JURNAL TIMES
TECHNOLOGY INFORMATICS & COMPUTER SYSTEM

Volume XIV No 1, Juni 2025
*p*ISSN : 2337 – 3601
*e*ISSN : 2549 – 015X

Tersedia *online* di http://ejournal.stmik-time.ac.id

WEB-BASED DECISION SUPPORT SYSTEM FOR DIRECT CASH ASSISTANCE (BLT) SELECTION IN KALASEY SATU VILLAGE USING PROFILE

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Abstract
Direct Cash Assistance (BLT) is a government program to help underprivileged people. The selection process of BLT recipients in Kalasey Satu Village is still manual, which took a long time and has a high risk of errors. This study aims to implement a web-based Decision Support System using the Profile Matching method to assist the village government in selecting 56 recipients from 120 candidates. The system was developed with the waterfall model using PHP and MySQL, with selection criteria including economic, family, and social aspects. The results showed that candidate A87 obtained the highest score of 4.5245833, and A83 the lowest at 2.0941666. The system was tested using black box testing and functions properly. This system is expected to help the village government determine BLT recipients
Keywords: Direct Cash Assistance, Decision Support System, Profile Matching, Website

1. Introduction

Poverty remains a significant social issue in Indonesia, particularly in rural areas. To address this challenge, the Government of Indonesia introduced the Direct Cash Assistance (BLT) program, financed through Village Funds (BLT-DD) [1]. The BLT-DD program aims to alleviate the economic burden of vulnerable communities by providing financial support to meet their essential daily needs [2]. Nevertheless, the effectiveness of BLT distribution is highly dependent on the accuracy and fairness of the beneficiary selection process. In Kalasey Satu Village, the selection of BLT recipients is still conducted manually through data collection and subjective decision-making by village officials. This manual approach is not only time-consuming, often taking more than two months, but also susceptible to errors and inconsistencies.

In a previous period, Kalasey Satu Village identified 120 households as potential BLT recipients through initial data collection. However, due to budget constraints and quota limitations, only 56 households were eligible to receive the assistance. Manually evaluating such a large number of candidates increases the likelihood of inaccuracies, delays in aid distribution, and perceptions of unfairness among residents, which may trigger social tensions. To address these challenges, a Decision Support System (DSS) can be utilized to support decision-making in semi-structured or unstructured contexts by providing relevant and processed information for timely and accurate decisions [3][4]. Unlike automated systems that independently generate decisions, a DSS functions as an analytical tool that assists decision-makers in evaluating data against predefined criteria. One effective DSS approach is the Profile Matching method, which assumes the existence of an ideal level of predictor variables that candidates should achieve, rather than merely satisfying minimum requirements [5]. This method systematically compares candidate profiles with the ideal profile to identify gaps, thereby enabling the selection of alternatives that most closely align with the established criteria [6].

Previous studies have applied methods such as Simple Additive Weighting (SAW) to address similar selection problems [2]. However, these methods are less effective in evaluating profile-based compatibility. Therefore, this study aims to develop a web-based Decision Support System (DSS) that implements the Profile Matching method to assist officials in Kalasey Satu Village in accurately and objectively selecting 56 recipients from 120 eligible candidates, while minimizing potential selection bias.

2. Literature Review

Decision Support System

The basic concept of Decision Support Systems (DSS) originated in the 1960s with the introduction of the Management Decision System (MDS) by Michael Scott Morton [7]. DSS is designed to assist in solving problems that are semi-structured or unstructured by providing relevant and processed information to support decision-making [3]. It does not function as a fully autonomous decision-maker, but rather as a tool that enhances the quality and speed of human decisions through data analysis [4].

Herbert A. Simon, a pioneer in decision theory, identified four key stages in the decision-making process [8]. The first stage, the intelligence phase, involves scanning and identifying problem situations. This is followed by

the design phase, which entails formulating and analyzing possible solutions. In the choice phase, a specific course of action is selected. Lastly, the implementation phase involves executing the chosen solution to resolve the problem, although this stage can often be complex and iterative.

These phases form the conceptual foundation of DSS design, which aims to facilitate decision-makers in structuring and analyzing data in support of strategic and operational choices.

Profile Matching Method

The Profile Matching method is widely used in decision-making processes based on the assumption that there is an ideal level of predictor variables that candidates should achieve, not merely meet minimum requirements [5]. This method compares each candidate's actual profile with the ideal profile to identify the gap, which indicates how closely a candidate meets the expected competencies. A smaller gap corresponds to a higher weighted score, increasing the candidate's likelihood of being prioritized in the selection process.

The stages of the Profile Matching method are as follows:

a. Determine criteria to be used as decision variables.
b. Set target values for each criterion to define the ideal profile.
c. Input actual values for each candidate based on their data.
d. Calculate the GAP using

$$GAP = Object\ Value - Target\ Value \quad (1)$$

e. Assign GAP weights according to the standard scale, shown in Table 1:

Gap	Score	Description
0	5	No gap (competency matches exactly what is needed)
1	4.5	Individual's competency exceeds by 1 levels
-1	4	Individual's competency lacks by 1 levels
2	3.5	Individual's competency exceeds by 2 levels
-2	3	Individual's competency lacks by 2 levels
3	2.5	Individual's competency exceeds by 3 levels
-3	2	Individual's competency lacks by 3 levels
4	1.5	Individual's competency exceeds by 4 levels
-4	1	Individual's competency lacks by 4 levels

f. Calculate NCF (Core Factor Average) using:

$$NCF = \frac{\sum Core\ Weights}{\sum Number\ of\ Core\ Items} \quad (2)$$

g. Calculate NSF (Secondary Factor Average) using:

$$NSF = \frac{\sum Secondary\ Weights}{\sum Number\ of\ Secondary\ Items} \quad (3)$$

h. Calculate aspect score by combining NCF and NSF with respective weight percentages:

$$N_{\text{aspect}} = X\% \times NCF + X\% \times NSF \quad (4)$$

Where X% is the proportion weight assigned to core and secondary factors

i. Determine total score by aggregating scores from each aspect with aspect weight percentages:

$$D = (X\% \times P_1) + (X\% \times P_2) + (X\% \times P_3) \quad (5)$$

Where D is the total score determining the ranking of each candidate

The Profile Matching method provides an objective way to rank candidates by measuring how closely they match the ideal profile defined by decision-makers. This approach is especially effective for multi-criteria selection processes requiring detailed evaluation of candidate competencies.

Unified Modeling Language

Unified Modeling Language (UML) is a modeling language for object-oriented systems or software. The modeling is actually used to simplify complex problems to make them easy to learn and understand[9].

Waterfall

The waterfall method is a method that approaches the software life cycle, starting with the stages of analysis, design, coding, testing, and support. It can be concluded that this waterfall method is a system that works

sequentially, so that there is no duplication at any of these stages[10]. Figure 1 shows the stages in the waterfall method.

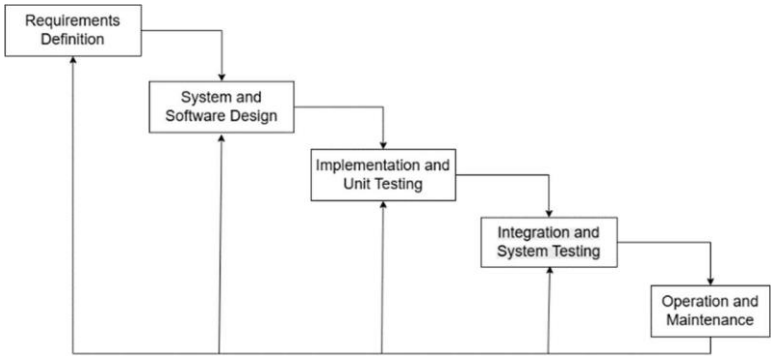

Figure 1. Waterfall Method [11]

Black Box Testing

Black Box Testing is a system testing method that evaluates website functionality without checking the internal structure or operational mechanisms of the system[12]. This method aims to make sure that the system functionality is in compliance with predetermined specifications. With this method, software developers can design various input conditions to verify that all requirements in the program have been fulfilled[13].

3. Research Methods

Data

The data source collected in this research is primary data - data collected directly at the location of the research. The data used is 120 data on prospective recipients of Direct Cash Assistance (BLT) in Kalasey Satu Village.

Research Stages

At this stage of the research will explain the steps taken by the researcher, can be seen in Figure 2.

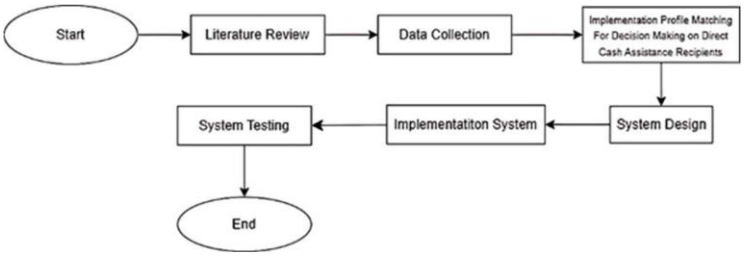

Figure 2. Research Stages

Development Method

Software development in this research will use the waterfall method. This method is systematic and coherent, where each stage in the development process must be completed before the next stage begins. The stages in the waterfall method are described as below:

a. Requirements Analysis: at this stage, interviews will be conducted with village officials to identify problems in the selection of direct cash assistance recipients in Kalasey Satu Village.
b. System Design: at this stage is designing a system based on the analysis of the needs of the previous stage. System design using Unified Modeling Language (UML), including Use Case Diagram, Activity Diagram, Class Diagram.
c. Implementation: is stage of implementation of the design into the program code. The program code is written using the Hypertext Markup Language (HTML) programming language for interface display and PHP: Hypertext Preprocessor (PHP). While as a Database Management System (DBMS) using MySQL.
d. Testing: this stage is for testing the system that has been built. This test uses black box testing to test system functionality. The purpose of this test is to identify potential failures and defects in the system, so that it is hoped that the resulting output is as expected and in accordance with user needs.
e. Maintenance and Operational: at this stage, the completed system will be given to the Kalasey Satu Village government to be operated and go through a maintenance process. This maintenance includes fixing or modifying errors that have been detected previously, repairing system implementation, and upgrading system services to meet new needs.

4. Results

Data Description

Based on the interviews, five key conditions were identified as the basis for determining eligibility for Direct

Cash Assistance (BLT)

a. Loss of Income: This criterion targets individuals with no or minimal sources of income. Indicators include employment status, income level, house condition, and ownership of productive assets.
b. Having Family Members with Chronic Illness or Disabilities: Candidates who have family members requiring long-term care due to illness or disability are prioritized. Indicators include the number of family members affected and the presence of chronic conditions.
c. Not Receiving Other Government Assistance (e.g., PKH): To avoid duplication of social support, preference is given to families not currently enrolled in other assistance programs.
d. Households with Elderly Members: Elderly individuals or those living with elderly dependents are prioritized, particularly those aged 60 and above, as they are generally less economically productive.
e. Female-Headed Households in Poverty: Women serving as heads of households from poor families are also prioritized, especially those with dependents and low educational or economic backgrounds.
f. These five eligibility conditions were then translated into system criteria and grouped under three primary assessment aspects: Economic, Family, and Social. Each criterion and its sub-indicators were assigned specific codes to support structured analysis using the Profile Matching method (e.g,, E1 for income). The full, shown in Table 2.

Table 2. Criteria *BLT* Recipients

Aspect	Code	Criteria	Sub Criteria	Value	Type
Economy	E1	Income	No Income	5	Core Factor
			≤ 500,000/month	4	
			500,000 < $x \leq$ 1,000.000/month	3	
			1,000,000 < $x \leq$ 1,500,000/month	2	
			> 1,500.000/month	1	
	E2	Job	No job	5	Core Factor
			No permanent job	3	
			Have permanent job	1	
	E3	House condition	Self-owned Permanent House	1	Secondary Factor
			Rented Permanent House	2	
			Self-owned Semi-PermanentHouse	3	
			Rented Semi-Permanent House	4	
			House not suitable forhabitation	5	
	E4	Assets	No assets	5	Secondary Factor
			Very few assets	4	
			Basic assets	3	
			Some assets	2	
			Sufficient assets	1	
Family	K1	Family members with disabilities	None	1	Core Factor
			1	2	
			> 1	3	
	K2	Have chronic conditions	Yes	2	Secondary Factor
			No	1	
	K3	Family memberswith chronic conditions	None	1	Core Factor
			1	2	
			> 1	3	
	K4	Age	< 60	1	Secondary Factor
			60 ≤ x < 65	2	
			65 ≤ x < 70	3	
			≥ 70	5	
	K5	Number of dependent	0	1	Core Factor
			1	2	
			2	3	
			3	4	

		s	≥ 4	5	
Social	S1	Other beneficiaries status	Yes	1	Core Factor
			No	2	
	S2	Household head	Male	1	Core Factor
			Female	2	
	S3		No education	5	Secondary Factor
		Educational Status	Elementary school		
			Junior high school		
			Senior high school		
			Diploma		
			Bachelor's degree		

Requirements Definition

System requirements in making a Web-based Decision Support System of Direct Cash Assistance Recipients areas follows:

a. Requirements of Users

The user in this system is the admin, which is the Kalasey Satu Village stakeholders. Therequirements of the user includes this:

a) Admin can log in to the system using their username and password.
b) Admin can manage (add, edit, delete) aspects used in the selection of BLT recipients.
c) Admin can view the weight used in the selection of BLT recipients.
d) Admin can manage (add, edit, delete) criteria in the selection of BLT recipients.
e) Admin can manage (add, edit, delete) sub criteria in the selection of BLT recipients.
f) Admin can manage (add, edit, delete) alternative data for prospective BLT recipients.
g) Admin can view the scoring of alternative data for prospective BLT recipients.
h) Admin can calculate and rank the data BLT recipients using the Profile Matching method.
i) Admin can download or print the results of the ranking of prospective BLT recipients.
j) Admin can manage the account (change name or password).
k) Admin can exit the system after use.

b. System Requirements

a) The system can verify the user login using a valid username and password.
b) The system can save and manage aspects in the selection of BLT recipients.
c) The system can display the weight used in the selection of BLT recipients.
d) The system can save and manage criteria in the selection of BLT recipients.
e) The system can save and manage sub-criteria in the selection of BLT recipients.
f) The system can save and manage the data of prospective BLT recipients.
g) The system can display the scoring data of prospective BLT recipients.
h) The system can calculate and rank the data of prospective BLT recipients using Profile Matchingmethod.
i) The system can download or print the result of the ranking of prospective BLT recipients in thesuitable format.
j) The system can allow the admin to manage the account.
k) The system can allow the admin to log out after using the system.

System Design

This system designed to give an illustration about the system will be built and developed. In the design process,the Unified Modeling Language (UML), which includes use case diagrams, activity diagrams, and class diagrams tovisualize the system workflow.

a. Use Case Diagram

The admin acts as the main user in the system with several functions, including managing aspects, criteria,sub-criteria, and alternative data; performing scoring, calculation, and ranking using the Profile Matching method; as well as viewing, downloading, or printing the results. Admins can also manage accounts and perform login/logout activities. The use case diagram is shown in Figure 3.

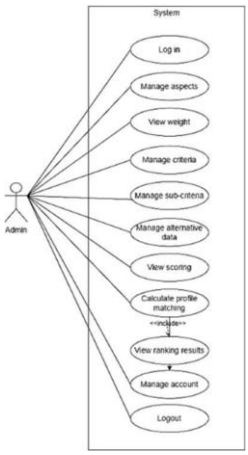

Figure 3. Use Case Diagram

b. Activity Diagram

a) Activity Diagram Login

The login process begins when the admin enters a username and password. If the credentials are valid, the system grants access to the dashboard. Otherwise, an error message appears, and the system returns tothe login page. The login activity diagram is shown in Figure 4.

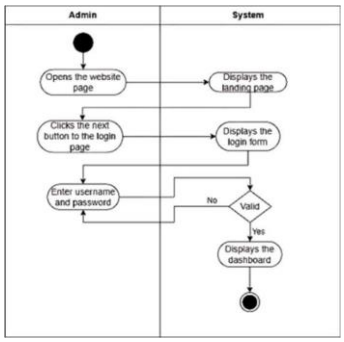

Figure 4. Activity Diagram Login

b) Activity Diagram Add Data

This activity diagram illustrates the data entry process. The admin opens the menu, clicks the add button, fills in the form, and submits it. The system then validates the input. If valid, the data is saved and the pageis reloaded; if not, the form is shown again. The activity diagram is presented in Figure 5.

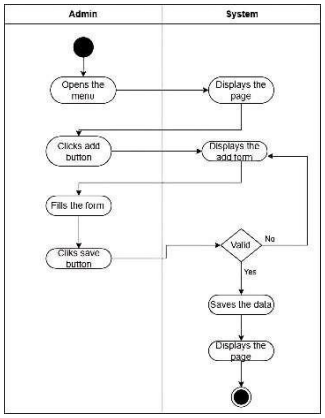

Figure 5. Activity Diagram Add Data

c) Activity Diagram Calculation

This diagram shows the calculation process using the Profile Matching method. The admin opens the calculation menu, and the system displays the results along with the ranking. The admin can then choose to download or print the results. The activity diagram is shown in Figure 6.

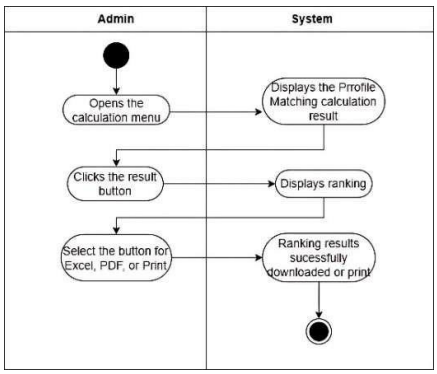

Figure 6. Activity Diagram Calculation

c. Class Diagram

The class diagram illustrates the system structure through several main classes, each containing attributes and methods, and connected to one another. The main classes include: User, Weight, Aspect, Factor, FactorValue, Alternative, Value, and Ranking. The class diagram is shown in Figure7.

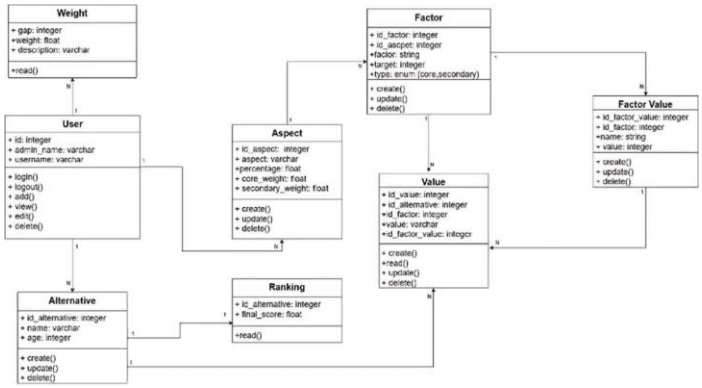

Figure 7. Class Diagram

Implementation System

The implementation of a web-based Decision Support System for the Selection of Direct Cash AssistanceRecipients Using the Profile Matching Method in Kalasey Satu Village, Minahasa Regency can be seen in thefollowing figures.

a. Login Page

The login page allows users to access the Decision Support System for BLT recipient selection in KalaseySatu Village by entering a valid username and password. Successful login redirects the user to the dashboard, while incorrect credentials prompt an error message. The login page can be seen in Figure 8.

Figure 8. Login Page

b. Dashboard Page

Displayed after login, the dashboard presents a summary of data, including total aspects, criteria, sub- criteria, alternatives, and ranking results. It features a sidebar menu for navigating to various system functions.The dashboard page can be seen in Figure 9.

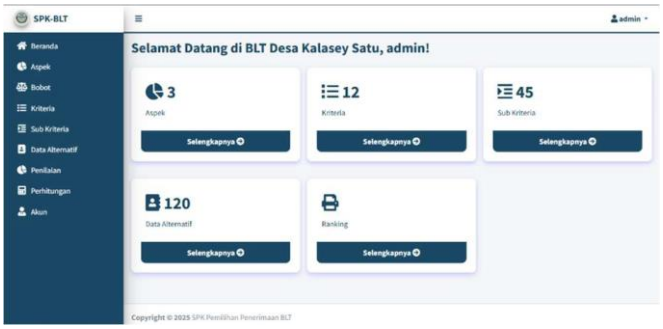

Figure 9. Dashboard Page

c. Aspect Page

This page lists aspects used in the decision-making process, along with their percentage, core factor, and secondary factor. Users can add, edit, or delete aspects and use the search function to find data efficiently. Theaspect page can be seen in Figure 10.

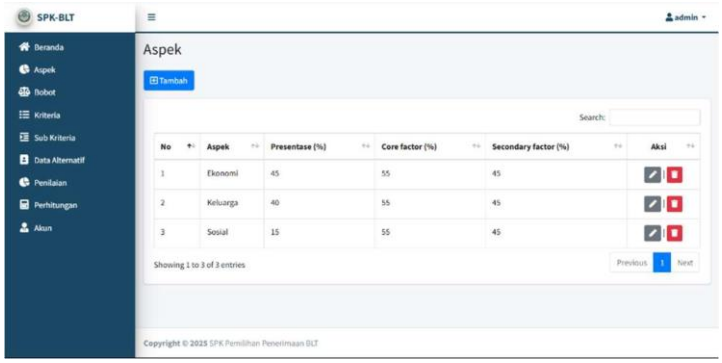

Figure 10. Aspect Page

d. Alternative Page

The alternative page displays detailed data on prospective BLT recipients, with each record aligned to thedefined criteria. It includes features for adding, editing, deleting, and searching data. The alternative page can be seen in Figure 11.

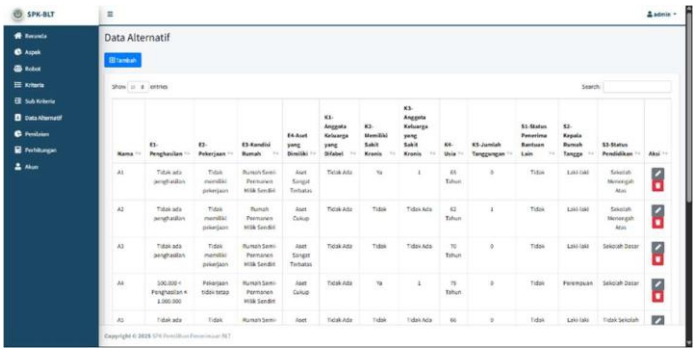

Figure 11. Alternative Page

e. Calculation Page

The calculation page is used to display the calculation steps using the Profile Matching method. The calculation page can be seen in Figure 12.

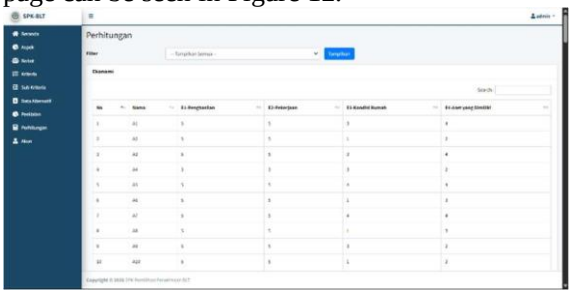

Figure 12. Calculation Page

On the calculation page there is also a “result” button to display the final calculation of the Profile Matching method or ranking results. On this page users can download or print the ranking results. Ranking results can beseen in the Figure 13.

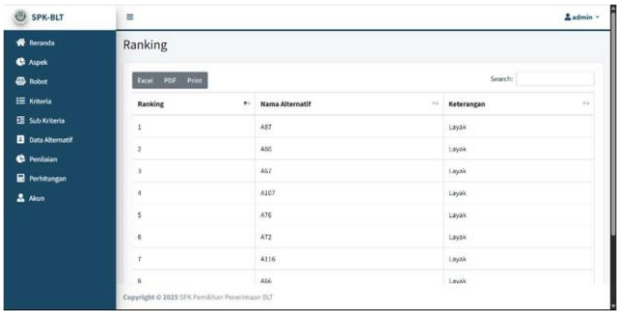

Figure 13. Ranking Result

f. Account Page

The account page is a page for users to change data such as name and password if needed. The accountpage can be seen in the Figure 14.

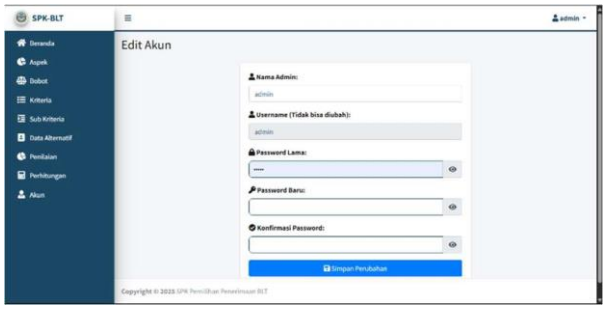

Figure 14. Account Page

Black Box Testing

Black box testing focuses on evaluating software functionality without examining internal code or design. Itensures that inputs, processes, and outputs align with the required specifications.

a. Black Box Testing Login Page

Table 3. Black Box Testing Login Page

No.	Scenario Test	Case Test	Expected Result	Test Result
1.	Admin Login	Did not fill in the username and passwordand click the login button	Failed login to the system and displayed the message“Please fill out this field.”	Success
2.	Admin Login	Enter the incorrect username or passwordand click the login button	Failed to login to the system and displayed themessage “Username or password is incorrect!”	Success
3.	Admin Login	Enter in the correct username and passwordand click the login	Successfully login to the system and display theDashboard page	Success

b. Black Box Testing Alternative Page

Table 4. Black Box Testing Alternative Page

No.	Scenario Test	Case Test	Expected Result	Test Result
1.	Alternativ eData Menu	Click the alternative datamenu	System displays the alternative data page	Success
2.	Search Data	Input keywords relatedto alternative	System displays keywordssearched	Success

		data		
3.	Add AlternativeData	Click the add button	System displays the addalternative data form	Success
4.	Add AlternativeData	Input the data in the add alternative data form andclick save	System displays the message “Alternative datais successfully added!” and the added alternative data will show up on the alternative data page	Success
5.	Edit Alternative Data	Click the edit button(pencil icon) on one alternative data	The system displays the edit form with the selected data alternative	Success
6.	Edit AlternativeData	Edit the alternative dataand click save changes	System displays the message “Alternative datais successfully changed!”	Success
7.	Delete Alternative Data	Click the delete button (bin icon) on one of the sub criteria	The System will displaythe message “Are you sure want to delete?”	Success
8.	AlternativeData Form	Not filling all or one of the fields and click save or save changes	System will reject anddisplay “Please fill out this field.”	Success

c. Black Box Testing Calculation Page

Table 5. Black Box Testing Calculation Page

No.	Scenario Test	Case Test	Expected Result	Test Result
1.	Calculation Menu	Click calculation menu	System displays the stagesof the calculation results using the Profile Matching method	Success
2.	Ranking	Click result button	System displays theranking page	Success
3.	Ranking	Click Excel or PDFbutton	The ranking results of *BLT* recipients successfully downloaded	Success
4.	Ranking	Click Print button	Ranking results can beprinted	Success

Based on the results of Black Box testing of all system features, it can be concluded that the system has runaccording to its function. All test scenarios show results that match expectations

5. Conclusion

This study concludes that the implementation of a web-based Decision Support System using the Profile Matching method successfully improves the selection process of Direct Cash Assistance (BLT) recipients in Kalasey Satu Village. The system enables automatic, objective, and transparent ranking of 120 candidates, resulting in the accurate selection of 56 recipients. It also reduces the time and potential errors commonly found in manual processes. The Profile Matching method effectively compares candidate profiles against predefined ideal criteria, making the selection process fair and data-driven. Further development may include integration with population databases and expansion to other social assistance programs.

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