

Implementation of a Golf Club Selection Decision Support System Using the Simple Additive Weighting (SAW) Method

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Abstract

The selection of golf clubs that suit the characteristics of the players is an important factor in improving the performance of the game. Each golf club has different specifications, such as flexibility, kick point, weight, and price, so the selection process requires consideration of several criteria at the same time. The conventional election process often takes a long time and has the potential to cause subjectivity in decision-making. Therefore, this study aims to apply the Simple Additive Weighting (SAW) method in the Decision Support System to help determine the most suitable golf club based on several criteria that have been set. The SAW method is used because it is able to carry out the process of weighting and ranking alternatives systematically through the normalization stage and calculation of preference values. The criteria used in this study include kick point, flexibility, price, and weight. The calculation results show that the SAW method is able to produce different preference values for each alternative so that the ranking process can be carried out objectively. Based on the evaluation results, Basileus Spada 2 60 Stiff (S) Low Kick (L) obtained the highest preference value of 0.949, so it is recommended as the best alternative. Thus, the application of the SAW method can help the decision-making process in selecting golf clubs in a more structured, objective, and efficient manner.

Keywords: Decision Support System, Simple Additive Weighting, SAW, Golf Club Selection, Multi Criteria.

1 Introduction

Leonian Golf is an international company engaged in the sale of golf sports equipment and clothing that has a wide distribution network to various countries, including Indonesia. As one of the well-known golf equipment providers, Leonian Golf continues to expand the market by opening branches in various major cities to improve product accessibility and service quality to customers. To date, Leonian Golf has operated 12 branches in various regions of Indonesia as part of its business development strategy and improved customer service. As public interest in the sport of golf increases, the need for equipment that matches the characteristics of players is also getting higher. This condition requires companies to provide service that is not only fast, but also accurate and professional in helping customers choose the right equipment (Indri Tri Julianto, 2025).

Golf is one of the sports that uses the main tool in the form of a club to hit the ball towards the hole with the minimum number of strokes possible (Mustafa, 2024). In practice, the game of golf is greatly influenced by the quality of the equipment used, especially golf clubs which have a major role in producing optimal strokes. Each golf club has different technical specifications, such as the level of shaft flexibility, club weight, bending point or kick point, and price. The variation in these specifications causes each player to need a different type of stick according to the characteristics of the game they have. Factors such as swing speed, playing style, posture, and player ability level are important considerations in determining the most suitable golf club.

In practice, the process of selecting golf clubs is usually assisted by an expert known as a fitter. Fitters have a crucial role in analyzing the



characteristics of a player's stroke through a series of testing processes using special analysis tools. The device is able to measure various technical parameters such as ball speed, mileage, ball launch angle, and the level of stroke stability. Based on the results of these measurements, the fitter then provides recommendations for the type of golf club that is considered most suitable for the player's characteristics. This approach aims to ensure that the sticks used are able to support optimal game performance.

However, the process of selecting golf clubs through the manual trial method often takes quite a long time, especially when the number of brands and types of clubs available is very large. In a single fitting session, a customer can try several types of sticks before finding the most suitable option. The average time required for this process can be up to 1–2 hours. This condition has the potential to cause long queues, especially when the level of customer visits is high. In addition, an evaluation process that relies entirely on the fitter's experience can also give rise to a certain level of subjectivity in decision-making.

These problems show the need for an approach that can help the decision-making process more quickly, systematically, and objectively. One of the approaches that can be used is the Decision Support System (SPK). SPK is a system designed to help decision-makers solve semi-structured problems by utilizing data, models, and certain criteria (Octavia & Harefa, 2023). By utilizing SPK, the evaluation process of various alternatives can be carried out in a more structured manner so that the resulting decisions become more objective and accountable.

In the context of selecting golf clubs, the application of SPK can help evaluate various club alternatives based on a number of relevant criteria (Gunawan & Ariany, 2023). One of the methods that can be used in a multicriteria decision support system is Simple Additive Weighting (SAW). The SAW method is one of the methods in the Multi-Criteria Decision Making (MCDM) approach that works by giving weight to each criterion and calculating the preference value of each alternative through the process of normalization and weighted addition (Setyani & Sipayung, 2023). This method is widely used in various studies because it has a simple calculation process, is easy to implement, and is able to produce alternative rankings

objectively based on the preference values obtained (Wahyuningtyas et al., 2024).

The advantage of the SAW method lies in its ability to process a number of criteria simultaneously to produce the best alternative recommendations. In this study, the criteria used in the golf club evaluation process include flexibility, weight, kick point, and price (Pratama Putra, P., Toresa, D., Fadrial, Y. E., Sari, P., Muzawi, R., Sularno, S., & Sahrin, 2022). These four criteria were chosen because they are considered the main factors that affect the comfort and performance of players in using golf clubs. Through the process of normalization and weighting of these criteria, the SAW method is able to produce a preference value that describes the level of suitability of each alternative to the needs of the player.

Although Decision Support Systems have been widely applied in various fields, such as product selection, employee selection, and multi-criteria purchase recommendation systems, research that specifically discusses the application of SPK in golf club selection is still very limited, especially in the context of the sports retail industry in Indonesia. So far, the golf club fitting process is generally still carried out manually by relying on the experience and intuition of the fitter without being supported by a structured evaluation system to carry out weighting and alternative ranking quantitatively (Meidyanto et al., 2024).

Based on these conditions, this study aims to apply the Simple Additive Weighting (SAW) method in the Decision Support System to help the process of selecting golf clubs based on several predetermined criteria. The application of this method is expected to be able to produce a more systematic, objective, and efficient alternative evaluation process (Hermansyah, D., & Sihotang, 2022). With this system, the golf club recommendation process can be carried out in a more structured manner so that it can help fitters in providing more accurate recommendations and improving the quality of service to customers.

2 Methodologies

The application of the Simple Additive Weighting (SAW) method in this study was carried out through a series of structured and systematic stages. These stages include determining criteria and weighting based on expert considerations, compiling a decision matrix from available

alternative data, the process of normalizing values according to the type of criteria (benefit and cost), and calculating preference values using a weighted addition model (Wijana et al., 2024). Each stage has an important role to play in ensuring that the decision-making process is carried out objectively, consistently, and scientifically accountable. To provide a clearer picture of the flow of application of the SAW method in this study, the calculation stages are presented in the following Figure.



Figure 1 Calculation Stages of the Simple Additive Weighting (SAW) Method

Penerapan Metode Simple Additive Weighting (SAW)

a. Criteria, Types of Criteria, and Weights

This study applied the Simple Additive Weighting (SAW) method to determine the best golf club recommendations. Based on the consideration of experts/fitters, 4 criteria are used, each of which has the following weights and types of criteria: Kick

Point (C1) as a benefit with a weight of 0.20; Flexibility (C2) as a benefit with a weight of 0.35; Price (C3) as a cost with a weight of 0.15; and Weight (C4) as a benefit with a weight of 0.30. The total weight is 1.00. The determination of benefit and cost criteria aims to ensure that the normalization process can be carried out appropriately according to the characteristics of each criterion.

b. Alternative Data (Golf Stick Products)

The analysis assessed in this study is 30 golf club products available, covering several brands/series such as Basileus and Fujikura. Each product has a value on the four criteria, namely Kick Point, Flexibility, Price (millions of rupiah), and Weight (grams). The alternative data is used as an initial decision matrix before normalization.

c. Decision Matrix Normalization

The normalization stage is carried out to equalize the scale of values in each criterion. The SAW normalization formula used is:

Benefit criteria (the bigger the better):

$$r_{ij} = \frac{x_{ij}}{\max(x_{ij})}$$

Cost criteria (the smaller the better):

$$r_{ij} = \frac{\min(x_{ij})}{x_{ij}}$$

The normalization results for all alternatives in the four criteria have been presented in the normalization table (r) in the document, so that the next stage can directly calculate the preference value.

d. Calculation of Preference Value (vi)

The preference value of each alternative is calculated using the equation:

$$v_i = \sum_{j=1}^n (w_j \times r_{ij})$$

With:

V_i = the final value of the i-i alternative

w_j = weight criterion to j

r_{ij} = alternative normalization value i in criterion j

Calculation for Product 1 ($r = [1; 1; 0,40; 0,83]$):
 $V_1 = (0,20 \times 1) + (0,35 \times 1) + (0,15 \times 0,40) + (0,30 \times 0,83)$
 $V_1 = 0,20 + 0,35 + 0,06 + 0,249 = 0,859$

The same calculation was carried out on all 30 products to obtain the final ranking.

e. Ranking Results 30 Products

The following are the results of the ranking of 30 products based on consistent SAW calculations using weights and normalization tables:

Table 1 Results of Golf Stick Product Ranking Using the SAW Method

Rank	Product No.	Product Name	Vi
1	9	Basileus Spada 2 60 Stiff (S) Low Kick (L)	0,949
2	22	Basileus Betha II 60 Stiff (S) Low Kick (L)	0,921
3	2	Basileus AAA Premium 2021 60 Stiff (S) Low Kick (L)	0,907
4	8	Basileus Spada 2 50 Stiff (S) Low Kick (L)	0,907
5	26	Fujikura Ventus Blue 50 Stiff (S) Middle Kick (M)	0,881
6	13	Basileus Tri Fiana 60 Stiff (S) Middle Kick (M)	0,874
7	5	Basileus AAA Standard 60 Stiff (S) Middle Kick (M)	0,868
8	1	Basileus AAA Premium 2021 50 Stiff (S) Low Kick (L)	0,859
9	16	Basileus Tri Legero 60 Stiff (S) High Kick (H)	0,836
10	12	Basileus Tri Fiana 50 Stiff (S) Middle Kick (M)	0,83
11	4	Basileus AAA Standard 50 Stiff (S) Middle Kick (M)	0,823
12	7	Basileus Legerro 2 60 Stiff (S) High Kick (H)	0,815

Rank	Product No.	Product Name	Vi
13	28	Fujikura Ventus Black 60 Stiff (S) High Kick (H)	0,815
14	19	Basileus Shaft Z II 60 Stiff (S) High Kick (H)	0,787
15	20	Basileus Alpha II 60 Stiff (S) High Kick (H)	0,782
16	23	Basileus Deltha II 60 Stiff (S) High Kick (H)	0,782
17	24	Basileus Deltha II 70 Stiff (S) High Kick (H)	0,779
18	29	Fujikura Ventus Black 60 Stiff (S) High Kick (H) (varian 2)	0,764
19	25	Fujikura Ventus Blue 50 Regular (R) Middle Kick (M)	0,757
20	27	Fujikura Ventus Blue 60 Regular (R) Middle Kick (M)	0,744
21	3	Basileus AAA Premium 2022 50 Stiff Regular (SR) Low Kick (L)	0,721
22	18	Basileus Shaft Z II 50 Stiff (S) High Kick (H)	0,719
23	21	Basileus Betha II 50 Regular (R) Low Kick (L)	0,719
24	15	Basileus Tri Legero 50 Stiff Regular (SR) High Kick (H)	0,704
25	11	Basileus Tri Fiana 50 Regular (R) Middle Kick (M)	0,664
26	6	Basileus Legerro 2 50 Regular (R) High Kick (H)	0,539
27	10	Basileus Tri Fiana 40 Regular (R) Middle Kick (M)	0,554
28	14	Basileus Tri Legero 40 Regular (R) High Kick (H)	0,53
29	17	Basileus Shaft Z II 50 Regular (R) High Kick (H)	0,506
30	30	Fujikura Ventus Red 50 Regular (R) Low Kick (L)	0,586



Based on the calculation of the SAW method with the criteria of Kick Point (0.20), Flexibility (0.35), Price (0.15), and Weight (0.30), the highest preference value was obtained in Product 9, namely Basileus Spada 2 60 Stiff (S) Low Kick (L) with a value of $V_i = 0.9490$. Thus, the product is recommended as the best alternative in the selection of golf clubs on Leonian Golf

3 Results and Discussion

This section presents the results of analysis and discussion of the application of the Simple Additive Weighting (SAW) method in the process of selecting golf clubs based on predetermined criteria. The analysis is carried out through several stages of calculation, starting from the preparation of a decision matrix containing alternative data and criteria, the process of normalizing values according to the type of criteria (benefit and cost), to the calculation of the preference value of each alternative through the weighting process. The resulting preference value is then used as a basis for conducting an alternative ranking process to determine the golf club product that has the highest level of suitability. The results of the calculation process are expected to provide a more objective and structured picture in supporting decision-making in the golf club selection process.

a. Results of the SAW Method Calculation

Based on the normalization and weighting process using the Simple Additive Weighting (SAW) method, a preference value (V_i) was obtained for each of the 30 alternative golf club products. The calculation is carried out by multiplying the normalization value of each criterion by a predetermined weight, namely Kick Point (0.20), Flexibility (0.35), Price (0.15), and Weight (0.30), then adding up all the multiplication results.

From the results of consistent recalculation of the normalization table and weight, the highest preference value of 0.9490 was obtained for Product 9: Basileus Spada 2 60 Stiff (S) Low Kick (L). This product ranks first because it has a combination of optimal values on the Kick Point and Flexibility criteria (maximum value), relatively competitive price, and weight that is included in the highest category (benefit).

Here are the Top 10 products based on the highest preference value:

Table 2. Ten Best Alternatives to the Calculation Results of the SAW Method

Rank	Product Name	V_i Value
1	Basileus Spada 2 60 Stiff (S) Low Kick (L)	0,949
2	Basileus Betha II 60 Stiff (S) Low Kick (L)	0,9205
3	Basileus AAA Premium 2021 60 Stiff (S) Low Kick (L)	0,907
4	Basileus Spada 2 50 Stiff (S) Low Kick (L)	0,907
5	Fujikura Ventus Blue 50 Stiff (S) Middle Kick (M)	0,881
6	Basileus Tri Fiama 60 Stiff (S) Middle Kick (M)	0,8735
7	Basileus AAA Standard 60 Stiff (S) Middle Kick (M)	0,8675
8	Basileus AAA Premium 2021 50 Stiff (S) Low Kick (L)	0,859
9	Basileus Tri Legero 60 Stiff (S) High Kick (H)	0,836
10	Basileus Tri Fiama 50 Stiff (S) Middle Kick (M)	0,83

These results show that there is a significant variation in preference values between products, so that the ranking process can be carried out objectively and measurably.

b. Analysis of the Influence of Criteria on Outcomes

Based on the weights used, the criteria with the greatest influence on the final result are Flexibility (0.35) and Weight (0.30). This means that products with the appropriate shaft flex and optimal weight have the greatest contribution to determining the final ranking. Products with a combination of maximum scores on both criteria tend to be in the

top position. On the other hand, products with low flexibility or suboptimal weight experience a decrease in preference value despite having a lower price. The Price criterion has the least weight (0.15), so price is not the dominant factor in this system. This means that the system focuses more on technical performance than on cost considerations.

c. Evaluation of Consistency and Validity of Calculations

The results of the calculation of preference values using the Simple Additive Weighting (SAW) method show a proportional variation in values in each alternative based on the normalization value and the weight of the criteria that have been determined. The calculation process is carried out by multiplying the normalization value of each criterion by its respective weight, then adding up all the multiplication results to obtain the final preference value (V_i). Based on the results of the calculation, the difference in preference values for each alternative is obtained so that the ranking process can be carried out objectively. The alternatives with the highest preference scores showed the most optimal level of conformity to the criteria used in this study. Thus, the application of the SAW method in this study is able to produce an evaluation and alternative ranking process that is systematic, logical, and in accordance with the combination of weights and criteria that have been determined, so as to support the decision-making process in a more structured manner.

d. Implications of System Implementation

The implementation of a web-based Decision Support System (SPK) using the Simple Additive Weighting (SAW) method provides various benefits in the golf club selection process. One of the main benefits is that it speeds up the fitting process, as the system is able to automatically calculate preference values and rank alternatives based on predetermined criteria. With this system, fitters no longer need to manually evaluate each golf club alternative, so the time required in the decision-making process can be significantly reduced. In addition, the use of the SAW method also helps reduce subjectivity in decision-making, as the resulting recommendations are based on

mathematical calculations that consider the weights and values of each criterion in a structured manner. In addition to speeding up the decision-making process, this system also increases transparency in the golf club selection process. Each resulting recommendation can be clearly explained through the preference value obtained from the results of normalization and weighting of criteria. This allows both fitters and customers to understand the reasons behind choosing certain alternatives in a more rational and measurable way. This transparency can also increase user trust in the system used. On the other hand, the implementation of web-based SPK also contributes to increased service efficiency, especially when the number of customers who come to do golf club fittings is quite large. With a system that is able to provide recommendations quickly and accurately, the service process can be carried out more efficiently so that it can reduce customer waiting time. Overall, this system makes the process of selecting golf clubs no longer solely based on intuition or experience, but is supported by a systematic and data-based quantitative approach, so that the resulting decisions become more objective, consistent, and accountable. Overall, the application of the Simple Additive Weighting (SAW) method in the decision support system for selecting golf clubs has been proven to be able to produce the best alternative recommendations objectively based on a combination of predetermined criteria. The product with the highest preference value can be used as the main recommendation, while other products can still be considered according to the user's needs. These results show that the SAW method is effectively applied to the problem of multicriteria product selection in the sports equipment retail industry.

4 Conclusion

Based on the results of the research that has been conducted, the application of the Simple Additive Weighting (SAW) method in the Decision Support System (SPK) for web-based golf club selection is able to help the decision-making process more systematically and objectively. The SAW method is used to evaluate a number of alternative golf club products based on four main criteria, namely kick point, flexibility, price, and weight. Through the process of normalization, weighting, and calculation of preference values, the



system can generate alternative rankings that show the level of suitability of each product against the predetermined criteria. The calculation results show that the product Basileus Spada 2 60 Stiff (S) Low Kick (L) obtained the highest preference value of 0.949, so it is recommended as the best alternative. Thus, the developed system is able to speed up the golf club selection process, reduce subjectivity in decision-making by fitters, and increase efficiency and transparency in service to customers.

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