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*Research Article*

# Determining Student Achievement Using the Weighted Sum Model Method Based on the Decision Support System

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## Abstract
The field of education has a strong influence on the state and nation. A good education will produce good products for the country's future development. The foundation of a country is a good education system that produces high-quality alumni. The educational institution in question is a university. Universities can produce graduates of varying quality. This will cause a few problems in the development of education in Indonesia. The importance of student quality in a tertiary institution underscores the need for systematic, measurable assessment. Assessment of outstanding students can be grouped into 2 criteria: academic-based and non-academic-based. The assessment of undergraduate students refers to the selection guidelines for outstanding undergraduates issued by the Ministry of Research, Technology, and Higher Education. A computerized system is needed to store large amounts of data to support student selection (assessment) activities, enabling them to be carried out effectively and efficiently. The Decision Support System is one of the information system models that can implement this idea. The basic concept of a Decision Support System is to provide decision recommendations to the manager or leader of a case. The system's output produces the 5 best students with the highest score of 4.4. Assessment of outstanding students using the Decision Support System is more effective and reduces mathematical calculation errors in the assessment process. A computerized Decision Support System can store large amounts of data and process large volumes.

**Keywords**: Decision Support System, Student achievement, Weighted Sum Model

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## 1. Introduction

Mathematical calculations have advanced rapidly alongside technological advancements. The rapid pace of technological change has had a significant impact on human activities. One area affected by this rapid technological development is education. Education is a field that strongly influences the state and nation. A good education will produce good products for the future development of the country. The foundation of a nation is a good education that produces quality graduates. One such educational institution is a university. Universities can produce graduates of varying quality. This will cause problems for the development of Indonesia's education sector. The quality of university graduates has a significant impact on a country's economic development (Kementerian Pendidikan dan Kebudayaan, 2020). By developing human resources in line with advances in science and technology and changes in the global landscape, Indonesia can achieve the goal of independence as a nation with distinctive characteristics, character, and intelligence, able to compete and even stand on equal footing with other developed countries.

The importance of student quality in higher education institutions underscores the need for systematic, measurable assessments. Assessments of outstanding students can be grouped into two categories: academic and non-academic. Assessments for undergraduate students are based on the Ministry of Research, Technology, and Higher Education's (Kemenristekdikti) selection guidelines for outstanding undergraduate students. Both academic and non-academic criteria reflect students' competencies. All students should possess both criteria to ensure academic and non-academic abilities are balanced. Academic criteria are based on grades earned during lectures, while non-academic criteria encompass all activities not undertaken during lectures or undertaken outside of campus for self-exploration. The outcome of this assessment process is an award given to students as a token of appreciation for their achievements.

To support student assessment activities effectively and efficiently, a computerized system is needed to store large amounts of data. A Decision Support System is one information system model that can implement this idea. The basic concept of a Decision Support System is to provide decision recommendations to managers or leaders regarding a case. The system is then integrated using mathematical methods to effectively and accurately measure a problem. Research conducted (previously) by Rio Irwansyah, Mesran stated that the Weighted Sum Model (WSM) method is considered to be able to solve the problems or cases faced by the Education Office to determine the best vocational school students. (Irwansyah & Mesran, 2022). Another study conducted by Nur Hayati, Sri Rahayu, and Tri Ichsan Saputra stated that the Weighted Sum Model can be applied to the ranking process to produce a decision that is precise, fast, and objective. (Hayati et al., 2021). Research conducted by Wahyu Adi Kurniawan et al. states that the more pattern data applied to a problem, the higher the resulting precision, recall, accuracy, and f-measure values. The higher the output values of precision, recall, f-measure, and accuracy, the better and more accurate the Weighted Sum Model method can be. (Wahyu Adi Kurniawan, 2019). The latest research conducted by Israa Ibrahim Al-Bayati et al. showed that the Weighted Sum Model method can provide recommendations for project selection, from the lowest to the highest ranking. (Al-Bayati & Al-Zubaidy, 2020).

## 2. Literature Review

### 2.1 Weighted Sum Model Method

The Weighted Sum Model is part of the Multi-Criteria Decision-Making technique. This method is often implemented to assist decision-makers, in this case, managers, in formulating accurate decisions. (Nofriansyah & Defit, 2017). The mathematical process used in this method involves multiplying the criterion weights by the alternative values. This mathematical process of multiplying the weights by the alternative values provides decision-makers with an effective solution that yields satisfactory results. (Chagas & Wagner, 2022).

Mathematical calculations in the Weighted Sum Model method are an effective way for managers to make decisions across various cases, provided there is numerical data from the cases being studied (Alayón Suárez, 2021). The Weighted Sum Model uses two variables: alternative data and criterion data. Alternative data adapts to the data being studied, while criterion data are variables related to the research case. These two variables are closely related, and decision-makers' observations are essential for

determining the weighting of each criterion. Naturally, each criterion has a different weighting value. The mathematical calculation of the Weighted Sum Model method is in accordance with equation 1.

$$\sum_{j=1}^{n} w_j x_{ij} \quad \ldots\ldots (1)$$

Information :
n = number of criteria
wj = weight of each criterion
xij = x matrix value

2.2 Decision Support System
One concept in Artificial Intelligence is the Decision Support System, which provides decision recommendations to a manager. (R. Ramadhan, 2023). A manager is a leader in an institution or agency who has the authority to make decisions. The concept of a Decision Support System can be implemented in various fields, including economics, education, and health. Decision Support Systems are often implemented using Multi-Criteria Decision-Making methods, which have different mathematical solution models (R. Ramadhan & Eliyen, 2022). Data is the main component processed by a Decision Support System, so data availability is very important (R. F. Ramadhan & Eliyen, 2022). The incoming data is then processed using a mathematical method that can be translated into a computer programming language.

2.3 Student Assessment
Students are alumni or products of a university. The quality of a university can be seen from the academic and non-academic performance of its students. To determine students' academic and non-academic performance, a systematic, measurable assessment is required, in accordance with the Ministry of Research, Technology, and Higher Education Regulation on the Selection of Outstanding Graduates (Direktorat Kemahasiswaan, 2019). Academic and non-academic abilities are distinct forms of assessment. Academic abilities include GPA, TOEFL (English) scores, and TOAFL (Arabic) scores. Non-academic abilities, on the other hand, include student achievement and organizational involvement. Achievements refer to those outside of college, while organizational involvement serves as a vehicle for students to discover their identity. Ultimately, students should possess both academic and non-academic abilities simultaneously (Directorate General of Higher Education, Ministry of Education and Culture, 2020). Assessments of outstanding students are crucial across all universities to encourage students and gauge their preparedness for a competitive future.

## 3. Methods

The research process naturally involves a flow of steps. This research flow is shown in Figure 1. It begins with the most basic step: identifying the research problem. Problem identification is the process of identifying issues that can be used as research topics. The topic discussed in this study is student achievement assessment. The increasing number of students makes future competition fiercer, especially for employment. This issue can be developed into a research topic, with a practical computational method used to solve the problem. The literature review stage involves gathering references from journals and books that support the research and share the same topic, references can be national or international.

Data collection is the stage in which researchers gather data, which is then processed using computational methods based on Decision Support Systems. The processed data is tailored to the research theme. This research examines high-achieving students, so the data processed in the DBMS in this study is student data.

System design is carried out because it is inseparable from the research concept based on Decision Support Systems. System design is necessary to avoid errors during development and thus minimize them. Another goal of system design is to design the database structure and its relationships. Database design is necessary because the concept of a Decision Support System is inseparable from data storage and data processing.

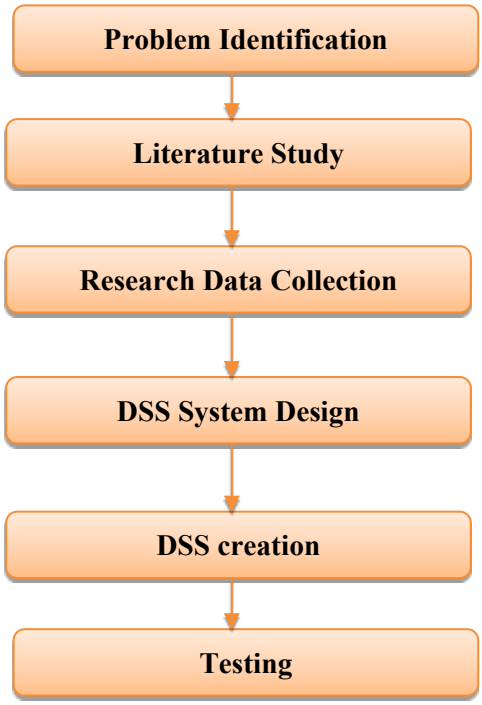


**Figure 1.** Research Method

System development is the technical stage of coding the Weighted Sum Model method into a programming language. The database is then processed using a programming language that implements the Weighted Sum Model. The final stage of the research is system testing. System testing is conducted by university leaders who are experts in assessing student achievement. These leaders can be likened to managers.

The system being developed will implement the Weighted Sum Model, enabling practical mathematical data processing without the need for conventional methods. The system design uses the Weighted Sum Model, as shown in Figure 2.

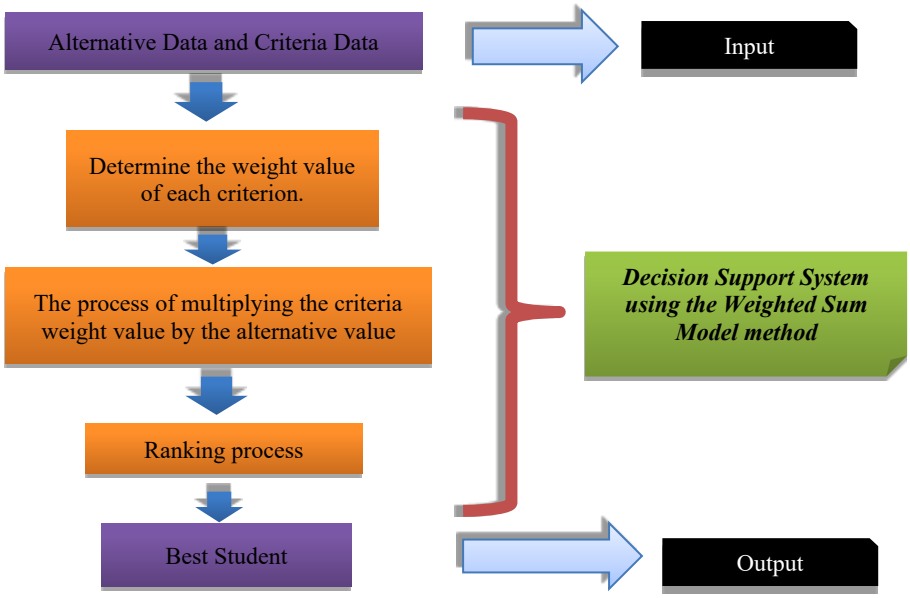


**Figure 2.** Decision Support System Design

## 4. Results

4.1 Implementation of the Weighted Sum Model Method

The Weighted Sum Model calculation process begins by determining the criteria for assessing high-achieving students. The criteria implemented in this study fall into two groups: academic-based and non-academic-based. These criteria are grouped as shown in Table 1.

Table 1. Student Assessment Criteria Groups

| No | Criteria | Criteria Group |
|---|---|---|
| 1 | Student GPA | |
| 2 | TOEFL or English | Academic Criteria |
| 3 | TOAFL or Arabic | |
| 4 | Academic/Non-Academic Achievements | Non-Academic |
| 5 | Activity in Organizations | Criteria |

The grouping of criteria aims to simplify the student assessment process, as students possess and master both academic and non-academic skills. This combination of criteria groups will facilitate researchers' assessment of student achievement using the Weighted Sum Model. Several of the criteria presented are considered representative of the calculation process for assessing outstanding students, as one of them is derived from the Ministry of Education and Culture's Outstanding Undergraduate Student Selection Guide, which universities across Indonesia widely apply.

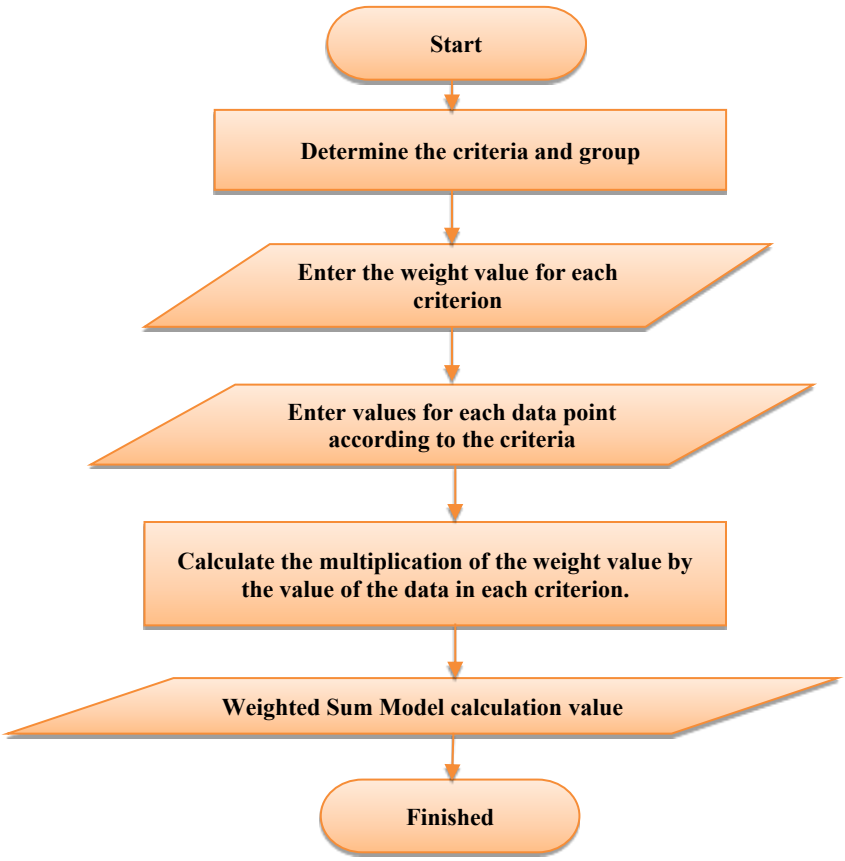


Figure 2. Flowchart of the Weighted Sum Model Method

The Weighted Sum Model is applied in a Decision Support System after the assessment criteria have been determined. The Weighted Sum Model method begins by determining the weights and ends with a ranking based on multiplying the weights by the criteria values. The general process for calculating the Weighted Sum Model method is shown in Figure 2.

As shown in Figure 2, the Weighted Sum Model calculation process begins by determining the data to be used in the research. In this study, the data used are from undergraduate students. Based on the

obtained data, several criteria are identified as appropriate for student assessment. These criteria are grouped into two categories: academic-based and non-academic-based.

These predetermined criteria are assigned different weights based on their importance. The weights assigned to each criterion are determined by the decision-maker, who is the university or faculty responsible. The criteria weights are shown in Table 2.

Table 2. Criteria Weight Values

| No | Kriteria | Nilai Bobot |
|---|---|---|
| 1 | Student GPA | 0,3 |
| 2 | TOEFL or English | 0,1 |
| 3 | TOAFL or Arabic | 0,1 |
| 4 | Academic/Non-Academic Achievements | 0,25 |
| 5 | Activity in Organizations | 0,25 |

The next step is to enter or input the grades for each student according to the predetermined system criteria. The grades entered range from 1 to 5, with 1 being the least important and 5 the most important. The final step in the Weighted Sum Model calculation is to multiply each criterion's weight by the student's grade for that criterion, then sum the results.

$$\mathbf{MHS5} = (\mathbf{0,3}\ \boldsymbol{x}\ \mathbf{5}) + (\mathbf{0,1\ x\ 2}) + (\mathbf{0,1\ x\ 4}) + (\mathbf{0,25\ x\ 3}) + (\mathbf{0,25\ x\ 3}) = \mathbf{3,6}$$
$$\mathbf{MHS10} = (\mathbf{0,3}\ \boldsymbol{x}\ \mathbf{5}) + (\mathbf{0,1\ x\ 4}) + (\mathbf{0,1\ x\ 4}) + (\mathbf{0,25\ x\ 4}) + (\mathbf{0,25\ x\ 3}) = \mathbf{4,05}$$

The resulting values will influence the final calculation results. The Weighted Sum Model calculation results will then be ranked.

4.2 Test Results

The 22 students used in the study, as shown in Table 2, were randomly selected from various study programs within one faculty. Student data that met the criteria were entered into the Decision Support System and processed using the Weighted Sum Model, resulting in final grades.

Table 2. Final Results of the Weighted Sum Model Method

| No | Code | *Weighted Sum Model* Score |
|---|---|---|
| 1 | MHS1 | 3,95 |
| 2 | MHS2 | 3,50 |
| 3 | MHS3 | 3,50 |
| 4 | MHS4 | 3,40 |
| 5 | MHS5 | 3,60 |
| 6 | MHS6 | 3,70 |
| 7 | MHS7 | 3,70 |
| … | ….. | ……. |
| 22 | MHS22 | 3,20 |

The sample size of 22 students is sufficiently representative of the entire student body. The final results varied, yielding different scores.

## 5. Discussion

The results of this study demonstrate that the implementation of the Weighted Sum Model (WSM) within a Decision Support System effectively identifies outstanding students by integrating both academic and non-academic criteria. By assigning specific weights to variables—such as GPA (0.3), language proficiency in English and Arabic (0.1 each), and organizational activity or achievements (0.25)—the system provides a balanced evaluation that reflects the multifaceted nature of student competency. The ranking process, which identified MHS8 as the top performer with a score of 4.4, confirms that the WSM method is a practical and objective tool for assessment. This systematic approach ensures that the selection of high-achieving graduates is measurable and adheres to national guidelines provided by the Ministry of Research, Technology, and Higher Education.

Furthermore, the transition to a computerized Decision Support System addresses significant limitations found in conventional assessment methods, particularly regarding human error and time efficiency. These findings align with previous research which suggests that the Weighted Sum Model provides high precision and objectivity in ranking processes. The system's ability to store and process large volumes of student data is essential for Indonesian universities seeking to produce quality graduates who can compete in a fiercer global environment. Ultimately, this digital transformation empowers university leaders to make faster, data-driven decisions while reducing the cognitive burden of complex mathematical calculations.

## 6. Conclusion

According to the Decision Support System's Weighted Sum Model, the 5 students with the highest rankings, in sequence, are MHS8, MHS10, MHS16, MHS1, and MHS19. The value of MHS 8 is 4.4, followed by the value of other students below it. Assessment of outstanding students using the Decision Support System is more effective and reduces the level of mathematical calculation errors in the assessment process. A computerized Decision Support System can store large amounts of data and process very large numbers. On the user side, they gain many benefits from the limitations of human energy and thought. With the help of the Decision Support System, they can provide a decision, including one in the assessment. The Decision Support System will be more helpful and easier for university managers and leaders to identify the best students, without relying on conventional methods that take a long time.

## References

Alayón Suárez, S. M. (2021). Weighted Sum Method for Multi-Objective Optimization: LP Model for Supply Chain Management of Perishable Products in a Dairy Company. *International Workshop on Service Orientation in Holonic and Multi-Agent Manufacturing*, 285–298.

Al-Bayati, I. I., & Al-Zubaidy, S. S. (2020). Applying the Analytical Hierarchy Process and Weighted Sum Model for Small Project Selection in Iraq. *IOP Conference Series: Materials Science and Engineering*, *671*(1), 012158.

Chagas, J. B. C., & Wagner, M. (2022). A weighted-sum method for solving the bi-objective traveling thief problem. *Computers & Operations Research*, *138*, 105560.

Direktorat Kemahasiswaan, D. J. P. dan K. K. R. T. dan P. T. (2019). *Pedoman Pemilihan Mahasiswa Berprestasi Sarjana*.

Hayati, N., Rahayu, S., & Saputra, T. I. (2021). Sistem Informasi Pemilihan Asisten Laboratorium dengan Metode Weighted Product dan Weighted Sum Model. *STRING (Satuan Tulisan Riset Dan Inovasi Teknologi)*, *6*(1), 1–8.

Irwansyah, R., & Mesran, M. (2022). Sistem Pendukung Keputusan Pemilihan Pelajar SMK Terbaik Di Kota Medan Menggunakan Metode Weighted Sum Model. *Journal of Information System Research (JOSH)*, *3*(3). https://doi.org/10.47065/josh.v3i3.1432

Kementerian Pendidikan dan Kebudayaan. (2020). *Rencana Strategis Kementerian Pendidikan Dan Kebudayaan 2020-2024*.

Nofriansyah, D., & Defit, S. (2017). *Multi-Criteria Decision Making (MCDM) pada Sistem Pendukung Keputusan*. Deepublish.

Ramadhan, R. (2023). Implementasi dan Analisis Metode MOORA dan SMART pada Pemilihan Platform Jual Beli Online menggunakan Decision Support System. *Komputika : Jurnal Sistem Komputer*, *12*(1). https://doi.org/10.34010/komputika.v12i1.9300

Ramadhan, R., & Eliyen, K. (2022). Implementasi Metode Topsis Pada Decision Support System Untuk Penilaian Mahasiswa Berbasis Prestasi Akademik Dan Non Akademik. *Rabit : Jurnal Teknologi Dan Sistem Informasi Univrab*, *7*(2). https://doi.org/10.36341/rabit.v7i2.2470

Ramadhan, R. F., & Eliyen, K. (2022). Implementasi Metode Analytical Hierarchy Process pada Penilaian Mahasiswa Berprestasi Berbasis Decision Support System. *Jurnal Informatika Dan Rekayasa Perangkat Lunak*, *4*(2), 98–105.

Wahyu Adi Kurniawan. (2019). Sistem Pendukung Keputusan Pencarian Universitas di Malang Menggunakan Weight Product dengan Pembobotan Weighted Sum Model. *Jurnal Ilmiah Informatika*, *4*(2), 103–110. https://doi.org/10.35316/jimi.v4i2.554