Implementation of the SAW Method in a Decision Support System for Selecting the Best Paper in the Devitara Journal

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Abstract

The quality of scientific papers plays a critical role in maintaining the credibility and reputation of academic journals. In many cases, the process of selecting the best paper for publication is still based on subjective assessments, which can lead to inconsistencies and bias. To address this issue, this research proposes the implementation of a Decision Support System (DSS) using the Simple Additive Weighting (SAW) method to assist in the evaluation and selection of the best paper submitted to the Devitara Journal. The SAW method was chosen due to its simplicity and effectiveness in handling multi-criteria decision-making problems. This study defines six evaluation criteria: originality, relevance to the journal's scope, scientific contribution, writing quality, reference novelty, and research significance. Each submitted paper is scored and ranked based on weighted criteria using the SAW method. The results show that the DSS can provide a more objective, efficient, and transparent paper selection process. This system is expected to improve the quality assurance and editorial workflow of the Devitara Journal.

Keywords: **PKH, Decision Table Method**

Introduction

Scientific journals play a crucial role in disseminating research findings and advancing knowledge. The quality of the papers published directly affects the reputation and credibility of a journal. Therefore, the selection process for identifying the best paper in each issue becomes an essential editorial task. However, in many cases, the evaluation of submitted manuscripts still relies on subjective judgment by editors or reviewers. This subjectivity may lead to inconsistencies and potential bias, ultimately affecting the fairness and transparency of the publication process.

To address this issue, a Decision Support System (DSS) can be implemented to aid in the selection process through a structured, quantitative approach. One of the widely adopted methods in DSS is the Simple Additive Weighting (SAW) technique, known for its simplicity and effectiveness in solving multi-criteria decision-making problems [1].

SAW evaluates alternatives based on several criteria by assigning weights to each criterion and calculating the weighted sum of scores. Its application has been proven effective in various sectors, including employee selection, academic performance evaluation, and scholarship awards [2], [3].

In a recent study, Wicaksono et al. (2023) applied the SAW method to assess teacher performance, achieving consistent and objective results [2]. Similarly, Putri and Handayani (2022) used SAW for selecting top-performing employees, resulting in a more accountable and fair evaluation process [3]. Furthermore, Siregar and Fitriani (2020) demonstrated the use of SAW in selecting outstanding students, highlighting its effectiveness in ensuring transparency [4].

Although SAW has been successfully implemented in several domains, its application for evaluating and selecting the best paper in scientific journals—particularly in the context of the Devitara Journal—remains limited. This research aims to develop a Decision Support System using the SAW method to evaluate papers based on multiple criteria, including originality, scientific contribution, writing quality, and relevance to the journal's scope.

The proposed system is expected to assist journal editors in selecting the best paper more objectively and efficiently, thereby improving the overall quality and integrity of publications in the Devitara Journal.

Literature Review

2.1 Decision Support System (DSS)

A Decision Support System (DSS) is a computer-based system that aids decision-making in complex, semi-structured, or unstructured situations. It supports human judgment by providing tools for data analysis and scenario evaluation. According to Pratama et al. [5], a DSS helps decision-makers to choose the best alternative from several options based on specific criteria.

DSS has been applied in numerous fields such as education, healthcare, supply chain, and human resources. For instance, in academic institutions, DSS has been implemented to evaluate student performance and select scholarship recipients [6].

2.2 Simple Additive Weighting (SAW)

The Simple Additive Weighting (SAW) method, also known as the weighted sum method, is one of the most widely used techniques in multi-criteria decision-making (MCDM). It evaluates alternatives by multiplying normalized criteria values with corresponding weights and summing the results [8]. SAW is preferred due to its simplicity, efficiency, and ease of implementation [9]. It has been effectively used in various selection systems such as scholarship selection, employee performance evaluation, and academic decision-making [10].

2.3 Best Paper Selection Criteria

In academic publishing, best paper selection typically considers criteria such as originality, relevance, methodology, clarity, and contribution to the field [11]. To ensure fairness and objectivity, a quantitative and transparent scoring method is essential, making DSS combined with SAW a suitable approach [12]. Recent studies have shown that using SAW in research evaluation systems can significantly improve selection consistency and reduce human bias [13]

2.4 Related Works

Recent implementations of DSS using SAW have been successfully applied in various domains. For instance, in [14], a SAW-based DSS was developed for evaluating student final projects. Meanwhile, [15] applied SAW in the context of journal article review selection, demonstrating improvements in review objectivity and reviewer satisfaction.

Research Methodology

3.1 Research Materials

The materials used in this research involve the development of a Decision Support System (DSS) to assist in selecting the best paper submitted to the Devitara Journal, aiming to support transparency, objectivity, and efficiency in the evaluation process. The system is built using the Simple Additive Weighting (SAW) method, which allows the assessment of papers based on multiple predefined criteria such as originality, methodology, relevance, technical quality, and writing clarity. These criteria are aligned with journal standards and the editorial board's expectations.

3.2 Research Procedures

The stages carried out in this research are as follows:

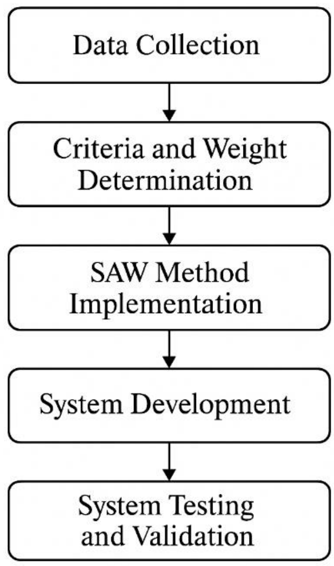

Figure 1. Research Framework

The stages carried out in this Based on the framework in Figure 3.1, each step can be explained as follows:

1. Data Collection
   Data was gathered from the editorial board of Devitara Journal, including historical paper evaluation scores, assessment rubrics, and expert judgment. The data included the following criteria:
   a. Relevance to journal scope

b. Originality
c. Methodological rigor
d. Contribution to knowledge
e. Language and presentation quality.

2. Criteria and Weight Determination
Each criterion was evaluated and assigned a weight based on its importance, determined through discussions with domain experts and literature references. The weights were normalized so that the total equals 1.
3. SAW Method Implementation
The SAW method involves the following steps:
a. Constructing a decision matrix with alternatives (papers) and criteria.
b. Normalizing the decision matrix using benefit and cost criteria.
c. Calculating the weighted sum for each alternative.
d. Ranking the alternatives based on their final scores.
The formula for calculating the final score (Si) of each paper is:

$$\mathrm{Si}\sum_{j=1}^{n} wj.rij$$

where:
Si: Final score of paper i
wj: Weight of criterion j
rij: Normalized score of paper iii for criterion j
4. System Development
Based on the SAW logic, a decision support system is developed—usually as a software or web-based application—to automate the ranking and evaluation process.
5. System Testing and Validation
The final stage involves testing the system to ensure it functions correctly. Validation is done by comparing system outputs with expected results or expert evaluations.

Results

The Simple Additive Weighting (SAW) method, also known as the weighted summation method, is one of the most widely used multi-criteria decision-making techniques. It is valued for its simplicity and effectiveness in evaluating several alternatives based on multiple criteria. The steps of calculation using the SAW method are as follows:

4.1 Determine the Alternatives

Alternatives are the options or candidates to be evaluated based on a set of criteria. In the context of this research, alternatives refer to selected paper submissions, depending on the case application.

Table 1. Best Paper Submissions Alternatives

Code	Paper Title	Author(s)
P1	"Implementation of SAW Method in Decision Support Systems for Employee Appraisal"	Ahmad R., Sari D.
P2	"Optimization of Academic Performance using Naive Bayes Classification"	Budi S., Tania M.
P3	"Development of Smart Farming Systems using IoT and AI"	Rina K., Andi F.
P4	"Design of E-Government Services Based on REST API Architecture"	Deni P., Wahyu H.
P5	"Sentiment Analysis of Twitter Data Using BERT Transformer"	Sinta L., Arif M.

4.2 Determining the Criteria for Decision Making

In the SAW (Simple Additive Weighting) method, determining the decision-making criteria is a crucial step. These criteria serve as the basis for evaluating and comparing each alternative (paper) submitted to the Devitara Journal. The following table shows the criteria used in this study:

Table 1. Decision-Making Criteria

Code	Paper Title	Author(s)
P1	"Implementation of SAW Method in Decision Support Systems for Employee Appraisal"	Ahmad R., Sari D.
P2	"Optimization of Academic Performance using Naive Bayes Classification"	Budi S., Tania M.
P3	"Development of Smart Farming Systems using IoT and AI"	Rina K., Andi F.
P4	"Design of E-Government Services Based on REST API Architecture"	Deni P., Wahyu H.
P5	"Sentiment Analysis of Twitter Data Using BERT Transformer"	Sinta L., Arif M.

4.3 Determining the Weight of Each Criterion

In this stage, each criterion is assigned a weight based on its importance in evaluating the best paper. The weights are given in relative scale and will later be normalized for the Simple Additive Weighting (SAW) calculation. Each criterion is also categorized as either a Benefit (the higher the better) or Cost (the lower the better) criterion.

Table 2. Criteria Weighting

No	Criterion	Code	Weight	Type
1	Relevance to Journal Scope	C1	3	Benefit
2	Originality and Innovation	C2	3	Cost
3	Methodological Rigor	C3	2	Benefit
4	Writing Quality	C4	1	Benefit
5	Contribution to Research/Impact	C5	1	Benefit
	Total		**10**	

The decision matrix shows the scores of each paper (alternatives) based on the evaluation criteria. Each paper is assessed against the same five criteria: relevance, originality, methodology, writing, and contribution.

4.4 Construct the decision matrix based on the criteria, then normalize the matrix using equations adapted to the type of attribute (benefit or cost), resulting in the normalized matrix R.

Table 3. Decision Matrix Based on Criteria

1	3	1	1	1
2	4	2	2	2
3	3	3	3	3
4	2	4	4	4
5	1	5	5	5

From column **C1**, the maximum value is **5**, so each row in column **C1** is divided by the maximum value of column **C1**.

R11 = 1/5 = 0,2
R21 = 2/5 = 0,4
R31 = 3/5 = 0,6
R41 = 4/5 = 0,8
R51 = 5/5 = 1

From column **C2**, the minimum value is **1**, so each row in column **C2** is divided by the minimum value of column **C2**.
R12 = 5/1 = 0,2
R22 = 4/1 = 0,25
R32 = 3/1 = 0,33333333333333
R42 = 2/1 = 0,5
R52 = 1/1 = 1
From column **C3**, the maximum value is **5**, so each row in column **C3** is divided by the maximum value of column **C3**.
R13 = 1/5 = 0,2
R23 = 2/5 = 0,4
R33 = 3/5 = 0,6
R43 = 4/5 = 0,8
R53 = 5/5 = 1
From column **C4**, the maximum value is **5**, so each row in column **C4** is divided by the maximum value of column **C4**.
R14 = 1/5 = 0,2
R24 = 2/5 = 0,4
R34 = 3/5 = 0,6
R44 = 4/5 = 0,8
R54 = 5/5 = 1
From column **C5**, the maximum value is **5**, so each row in column **C5** is divided by the maximum value of column **C5**.
R15 = 1/5 = 0,2
R25 = 2/5 = 0,4
R35 = 3/5 = 0,6
R45 = 4/5 = 0,8
R55 = 5/5 = 1

Table 4. Normalized Factors

0,2	0,2	0,2	0,2	0,2
0,4	0,25	0,4	0,4	0,4
0,6	0,33333333333333	0,6	0,6	0,6
0,8	0,5	0,8	0,8	0,8
1	1	1	1	1

The final result is obtained from the ranking process, which is the sum of the multiplication of the normalized matrix R by the weight vector to obtain the highest value, which is selected as the best alternative solution.
A1 = (0,2*3) + (0,2*3) + (0,2*2) + (0,2*1) + (0,2*1) = 2
A2 = (0,4*3) + (0,25*3) + (0,4*2) + (0,4*1) + (0,4*1) = 3,55
A3 = (0,6*3) + (0,33333333333333*3) + (0,6*2) + (0,6*1) + (0,6*1) = 5,2
A4 = (0,8*3) + (0,5*3) + (0,8*2) + (0,8*1) + (0,8*1) = 7,1
A5 = (1*3) + (1*3) + (1*2) + (1*1) + (1*1) = 10
Berdasarkan perbandingan nilai akhir maka didapatkan
nilai sebagai berikut:
A1 = 2
A2 = 3,55
A3 = 5,2
A4 = 7,1
A5 = 10

Conclusion

Based on the final preference score calculation using the Simple Additive Weighting (SAW) method, the following values were obtained: A1 = 2, A2 = 3.55, A3 = 5.2, A4 = 7.1, and A5 = 10. From these results, it can be concluded that alternative A5 has the highest score and is the best choice in the decision-making process, followed by A4, A3, A2, and A1 respectively. This indicates that A5 most closely meets the established criteria based on the assigned weights and the type of attributes.

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