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Determining Zakat Recipients Using Simple Multi Attribute Rating Technique with Analytic Hierarchy Process Eigen Preference

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Abstract

Paying zakat for Muslims is an obligation to alleviate the burden of recipients. However, difficulties arise in determining the right individuals for zakat distribution because each type of mustahiq or zakat recipient can seem similar to one and another therefore become hard distinguish. This research aims to enhance accuracy using a Decision Support System (DSS) with criteria like Number of Dependents, Income, Occupation, Home Ownership, Marital Status, House Walls, House Floors, and House Roof. The Analytic Hierarchy Process (AHP) method simplifies unstructured problems into a hierarchy, and the Simple Multi-Attribute Rating Technique (SMART) offers flexibility in analysis. Decision outcomes are rankings with the highest scores, ordering those most deserving of zakat. Weighting results highlight Number of Dependents with the highest weight at 0.335 for determining zakat recipients. Based on ranking, alternative A1 secures the top position with a score of 0.077.

Keyword: Analytic Hierarchy Process, Mustahiq, Simple Multi-Attribute Rating Technique, Zakat

1. INTRODUCTION

Zakat is a mandatory religious duty for Muslims, aimed at addressing social disparities in society with the goal of ease the burdens of zakat recipients(mustahiqs) [1]. Mustahiq (مستحق) refers to the group eligible to receive zakat. According to Surah At-Taubah, verse 60, this group includes the following categories: the poor (fakir), the needy (miskin), those employed to administer zakat (amil), those whose hearts are to be reconciled (muallaf), those in debt (gharim), those fighting in the cause of Allah (fii sabilillah), and the wayfarer (ibnu sabil)[2][3].The distribution of zakat is one way to improve the welfare of zakat recipients and reduce social inequality resulting from wealth disparities [4], [5]. The National Amil Zakat Agency (BAZNAS) is an Indonesian national institution tasked with collecting and distributing zakat [6]. Decision Support System (DSS) can enhance accuracy in zakat distribution by providing information and calculations based on attributes and criteria [7]. There are techniques within DSS, including Analytic Hierarchy Process (AHP) and Simple Multi-Attribute Rating Technique (SMART).

The AHP method is a technique that addresses unstructured problems by formulating complex problems into a simple hierarchy and systematically evaluating factors [8]. AHP is easy to understand as it breaks down complex problems into small steps[9]. SMART, on the other hand, is a technique where each alternative has criteria with different weights. The decision-maker determines the significant differences in the weight level of each criterion. SMART is also a flexible and simple method in its analysis [10], [11].

According to a study conducted by Sari et al. (2022), a DSS for zakat recipients using SMART was implemented. Based on the SMART method calculation with 15 respondents, it was found that A10 is the most deserving of zakat with a value of 0.162, while A6 is the least deserving with the highest value of 1[12]. Another study by Parida et al. (2019) on a DSS for distributing rice to the poor using the AHP method highlighted issues arising from subjective assessments during raskin (subsided rice for poor and vulnerable households), leading to inaccurate targeting. AHP was used to determine raskin recipients based on criteria with predefined weights [13]. Similar research done by Rafiq et al. (2024) to determine productive zakat recipient using AHP and SMART, has provided zakat related institutions an effective way to accurately

determine zakat recipients. DSS that implemented this technique has ranked the candidates from 1.5759 being the highest value to 0.4528 as the lowest [14]. Study performed by Rizki and Samsudin (2024) which determines zakat recipient, implements both SAW and SMART method on a web-based decision support system. The system has contributed to increasing the effectiveness in zakat distribution while also being accurate and transparent [15]. Dewi et al. (2023) combined AHP and SMART to help determine the recipients of a village funding program which divided the candidates into 6 different criteria, has resulted in recommendations that would help village officials to determine the recipients accurately [16].

Existing studies have shown that SMART effectively ranks zakat recipients, while AHP helps structure complex decisions by breaking them into hierarchies. Some research has combined these methods to improve accuracy and transparency. However, challenges remain in refining weight assignment, as decision-makers still rely on subjective judgments when determining criteria importance. Ensuring fairness in zakat distribution requires a more structured preference approach to enhance consistency.

Integrating SMART with AHP Eigen Preference enhances decision-making through refined weight distribution using eigen vector calculations. The approach strengthens reliability and reduces inconsistencies in judgment, ensuring a more structured evaluation process. Greater accuracy and transparency in zakat distribution provide institutions with an effective tool for determining recipients, leading to fairer and more justifiable allocations. Given the discussed points, both SMART and AHP

Given the discussion points and insights from past studies, this research aims to improves how recipients are selected by making the weighting process more structured and transparent. Therefore, the research will focus on determining zakat recipients using SMART with AHP Eigen Preference.

2. MATERIAL AND METHOD

Materials The study follows several stages in its implementation, including: (1) Literature Review, (2) Data Analysis, (3) Application of AHP to get Eigen Preference (4) Ranking with SMART and (5)Drawing conclusion, as illustrated in Figure 1.

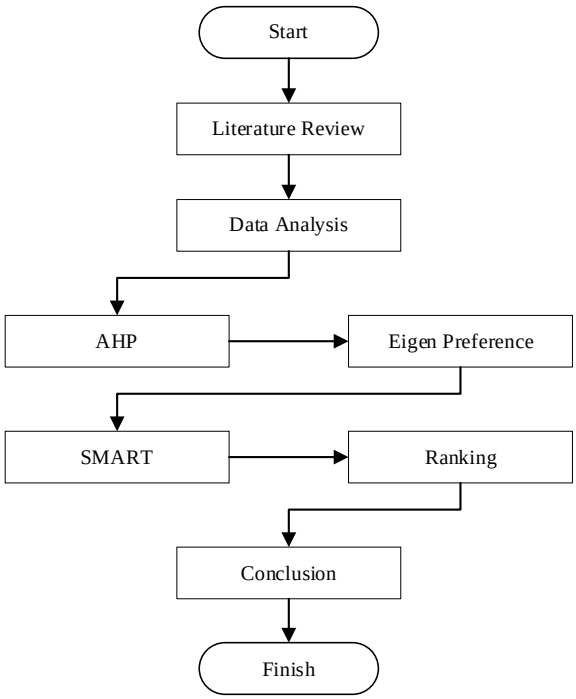

Figure 1. Research Methodology

Implementing AHP to derive eigen preferences, wherein these eigen preferences serve as weights for criteria in calculations using SMART. Following that, the SMART method is employed to identify eligible zakat recipients. Conclusions are drawn based on the research findings.

2.1. Data

The data was obtained from a previous study conducted by Pertiwi in 2022, which applied the Simple Additive Weighting (SAW) method for selecting mustahiq. In that study, data on zakat recipients was gathered from BAZNAS stationed in Bengkalis. The details of the zakat recipients are presented in Table 1.

Table 1. Mustahiq data

Alternatives	Dependents	Income	Occupation	House Ownership	…	Roof Type
A1	3	Rp. 500,000	Household/Unemployed	Own	…	Asbestos/zinc
A2	3	Rp. 500,000	Household/Unemployed	Own	…	Asbestos/zinc
A3	2	Rp. 1,000,000	Household/Unemployed	Own	…	Asbestos/zinc
A4	2	Rp. 500,000	Household/Unemployed	Own	…	Asbestos/zinc
A5	1	Rp. 1,000,000	Household/Unemployed	Own	…	Asbestos/zinc
A6	2	Rp. 500,000	Household/Unemployed	Own	…	Asbestos/zinc
A7	3	Rp. 500,000	Household/Unemployed	Own	…	Asbestos/zinc
A8	3	Rp. 1,000,000	Household/Unemployed	Own	…	Asbestos/zinc
A9	3	Rp. 1,000,000	Merchant/Farmer/Fisherman/ Livestock Farmer	Own	…	Asbestos/zinc
A10	2	Rp. 500,000	Household/Unemployed	Own	…	Asbestos/zinc
…	…	…	...	...	…	
A46	3	Rp. 2,500,000	Entrepreneur	Own	…	Asbestos/zinc

The mustahiq data consists of 46 records, covering various criteria related to personal and household conditions. Personal information includes religion, occupation, marital status, last education level, monthly income, and number of dependents. Housing conditions are categorized based on ownership status, as well as the type of walls, floors, and roof. Income is classified into four priority levels: Priority 1 for those earning less than Rp. 1,003,714, Priority 2 for incomes between Rp. 1,003,714 and Rp. 2,007,428, Priority 3 for those earning up to Rp. 3,011,142, and Priority 4 for incomes reaching Rp. 4,159,999. These criteria help assess the eligibility of zakat recipients based on economic and living conditions [17].

2.2. Analytical Hierarchy Process (AHP)

Thomas L. Saaty (1970) developed a decision support method called Analytical Hierarchy Process (AHP). This method can assist in solving problems with complex multiple criteria by structuring them into a decision hierarchy[18]. The steps of the AHP method are as follows[19][20][21]:

1. The AHP method begins by decomposing goals, criteria, and alternatives into a hierarchy.
2. Determining the priority values of each criterion and its alternatives by the decision-maker using a numerical scale.
3. Defining a pairwise comparison matrix of size n x m with elements a_{ij} representing the goal i compared to the goal j.
4. Determining the comparison scale based on Table 2

Table 2. Scale of Importance Weights

Importance Scale	Description
1	Both elements have equally important influence
3	One element is slightly more important than the other
5	One element is more important than the other
7	One element is significantly more important
9	One element is vastly more important
2, 4, 6, 8	Values between two adjacent importance weights
Inverse	Inverse value of the conditions above for pairs of similar factors

5. Creating prioritized rankings for each criterion based on the comparison matrix.
6. If the matrix A' epresents pairwise comparisons, the weight vector $(A)(W^T) = (n)(W^T)$ is obtained by normalizing column j in the matrix using the formula of equation 1.

$$A' = \sum_i a_{ij} = 1 \tag{1}$$

Calculating the average value for each row i in the matrix A' sing the formula from equation 2.

$$w = \frac{1}{n}\sum_i a'_{ij} \tag{2}$$

7. Calculating the eigenvalue to perform consistency testing using equation 3.

$$\lambda_{max} = \frac{1}{n}\sum_{i=1}^{n}\left[\frac{\text{element at position i in } (A)(W^T)}{\text{element position i in } W^T}\right] \tag{3}$$

8. Determining the consistency index value using the formula in Equation 4.

$$CI = \frac{\lambda max - n}{n-1} \quad (4)$$

9. The result of comparing the values of CI and RI is expressed as the consistency ratio, as shown in Equation 5.

$$CR = \frac{CI}{RI} \quad (5)$$

Table 3 contains the Random Index (RI) values.

Table 3. Random Index Value

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	5,8	0,9	1,12	1,24	1,32	1,41	1,45	1,49

2.3. Simple Multi Attribute Rating Technique (SMART)

SMART is a method employed to address issues involving multi-attributes in decision-making [22]. Alternatives considered by this method consist of criteria with weighted values indicating the level of importance for each criterion [23]. Weights and levels of importance are evaluated to determine the best alternative [24].

The SMART method begins by defining the criteria used for decision-making. Each criterion is assigned a weight to indicate its relative importance. The weights are then normalized using the formula 6.

$$w_i = \frac{w_j}{\sum w_j} \quad (6)$$

Where w_i represents the normalized weight, w_j is the weight value for a specific criterion, and $\sum w_j$ is the total weight of all criteria.

After normalization, parameter values are assigned to each criterion for every alternative. The utility value for each criterion is then calculated based on whether it is a benefit or cost criterion. For benefit criteria, the utility value is determined using equaion 7.

$$u_i(a_i) = \frac{C_i - C_{min}}{C_{max} - C_{min}} \quad (7)$$

Where $u_i(a_i)$ is the utility value for criterion i, is the actual value of the criterion, while C_{max} and C_{min} represent the highest and lowest values, respectively. For cost criteria, the total utility value of an alternative is obtained through equation 8.

$$u(a_i) = \sum_{j=1}^{m} w_j \, u_i \, (a_i) \quad (8)$$

Where u(ai) is the total utility score, wj is the normalized weight, and ui(ai) is the assigned utility value. Finally, alternatives are ranked based on their total utility, with higher values indicating better suitability [25], [26].

3. RESULTS AND DISCUSSION

3.1. Determination of Alternatives and Criteria

In determining zakat recipients, data on alternatives along with priority values and criteria are required. The alternatives and criteria are presented in Table 4 and Table 5, respectively.

Table 4. Normalized Alternative Data

Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A1	0.667	0.000	0.000	1.000	0.000	0.000	0.000	1.000
A2	0.667	0.000	0.000	1.000	0.000	0.000	0.000	1.000
A3	0.333	0.500	0.000	1.000	0.000	0.000	0.000	1.000
A4	0.400	0.333	0.200	1.000	0.333	0.500	0.500	1.000
A5	0.400	0.667	0.200	1.000	0.333	0.500	0.500	1.000
A6	0.455	0.333	0.200	1.000	0.333	0.500	0.500	1.000
A7	0.727	0.333	0.200	1.000	0.667	0.500	0.500	1.000
A8	0.727	0.667	0.200	1.000	0.667	0.500	0.500	1.000
A9	0.727	0.667	0.400	1.000	0.333	0.500	0.500	1.000
A10	0.455	0.333	0.200	1.000	0.667	0.500	0.500	1.000

Alternatives	C1	C2	C3	C4	C5	C6	C7	C8
A11	0.455	0.333	0.200	1.000	0.667	0.500	0.500	1.000
A12	0.455	0.667	0.200	1.000	0.667	0.500	0.500	1.000
A13	1.000	0.667	0.400	1.000	0.667	0.500	0.500	1.000
A14	0.727	0.667	0.400	1.000	0.333	0.250	0.500	1.000
A15	0.727	0.667	0.600	1.000	0.667	0.250	0.500	1.000
A16	0.455	0.667	0.400	1.000	0.333	0.500	0.500	1.000
A17	0.727	0.333	0.600	1.000	1.000	0.250	0.500	1.000
A18	0.727	0.333	0.600	1.000	1.000	0.250	0.500	1.000
A19	0.727	0.667	0.200	1.000	1.000	0.500	0.500	1.000
A20	0.455	0.667	0.200	0.333	1.000	0.500	0.500	1.000
A21	0.727	0.667	0.600	1.000	1.000	0.500	0.500	1.000
A22	1.000	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A23	0.727	0.667	1.000	1.000	1.000	0.500	0.500	1.000
A24	0.727	0.667	1.000	1.000	1.000	0.250	0.500	1.000
A25	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A26	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A27	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A28	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A29	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A30	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A31	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A32	0.727	0.667	0.400	1.000	1.000	0.500	0.500	1.000
A33	0.455	0.667	0.800	0.455	1.000	0.500	1.000	1.000
A34	0.182	1.000	0.600	0.182	0.500	0.750	0.750	1.000
A35	0.727	0.333	0.600	1.000	1.000	0.750	1.000	1.000
A36	1.000	0.667	0.600	1.000	1.000	0.500	0.750	1.000
A37	0.738	0.667	0.600	1.000	1.000	0.500	0.500	1.000
A38	0.738	0.667	0.600	1.000	1.000	0.500	0.500	1.000
A39	0.738	0.667	0.400	1.000	1.000	0.500	1.000	1.000
A40	1.000	0.667	1.000	1.000	1.000	0.750	0.750	1.000
A41	0.645	0.667	0.600	1.000	1.000	0.500	0.500	1.000
A42	1.000	0.667	1.000	1.000	1.000	1.000	0.750	1.000
A43	1.000	1.000	0.800	1.000	1.000	0.500	1.000	1.000
A44	1.000	1.000	1.000	1.000	1.000	0.750	0.750	1.000
A45	1.000	1.000	1.000	1.000	1.000	0.500	1.000	1.000
A46	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 4 presents the normalized alternative data, where categorical and varying numerical values have been transformed into a standardized numerical scale which allows for objective comparisons and ranking based on calculated scores. The next step in the process involves assigning priority values to each criterion, as shown in Table 5, which defines their relative importance in determining the final ranking.

Table 5. Criteria and Priority Values

Criteria	Type	Subcriteria	Values
Number of Dependents (C1)	Benefit	0	1
		1-2	2
		3-4	3
		5-6	4
		7-8	5
		9-10	6
		>10	7
Income(C2)	Cost	< Rp. 1,000,000	1
		Rp. 1,000,000 - Rp. 2,000,000	2
		Rp. 2,000,000 - Rp. 3,000,000	3
		Rp. 3,000,000 - Rp. 4,000,000	4
		> Rp. 4,000,000	5
Occupation (C3)	Cost	Household/ Unemployed	1
		Merchant/ Farmer/ Fisherman/ Livestock Farmer	2
		Daily Laborer	3
		Private Employee	4
		Entrepreneur	5
House Ownership (C4)	Cost	Lodging	1
		Family Owned/ Inherited	2
		Rent	3

Criteria	Type	Subcriteria	Values
		Own	4
Marital Status (C5)	Cost	Widow/ Widower	1
		Married	2
		Unmarried	3
House Walls (C6)	Cost	Bamboo/ Plywood	1
		Semi	2
		Brick	3
		Plaster	4
House Floors (C7)	Cost	Soil	1
		Platform	2
		Plaster	3
		Ceramic	4
Roof Type (C8)	Cost	Straw/ Palm Fiber/ Thatch	1
		Asbestos/ Zinc	2
		Roof Tiles	3

Table 5 presents the criteria and their assigned priority values, which are categorized into benefit and cost types. Benefit criteria, such as the number of dependents, assign higher values to greater numbers, while cost criteria, including income, occupation, and housing conditions, allocate lower values to more favorable conditions. These priority values serve as the basis for evaluating and ranking mustahiq eligibility in the decision-making process.

3.2. Calculation for Weight in AHP

The AHP method calculation is performed to determine the weights of each criterion. The weights are obtained through a pairwise comparison matrix that has been translated using the scale of importance weights or the Saaty scale. The pairwise comparison matrix is shown in Table 6.

Table 6. Pairwise comparison matrix

Criteria	C1	C2	C3	C4	C5	C6	C7	C8
Number of Dependents (C1)	1.000	5.000	3.000	5.000	7.000	3.000	5.000	5.000
Income (C2)	0.200	1.000	0.333	1.000	3.000	1.000	0.333	0.333
Occupation (C3)	0.333	3.000	1.000	5.000	5.000	3.000	3.000	3.000
Home Ownership (C4)	0.200	1.000	0.200	1.000	3.000	0.333	0.333	0.333
Marital Status (C5)	0.143	0.333	0.200	0.333	1.000	0.200	0.200	0.200
House Walls (C6)	0.333	1.000	0.333	3.000	5.000	1.000	3.000	3.000
House Floors (C7)	0.200	3.000	0.333	3.000	5.000	0.333	1.000	1.000
Roof Type (C8)	0.200	3.000	0.333	3.000	5.000	0.333	1.000	1.000
Total	2.610	17.333	5.733	21.333	34.000	9.200	13.867	13.867

The pairwise comparison matrix is then normalized by dividing each alternative by the total value of alternatives for each criterion. The normalization results, divided by the number of criteria (n), yield the Priority Vector (PV) as shown in Table 7.

Table 7. Normalization of the pairwise comparison matrix

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	Total	PV
Number of Dependents (C1)	0.383	0.288	0.523	0.234	0.206	0.326	0.361	0.361	2.682	0.335
Income (C2)	0.077	0.058	0.058	0.047	0.088	0.109	0.024	0.024	0.484	0.061
Occupation (C3)	0.128	0.173	0.174	0.234	0.147	0.326	0.216	0.216	1.615	0.202
Home Ownership (C4)	0.077	0.058	0.035	0.047	0.088	0.036	0.024	0.024	0.389	0.049
Marital Status (C5)	0.055	0.019	0.035	0.016	0.029	0.022	0.014	0.014	0.204	0.026
House Walls (C6)	0.128	0.058	0.058	0.141	0.147	0.109	0.216	0.216	1.073	0.134
House Floors (C7)	0.077	0.173	0.058	0.141	0.147	0.036	0.072	0.072	0.776	0.097
Roof Type (C8)	0.077	0.173	0.058	0.141	0.147	0.036	0.072	0.072	0.776	0.097

The resulting CR is $0 < 0.01$, indicating that the pairwise comparison matrix is acceptable or consistent. The weights produced are shown in Table 8. These weights can be used in the SMART method to determine zakat recipients.

Table 8. Criterion Weights

Criteria	PV
Number of Dependents (C1)	0.335
Income (C2)	0.061
Occupation (C3)	0.202
Home Ownership (C4)	0.049
Marital Status (C5)	0.026
House Walls (C6)	0.134
House Floors (C7)	0.097
Roof Type (C8)	0.097

3.3. Calculation using SMART

Before conducting the SMART method calculation, specific alternatives have been chosen for evaluation. The values of these alternatives are shown in Table 9.

Table 9. Chosen Alternatives

A	C1	C2	C3	C4	C5	C6	C7	C8
	Benefit	Cost	Cost	Cost	Cost	Cost	Cost	Cost
A1	3	1	1	4	1	1	2	2
A3	2	2	1	4	1	1	2	2
A7	2	1	1	4	1	2	2	2
A8	3	2	1	4	2	2	2	2
A9	3	2	2	4	1	2	2	2
A13	4	2	2	4	2	2	2	2
A14	3	2	2	4	1	1	2	2
A33	2	2	4	2	2	2	4	2
A34	1	3	3	1	1	3	3	2
A46	3	3	5	4	2	4	4	1
MAX	4	3	5	4	2	4	4	2
MIN	1	1	1	1	1	1	2	1

The next step is to calculate the utility values for alternative data using equation (3) for benefit criteria and equation (4) for cost criteria. Here is the utility calculation for the first criterion (C1) for the first alternative (A1).

$$\text{uC1 (A1)} = \frac{3-1}{4-1} = \frac{2}{3} = 0{,}667$$

$$\text{uC1 (A3)} = \frac{2-1}{4-1} = \frac{1}{3} = 0{,}333$$

$$\text{uC1 (A7)} = \frac{2-1}{4-1} = \frac{1}{3} = 0{,}333$$

$$\text{uC1 (A8)} = \frac{3-1}{4-1} = \frac{2}{3} = 0{,}667$$

$$\text{uC1 (A9)} = \frac{3-1}{4-1} = \frac{2}{3} = 0{,}667$$

$$\text{uC1 (A13)} = \frac{4-1}{4-1} = \frac{3}{3} = 1$$

The detailed utility values for alternative data are shown in Table 10.

Table 10. Utility Value Calculation

A	C1	C2	C3	C4	C5	C6	C7	C8
A1	0.667	0	0	-1	0	0	0	-1
A3	0.333	-0.5	0	-1	0	0	0	-1
A7	0.333	0	0	-1	0	-0.333	0	-1
A8	0.667	-0.5	0	-1	-1	-0.333	0	-1
A9	0.667	-0.5	-0.25	-1	0	-0.333	0	-1
A13	1	-0.5	-0.25	-1	-1	-0.333	0	-1
A14	0.667	-0.5	-0.25	-1	0	0	0	-1
A33	0.333	-0.5	-0.75	-0.333	-1	-0.333	-1	-1

A	C1	C2	C3	C4	C5	C6	C7	C8
A34	0	-1	-0.5	0	0	-0.667	-0.5	-1
A46	0.6667	-1	-1	-1	-1	-1	-1	0

The next step is to multiply the utility values of each alternative, obtained from the SMART method, by the weights obtained from the AHP calculation to determine the priority ranking.

C1(A1) = 0667 * 0.335 = 0.223

C1(A3) = 0.333* 0.335 = 0.112

C1(A7) = 0.333* 0.335 = 0.112

C1(A8) = 0.667 * 0.335 = 0.223

C1(A9) = 0.667 * 0.335 = 0.223

C1(A13) = 1 * 0.335 = 0,335 = 0.335, and so on.

Then, the results of each criterion will be summed for each respective alternative to obtain the final values, as shown in Table 11.

Table 11. Utility Value Calculation

A	C1	C2	C3	C4	C5	C6	C7	C8	Final Value
A1	0.223	0	0	-0.049	0	0	0	-0.097	0.077
A3	0.112	-0.031	0	-0.049	0	0	0	-0.097	-0.065
A7	0.112	0	0	-0.049	0	-0.045	0	-0.097	-0.079
A8	0.223	-0.031	0	-0.049	-0.026	-0.045	0	-0.097	-0.024
A9	0.223	-0.031	-0.051	-0.049	0	-0.045	0	-0.097	-0.048
A13	0.335	-0.031	-0.051	-0.049	-0.026	-0.045	0	-0.097	0.037
A14	0.223	-0.031	-0.051	-0.049	0	0	0	-0.097	-0.004
A33	0.112	-0.031	-0.152	-0.016	-0.026	-0.045	-0.097	-0.097	-0.351
A34	0	-0.061	-0.101	0	0	-0.089	-0.049	-0.097	-0.397
A46	0.223	-0.061	-0.202	-0.049	-0.026	-0.134	-0.097	0	-0.346

From these final values, rankings can be assigned, where higher final values indicate higher ranks for the alternatives. The rankings are shown in Table 12.

Table 12. Ranking

Alternative	Final Value	Rank
A1	0.077	1
A3	-0.065	6
A7	-0.079	7
A8	-0.024	4
A9	-0.048	5
A13	0.037	2
A14	-0.004	3
A33	-0.351	9
A34	-0.397	10
A46	-0.346	8

As shown in Table 12, it can be concluded that the recommended alternative for zakat recipients is Alternative 1 with a final value of 0.077.

3.4. Discussions

The results indicate that Alternative A1 ranks the highest, with a final value of 0.077. This ranking is primarily influenced by the number of dependents (C1), which holds the highest weight among all criteria. Additionally, A1 scores well in critical housing-related factors such as home ownership and structural conditions. The Analytical Hierarchy Process (AHP) ensures that these factors are systematically evaluated, leading to a fairer distribution of zakat to those most in need.

Comparing these findings with previous studies, the use of AHP and SMART has proven effective in multi-criteria decision-making. Prior research utilizing SMART and SAW has emphasized the importance of income levels in determining zakat eligibility. However, our study demonstrates that structural housing conditions and the number of dependents also play a significant role. The Eigen Preference approach in AHP further refines weight distribution, enhancing the reliability of ranking outcomes compared to simpler methods.

The implications of these findings extend to real-world zakat distribution, particularly for institutions such as BAZNAS. By adopting a structured decision-making approach, zakat distribution can be optimized, ensuring aid reaches those most in need. Moreover, the results highlight the necessity of balancing multiple socio-economic factors rather than relying solely on income-based assessments.

Despite its strengths, this study has limitations. The subjective nature of AHP in weight assignment introduces potential biases, as expert opinions influence the prioritization process. Additionally, the limited number of criteria may not capture all aspects of financial hardship, suggesting the need for broader assessments in future research. Additionally, future research should explore alternative weighting mechanisms, such as machine learning-based optimization, to minimize subjectivity. Expanding the criteria set and integrating real-time financial data could further refine decision-making.

4. CONCLUSION

In the decision-making process for determining zakat recipients, several criteria are considered, including 8 criteria in this study: Number of dependents, Income, Occupation, Home ownership, Marital status, House walls, House floors, and Roof type. The calculation results for determining zakat recipients using the Analytical Hierarchy Process (AHP) method indicate that the criterion of the number of dependents has the highest weight. The calculation with the Simple Multi-Attribute Rating Technique (SMART) method produces a table of priority rankings for zakat recipients. After ranking, the result shows that alternative A1 with a value of 0.077 is the top priority for zakat recipients. This analysis is expected to provide several options for determining zakat recipients based on the defined criteria.

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