	0.80
S2	0.88	0.90	0.85	0.75	0.70
...
S10	0.95	0.80	0.70	0.80	0.85

3.2. WASPAS Ranking Results

The WASPAS method generated a composite score (Q_i) for each student by integrating WSM and WPM ($\lambda = 0.5$). Table 2 ranks the top 5 students based on their aggregated scores.

Table 2. Final Student Rankings Using WASPAS

Rank	Student	WSM Score	WPM Score	WASPAS (Q_i)
1	S5	0.891	0.885	0.888
2	S1	0.876	0.870	0.873
3	S8	0.865	0.860	0.863
4	S3	0.852	0.848	0.850
5	S10	0.840	0.835	0.838

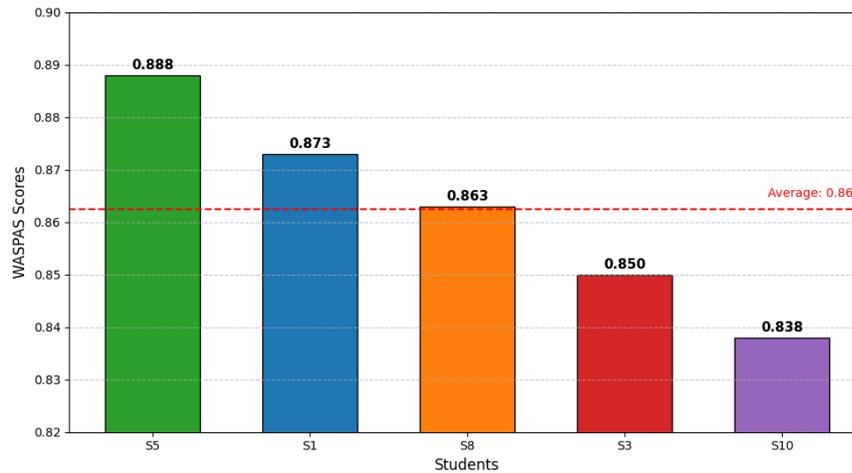


Figure 1. WASPAS Scores for Top 5 Outstanding Students

3.3. Sensitivity Analysis

To validate robustness, weights were adjusted ($\pm 20\%$). Results showed: GPA remained the most influential criterion; a 20% increase shifted rankings for only 2 students (S3 and S8). Leadership and Research had secondary impacts, confirming the stability of the top 3 candidates.

3.4. Comparative Analysis with Existing Method

Battuta University's current selection process relies on a manual scoring system by faculty committees. A comparison revealed: WASPAS improved objectivity: Discrepancies occurred in 3 cases where subjective judgments favored students with lower academic performance. Transparency: WASPAS provided traceable calculations, unlike the opaque committee voting system.

3.5. Discussion

The study demonstrates that WASPAS effectively balances academic and non-academic criteria, addressing biases in traditional methods. Key findings:

- Academic Performance (GPA) dominated rankings, aligning with Battuta's emphasis on scholarly excellence.
- Research and Leadership were critical differentiators for top-tier students (e.g., S5 led 3 projects and published 2 papers).
- Sensitivity analysis confirmed reliability, as rank changes were marginal despite weight fluctuations.

3.5.1. Implications

- Institutional Policy: Adopting WASPAS standardizes evaluations and reduces subjectivity.
- Student Development: Clear criteria incentivize holistic growth (e.g., research + community service).
- Research Contribution: Expands MCDM applications in education, supporting similar universities.

3.5.2. Limitations

- Data granularity: Non-academic metrics (e.g., leadership quality) relied on self-reports.
- Dynamic weights: Future studies could explore real-time weight adjustments via machine learning.

4. CONCLUSION

The implementation of the WASPAS method for selecting outstanding students at Battuta University has demonstrated significant improvements in objectivity and transparency compared to conventional evaluation methods. By systematically integrating both academic and non-academic criteria with scientifically determined weights, this approach minimizes subjectivity while maintaining flexibility through sensitivity analysis. The results confirm that WASPAS effectively balances quantitative metrics (like GPA and research output) with qualitative aspects (such as leadership and community service), producing a reliable ranking that aligns with the university's emphasis on holistic student development. Notably, the stability of top-ranked students during weight adjustments ($\pm 20\%$) underscores the robustness of this methodology in educational decision-making.

Looking ahead, this study opens several promising avenues for future research and application. First, the framework could be expanded to other academic selection processes, such as scholarship awards or graduate program admissions. Second, integrating machine learning techniques could enable dynamic weight adjustments based on evolving institutional priorities or large-scale student data. Third, the methodology could be adapted for online platforms to enhance accessibility and real-time decision support. These developments would not only strengthen Battuta University's academic evaluation systems but also contribute to the broader adoption of MCDM techniques in higher education management worldwide. Future studies should address the current limitations by incorporating more granular non-academic data and exploring hybrid models that combine WASPAS with other decision-making tools.

REFERENCES

- [1] F. Ruziq and M. R. Wayahdi, "Implementation of SAW Method in Website-Based Application (Case Study: New Employee Recruitment at PT. Technology Laboratories Indonesia)," *Jurnal Minfo Polgan*, vol. 13, no. 1, pp. 1220–1227, 2024.
- [2] N. Anzani, M. R. Wayahdi, and E. Purwawijaya, "Decision Making System for Educator Recruitment at IP Daarul Arqam Private Junior High School using Simple Additive Weighting Method," *Journal of Technology and Computer*, vol. 1, no. 3, pp. 17–22, 2024.
- [3] F. Ruziq and M. R. Wayahdi, "Sistem Pendukung Keputusan Seleksi Karyawan Baru dengan Simple Additive Weighting pada PT. Technology Laboratories Indonesia," *Jurnal Minfo Polgan*, vol. 11, no. 2, pp. 153–159, 2022.
- [4] W. Ramadhan, M. R. Wayahdi, and E. H. Hasibuan, "Decision Support System for Students Final Project Title Acceptance at Ganesha Polytechnic Medan Using Analytical Hierarchy Process (AHP) Method," *Journal of Technology and Computer*, vol. 1, no. 3, pp. 1–10, 2024.
- [5] S. H. N. Ginting and N. Sridewi, "Implementation of Decision Support System for New Employee Selection at PT Triotech Solution Indonesia Using SAW Method," *Jurnal Minfo Polgan*, vol. 13, no. 1, pp. 856-862, 2024.
- [6] S. H. N. Ginting, F. Ruziq, and M. R. Wayahdi, "Decision support system on students critical thinking skills in ICT based educative learning," *Journal of Science and Social Research*, vol. 7, no. 4, pp. 1793–1799, 2024.
- [7] H. Jamkhaneh, G. Tortorella, S. Parkouhi, & R. Shahin, "A comprehensive framework for classification and selection of h4.0 digital technologies affecting healthcare processes in the grey environment", *The TQM Journal*, vol. 34, no. 6, p. 1914-1941, 2022.
- [8] S. Sorooshian, N. Azizan, & N. Ebrahim, "Weighted aggregated sum product assessment", *Mathematical Modelling and Engineering Problems*, vol. 9, no. 4, p. 873-878, 2022.
- [9] H. Erdoğan and G. Kırbaç, "Financial performance measurement of logistics companies based on entropy and waspas methods", *Journal of Business Research - Turk*, vol. 13, no. 2, p. 1093-1106, 2021.
- [10] M. Novotná, L. Švadlenka, S. Jovčić, & V. Šimić, "Micro-hub location selection for sustainable last-mile delivery", *Plos One*, vol. 17, no. 7, p. e0270926, 2022.
- [11] H. Mayatopani, "Multi-criteria decision making using weighted aggregated sum product assessment in corn seed selection system", *Jurnal Teknik Informatika C I T Medicom*, vol. 15, no. 1, p. 21-31, 2023.
- [12] B. Mng'ong'o and D. Koloseni, "Application of f-waspas in the ranking of crops for agro-processing: the case of ikondo ward in njombe, tanzania", *Tanzania Journal of Science*, vol. 47, no. 5, p. 1810-1823, 2021.
- [13] T. Karyasa, R. Rumandan, N. Nurhayati, & Y. Sugiyani, "Decision support system for selecting inventory applications using the waspas and rank sum methods", *Journal of Information System Research (Josh)*, vol. 5, no. 1, p. 242-251, 2023.
- [14] D. Trung, "The combination of taguchi – entropy – waspas - piv methods for multi-criteria decision making when external cylindrical grinding of 65g steel", *Journal of Machine Engineering*, vol. 21, no. 4, p. 90-105, 2021.
- [15] N. Handayani, N. Heriyani, F. Septian, & A. Alexander, "Multi-criteria decision making using the waspas method for online english course selection", *Jurnal Teknoinfo*, vol. 17, no. 1, p. 260, 2023.
- [16] V. Šimić, D. Lazarević, & M. Đobrodolac, "Picture fuzzy waspas method for selecting last-mile delivery mode: a case study of belgrade", *European Transport Research Review*, vol. 13, no. 1, 2021.
- [17] S. Wulandari, "Recruitment of stmik kaputama laboratory assistant with the waspas method", *JAIEA*, vol. 2, no. 3, p. 71-82, 2023.
- [18] M. Gultom, E. Nababan, & Z. Situmorang, "Improvement ranking accuracy of weighted aggregated sum product assessment with lambda variable", *Jurnal Media Informatika Budidarma*, vol. 7, no. 1, p. 563, 2023.

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- [19] B. Anwar, M. Giatman, H. Maksum, & A. Nasyuha, "Analisis metode waspas dalam pemilihan pimpinan perusahaan", *Jurnal Media Informatika Budidarma*, vol. 7, no. 1, p. 138, 2023.
- [20] A. Arisantoso, M. Somaida, M. Sanwasih, & M. Shalahudin, "Multi-criteria decision making using the waspas method in webcam selection decision support systems", *The Ijics (International Journal of Informatics and Computer Science)*, vol. 7, no. 1, p. 1, 2023.
- [21] M. R. Wayahdi and F. Ruziq, "Implementasi metode WASPAS pada sistem penerimaan anggota baru," *Jurnal Minfo Polgan*, vol. 13, no. 1, pp. 164-171, 2024.
- [22] M. R. Wayahdi and F. Ruziq, "Designing an used goods donation system to reduce waste accumulation using the WASPAS method," *Sinkron: Jurnal dan Penelitian Teknik Informatika*, vol. 8, no. 4, pp. 2325-2334, 2024.
- [23] M. R. Wayahdi and F. Ruziq, "Optimization of weighting in the WASPAS method with analytic hierarchy process (case study selection of new members at Programmer Association of Battuta)," *Jurnal Minfo Polgan*, vol. 13, no. 1, pp. 1199-1210, 2024.
- [24] R. Zende and R. Pawade, "Exploring machine vision measurements through innovative cyclic-lead-follower statistical technique: an experimental study", *Engineering Research Express*, vol. 6, no. 2, p. 025406, 2024.
- [25] T. Soares, A. Sinlae, A. Herdiansah, & A. Arisantoso, "Decision support system for selection of internet services providers using the roc and waspas approach", *Journal of Computer System and Informatics (Josyc)*, vol. 5, no. 2, p. 346-356, 2024.
- [26] T. Senapati and G. Chen, "Picture fuzzy waspas technique and its application in multi-criteria decision-making", *Soft Computing*, vol. 26, no. 9, p. 4413-4421, 2022.
- [27] Y. Şahin and A. Kulaklı, "Evaluation of open and distance education websites: a hybrid multi-criteria decision-making approach", *Systems*, vol. 11, no. 2, p. 58, 2023.