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Decision Support System In Choosing Cellphone Accessories With The SAW Method On Muda Ponsel

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ABSTRACT

Supplier selection is a crucial factor influencing operational smoothness and service quality for mobile phone accessory businesses. Muda Ponsel currently selects suppliers based on experience and subjective judgment, leading to inconsistent decisions that are difficult to evaluate. This approach makes it challenging for the business owner to identify the best supplier as the number of alternatives grows. Therefore, this study aims to develop a Decision Support System (DSS) to facilitate objective supplier selection for mobile phone accessories using the Simple Additive Weighting (SAW) method. The study employs a quantitative approach, utilizing data collection techniques such as observation, interviews, and literature review. The criteria used for supplier evaluation include quality, price, and warranty. The SAW method is applied through a process involving criteria weighting, decision matrix construction, alternative value normalization, and preference value calculation to rank the best suppliers. The system is designed using Unified Modeling Language (UML) and implemented using PHP and MySQL. Black Box Testing is conducted to ensure all system functions operate as required. The study is expected to yield a system capable of providing objective, rapid, and accurate supplier recommendations based on the highest preference values. Implementing the SAW method can assist the owner of Muda Ponsel in enhancing decision-making effectiveness and efficiency, reducing subjectivity in supplier evaluation, and optimizing the management of supplier partnerships.

INTRODUCTION

Current advancements in technology and the internet have created various new opportunities in the economic and business sectors (Yoga et al., 2025). This has opened up opportunities for the development of financial systems that support the public in establishing new businesses (Sembiring, 2025). This, in turn, has driven business growth in the sale of telecommunications devices, particularly smartphones and mobile phone accessories. Cell phone accessories such as chargers, headsets, data cables, cases, tempered glass screen protectors, and power banks have become essential for people to support their daily smartphone use (Supardi & Lianda, 2025). This situation has led to increasingly fierce competition among businesses selling cell phone accessories. Consumers now demand products of good quality, at affordable prices, and with adequate stock availability (Di et al., 2025).

In the face of this competition, stores selling cell phone accessories must have effective inventory management and supplier selection (Rahman, 2025). uppliers play a crucial role in determining product quality, price stability, on-time delivery, and product availability. Mistakes in selecting suppliers can lead to a decline in the quality of products sold, delays in procurement, and reduced customer satisfaction (Petronela Kurniati Kondang et al., 2025).

Muda Ponsel is a business specializing in the sale of cell phone accessories, located on Jalan Lintas Sumatera, Aek Loba, Aek Kuasan Subdistrict, Asahan Regency, North Sumatra. The store offers a wide variety of cell phone accessories from several suppliers. However, in practice, the supplier selection process is still based on experience and subjective considerations, without a structured evaluation system.

This situation gives rise to several problems. First, the lack of standardized evaluation criteria makes the supplier selection process inconsistent and difficult to evaluate. Second, subjective decisions have the potential to lead to errors in supplier selection, such as substandard product quality, unstable prices, and delayed shipments. Third, the business owner faces difficulties in objectively comparing multiple suppliers as the number of alternative suppliers continues to grow.

Furthermore, the lack of systematic supplier assessment documentation makes it difficult to evaluate supplier performance. As a result, the supplier selection process must be repeated from the beginning, which is inefficient in terms of time and effort.

In the sale of cell phone accessories, product quality, price, and on-time delivery are key factors that significantly determine customer satisfaction. Therefore, a Decision Support System (DSS) is needed to help business owners objectively select the best suppliers based on several criteria.

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There are several strategies that can be used within a dynamic framework, namely the Direct Additive Weighting Strategy (SAW), Weighted Sum (WP), the Analytic Hierarchy Process (AHP), and Multi-Objective Optimization with Proportionality Check (MOORA). A Decision Support System is a computer-based system designed to assist decision-makers in selecting the best alternative from a set of available options based on specific criteria (Lufti Puspitasari et al., 2025). By utilizing sales data as the basis for calculations, DSSs are able to transform raw data into valuable information and support decision-making in an objective, rational, and measurable manner (Dewi & Fahrizal, 2025).

The SPK allows decision-makers to assign weights to each criterion, compare supplier alternatives quantitatively, and generate a ranking of the best suppliers (Ruwllah et al., 2025). With the use of DSS, the supplier selection process no longer relies solely on intuition but is supported by rational and transparent calculations (Pradipta et al., 2025). The implementation of the DSS at Awet Ponsel is expected to help business owners determine the best cell phone supplier based on quality, price, and warranty, thereby minimizing the risk of errors in decision-making (Alvi et al., 2025). The Decision Support System uses the Simple Additive Weighting (SAW) method. The SAW method is known as a simple yet effective weighted summation method for solving multi-criteria decision-making problems (Sutoyo & Iin, 2024). The basic principle of the SAW method is to assign weights to each predetermined criterion and then normalize the values of the alternatives so they can be compared fairly (Wijaya & Wulandari, 2024). he calculation results, in the form of preference values, indicate the level of superiority of each alternative, with the alternative having the highest value selected as the best alternative (Rizky Firdaus et al., 2024). The Simple Additive Weighting (SAW) method is also commonly known as the weighted summation method. The basic concept of the SAW method is to calculate the weighted sum of the performance ratings for each alternative across all attributes. The SAW method requires normalizing the decision matrix (X) to a scale that allows for comparison among all available alternative ratings (Rindang Subekti & Prasetya, 2024).

METHOD

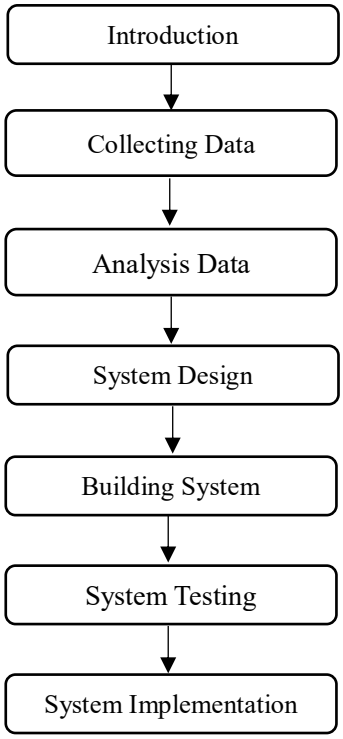


Figure 1. Research Stages

This study employs a quantitative method with the following steps:

Introduction

The initial stage of this research was a preliminary study aimed at gathering input and suggestions regarding the subject of the study. Through this study, the researcher was able to obtain information about the issues addressed in the research. In this study, the issue addressed is the lack of standardized evaluation criteria, which results in an inconsistent supplier selection process that is difficult to evaluate. Subjective decisions have the potential to lead to errors in supplier selection, such as substandard product quality, unstable prices, and delayed deliveries. Business owners face difficulties in objectively comparing multiple suppliers as the number of alternative suppliers continues to grow.

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Collecting Data

The next stage is data collection, which is conducted as part of the research to gather data related to the main research problem namely, a Decision Support System for Selecting the Best Cell Phone Accessory Suppliers Based on Quality, Price, and Warranty at Muda Ponsel through direct observation in accordance with the established criteria.

Analysis Data

In this stage, data analysis is conducted to transform the data into useful information. This ensures that the data can be easily understood and is beneficial to researchers in conducting their research. Following the analysis, it is believed that this problem can be addressed using the SAW method, which can serve as a reference for decision-making.

System Design

After the data analysis phase is complete, the next step is system design, which involves model design using UML, database design, and the definition of inputs and outputs to be generated in accordance with the established objectives.

Building System

This phase involves developing a system using the PHP programming language and a MySQL database to achieve a goal based on the requirements for a decision support system designed to identify the best supplier of cell phone accessories based on sales.

System Testing

In this phase, system testing is conducted to determine whether the developed system is capable of solving the problem as intended. Here, the developed system is tested using the black-box testing method. The black-box testing method is used to identify errors and demonstrate the application's functionality during operation, verifying whether inputs are accepted correctly and whether the resulting outputs match expectations.

System Implementation

After system testing is complete, the next step is system implementation. This phase is carried out to create and finalize the results of the design. During this phase, program code is written to solve the problems that were designed using the PHP and MySQL programming languages.

RESULT

Analysis Data

In the system process analysis using the Simple Additive Weighting method, it is necessary to determine the criterion values, criterion weights, number of criteria, and alternative preferences, as well as to assign preference values to each alternative. Next, the total score will be calculated to determine the best supplier of cell phone accessories as shown in the Table 1 below.

Table 1. Criteria

No	Evaluation Criteria	Criteria Code	Wight
1	Product Quality	C1	0.35
2	Price	C2	0.30
3	On-Time Delivery	C3	0.20
4	Stock Availability	C4	0.15

Table 1 presents the evaluation criteria and their respective weights used in the supplier selection process. The weights were determined based on the business priorities identified through observations and interviews with the owner of Muda Ponsel. Product Quality (C1) receives the highest weight (0.35) because it directly affects customer satisfaction and product reliability. Price (C2) is assigned a weight of 0.30 since competitive pricing influences profitability and purchasing decisions. On-Time Delivery (C3) has a weight of 0.20 because timely product delivery ensures stock availability and uninterrupted business operations. Finally, Stock Availability (C4) is weighted at 0.15, reflecting the supplier's ability to consistently provide the required products.

These criteria and weights serve as the basis for the Simple Additive Weighting (SAW) calculation. Each supplier is evaluated against all criteria, after which the values are normalized and multiplied by the corresponding criterion weights. The weighted scores are then summed to obtain the final preference value, which is used to rank suppliers objectively and determine the most suitable supplier for Muda Ponsel.

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Design System

The use case diagram describes the administrator. The proposed use case diagram is shown in Figure 2.

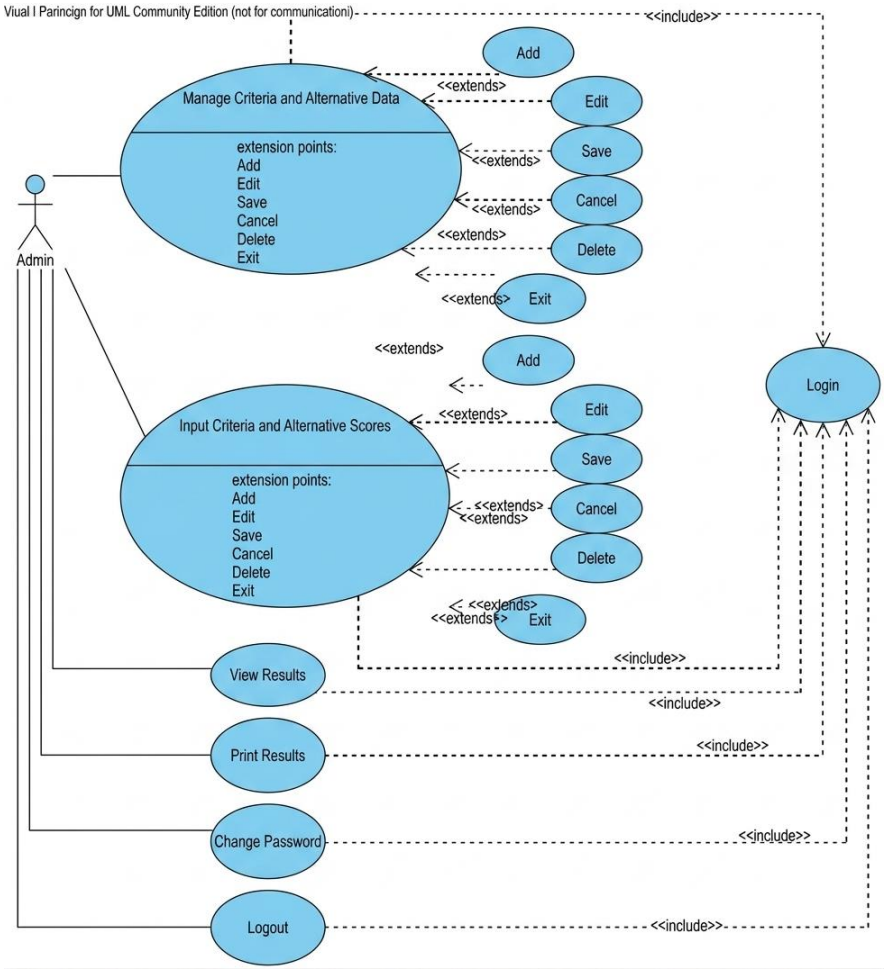


Figure 2. Design System

Figure 2 illustrates the overall design of the proposed Supply Chain Management (SCM) system. The system integrates the main business processes, including supplier management, inventory management, purchase ordering, sales transactions, and report generation into a single web-based application. The workflow begins with user authentication, where the administrator logs into the system to access operational modules according to authorized access rights.

After successful authentication, the administrator manages master data such as products, suppliers, and inventory records. The system then supports procurement activities by recording purchase orders submitted to suppliers and automatically updating inventory when purchased goods are received. Sales transactions performed by customers also trigger automatic inventory updates, ensuring that stock information remains accurate and available in real time. Finally, the system generates operational reports that summarize procurement, inventory, and sales activities, providing managers with reliable information for decision-making and business evaluation.

Implementation System

Program implementation is the stage at which a system whose design has been finalized and approved is put into use. The implementation stage also covers the deployment of the developed application.

Login Page

On this login form, users must first enter their username and password, then click the login button.

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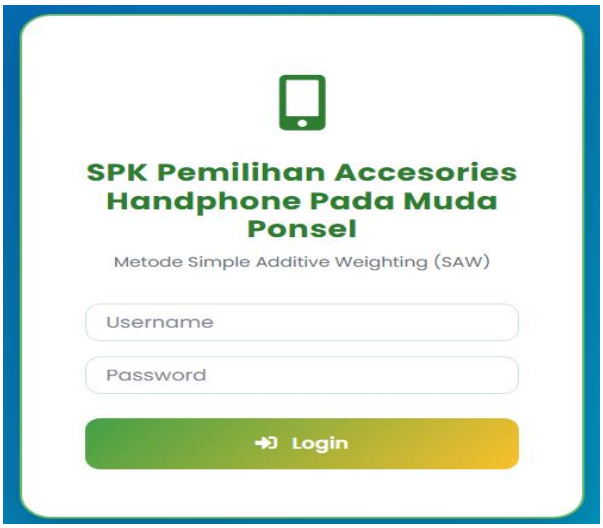


Figure 3. Login Page

Home Admin

This main menu form contains the menus and submenus found in the previously designed Admin system; users can select from the menus provided by the system that has been created.

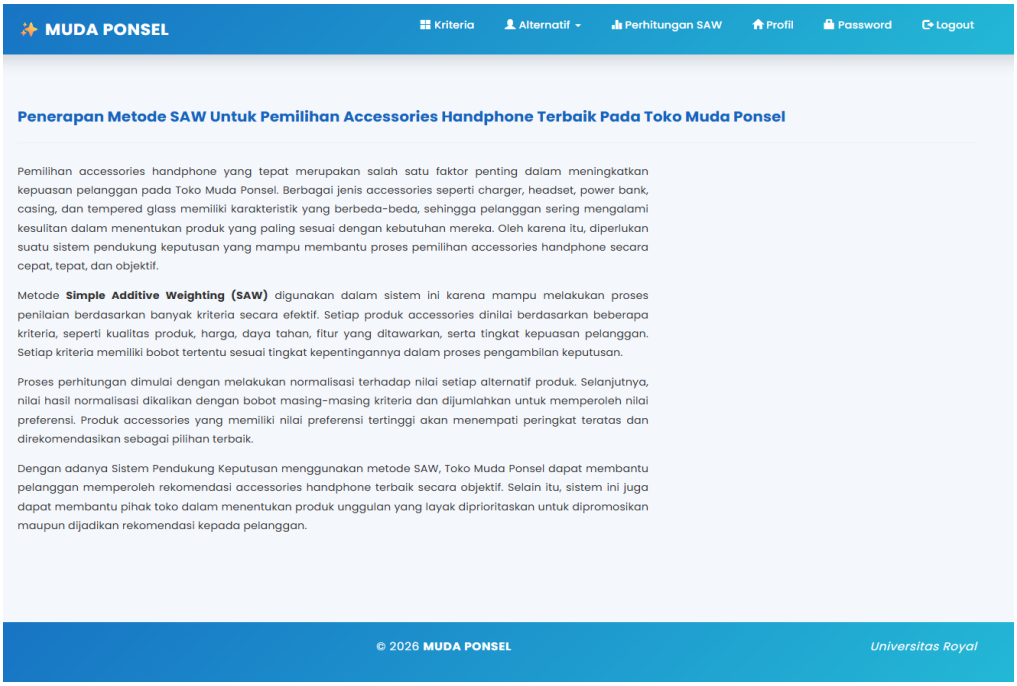


Figure 4. Home Admin

Criteria Page

Figure 5 presents the Criteria Page, which is used by the administrator to manage the evaluation criteria applied in the supplier selection process. This page allows the administrator to add, edit, update, or delete criteria according to the business requirements. Each criterion is assigned a predefined weight that reflects its relative importance in the decision-making process.

The criteria stored in this module serve as the primary input for the Simple Additive Weighting (SAW) method. During the evaluation process, each supplier is assessed against these criteria, and the corresponding weights are applied to calculate the final preference value. By managing the criteria through this page, the system ensures that the supplier evaluation process remains consistent, objective, and aligned with the company's procurement priorities. Furthermore, any modification to the criteria or their weights is automatically reflected in subsequent SAW calculations, allowing the decision-making process to remain flexible while maintaining accuracy and transparency.

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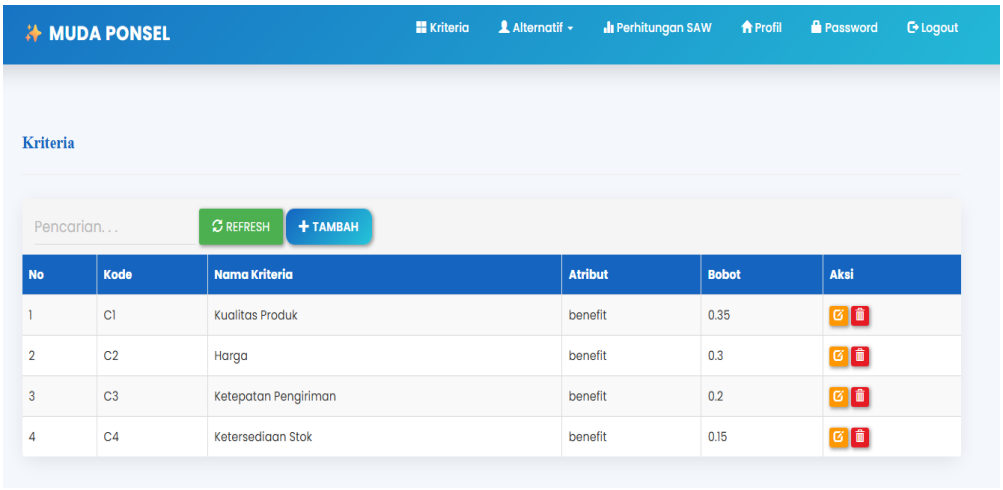


Figure 5. Criteria Page

Alternative Page

Figure 6 presents the Alternative Page, which is used to manage supplier data as the alternatives evaluated in the decision support system. Through this page, the administrator can add new suppliers, modify existing supplier information, or remove suppliers that are no longer considered in the evaluation process. Each supplier record contains the information required for assessment based on the predefined criteria.

During the decision-making process, every supplier entered on this page becomes an alternative in the SAW calculation. The administrator subsequently assigns performance scores for each criterion, such as product quality, price, on-time delivery, and stock availability. The complete and accurate input of alternative data ensures that the ranking process is objective and reflects the actual performance of each supplier.

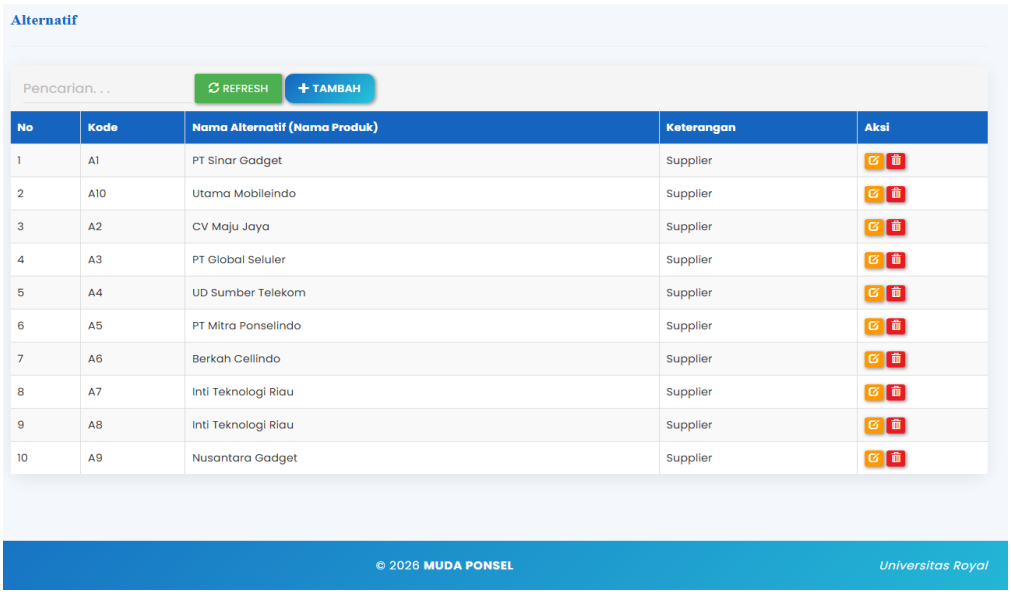


Figure 6. Alternative Page

Calculation Page

Figure 7 illustrates the Calculation Page, where the Simple Additive Weighting (SAW) method is executed to determine the best supplier. After the criteria, weights, and alternative scores have been entered, the system automatically normalizes the decision matrix according to the characteristics of each criterion (benefit or cost).

The normalized values are then multiplied by their corresponding criterion weights, and the weighted scores are summed to produce the final preference value for each supplier. Based on these values, the system ranks all alternatives in descending order. This automated calculation minimizes manual errors, improves consistency, and provides an objective basis for supplier selection.

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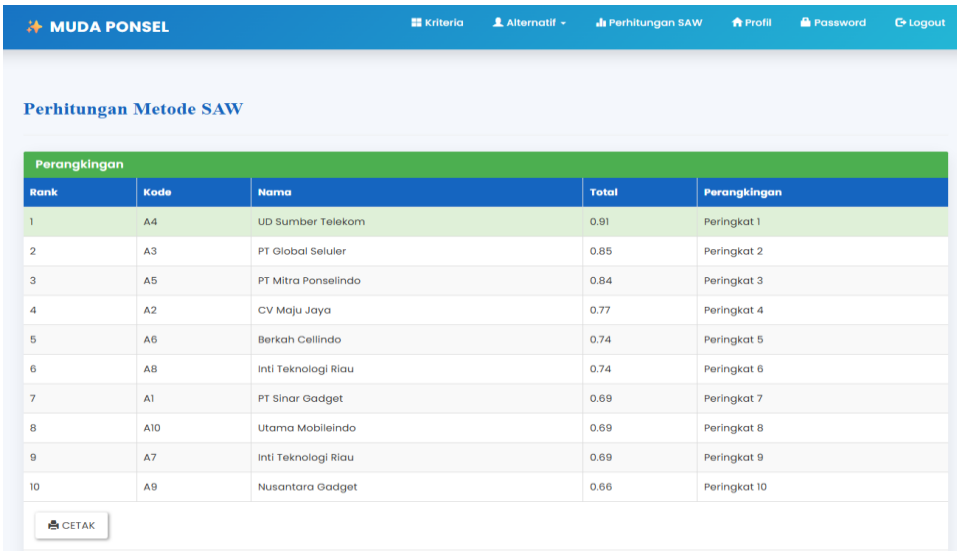


Figure 7. Calculation Page

Report Page

Figure 8 shows the Report Page, which presents the final results of the supplier evaluation process. After completing the SAW calculation, the system automatically generates a report containing supplier information, evaluation results, preference values, and the final ranking of all alternatives.

This report serves as a decision-support document for business owners when selecting the most suitable supplier. In addition to facilitating documentation, the report enables users to review previous evaluation results and compare supplier performance over time. Consequently, procurement decisions become more transparent, traceable, and supported by quantitative evaluation results rather than subjective judgment.

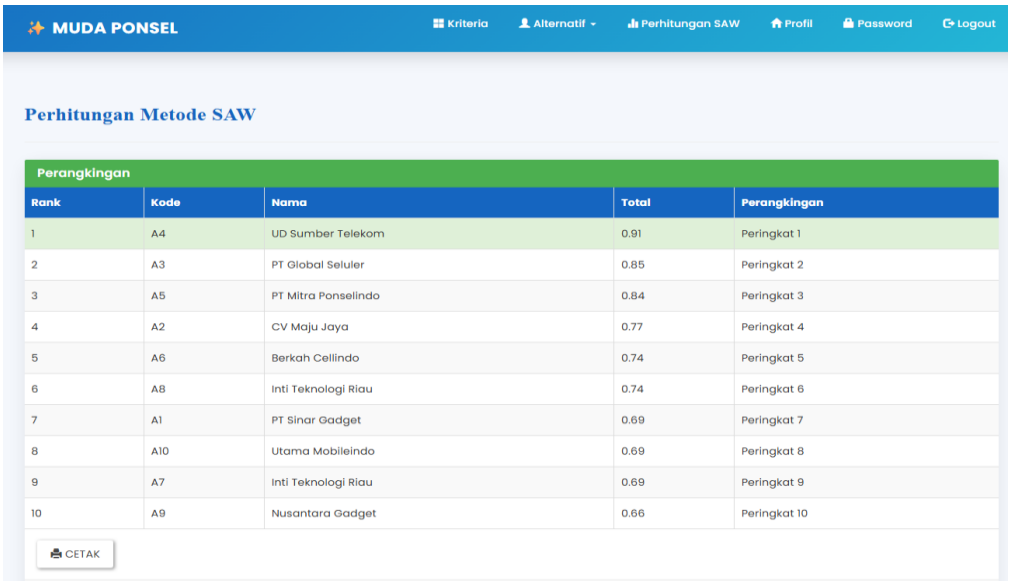


Figure 8. Calculation Page

DISCUSSION

The implementation of the Decision Support System (DSS) using the Simple Additive Weighting (SAW) method successfully addressed the supplier selection problems previously experienced by Awet Ponsel. Before the system was developed, supplier selection relied primarily on subjective judgment based on personal experience, making the evaluation process inconsistent and difficult to reproduce. Business owners also faced challenges in comparing multiple suppliers objectively because each supplier offered different levels of product quality, price, delivery performance, and stock availability.

After implementing the proposed system, supplier evaluation became more systematic because all alternatives were assessed using predefined criteria and corresponding weights. The SAW method normalized the values of each supplier and calculated preference scores objectively, allowing the system to generate supplier rankings based on

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quantitative evaluation rather than intuition. Consequently, the decision-making process became more transparent, consistent, and easier to justify.

The findings of this study are consistent with previous research, which reported that the SAW method is effective for solving multi-criteria decision-making problems because of its simple computational procedure and its ability to rank alternatives objectively (Lufti Puspitasari et al., 2025; Rindang Subekti & Prasetya, 2024). Previous studies have also shown that decision support systems improve the quality of decision-making by reducing subjectivity and providing measurable evaluation results (Alvi et al., 2025; Petronela Kurniati Kondang et al., 2025). However, unlike many earlier studies that focused on employee selection, scholarship recipients, or marketing strategy evaluation, this research applies the SAW method to supplier selection in a mobile phone accessories business. Furthermore, the developed application integrates supplier data management, evaluation criteria, SAW calculations, and report generation into a single web-based system.

From a practical perspective, the proposed system enables business owners to evaluate suppliers more efficiently while maintaining consistent assessment standards. The automated ranking process reduces the time required for supplier evaluation and minimizes the possibility of subjective decision-making. In addition, the integrated reporting feature facilitates documentation and monitoring of supplier performance for future procurement decisions. Therefore, the developed system not only improves operational efficiency but also contributes to a more objective, transparent, and accountable supplier selection process.

CONCLUSION

The application of the MOORA method to the Supplier Selection Decision Support System was developed to assist companies in determining the best suppliers based on predetermined criteria, thereby making the decision-making process easier, faster, and more accurate. The design of the Supplier Selection Decision Support System application, which utilizes the MOORA method, is capable of providing objective supplier evaluations and rankings based on a systematic calculation process that accounts for the weight of each criterion. Based on the test results conducted using an admin account, the developed system functions in accordance with user needs. All features operate properly, ranging from the management of supplier data, criteria data, and evaluation data, to the MOORA method calculation process and the presentation of supplier ranking results, making the system suitable for use as a tool to aid in supplier selection decision-making.

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