Determination of receipt of UPZ assistance using the SAW method

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1. Introduction

Zakat is the only worship in Islamic Shari'a which explicitly stated that there are officers (QS. Al-Maidah: 60 and 103). This is because zakat has a very strategic position in determining welfare, improving the economy, that can happen if the collection and distribution are managed in a trustworthy, transparent and professional. An institution on zakat management is National Zakat Agency (BAZNAS), which an institution manages the zakat management nationally, and non-structural government institution that is independent and responsible to President through the Minister of Religion. BAZNAS is located in the capital city and assisted by zakat collection unit (UPZ). Along this time, they conduct manually in determining the person who will receive the assistance, but it often occurs errors in its implementation. Therefore, a decision support system is needed to assist UPZ in determining the person who will receive the assistance. The decision support system was designed using SAW (Simple Additive Weighting) method, then the administrators obtain an alternative data in the form of lists of students who receive the UPZ assistance. The SAW algorithm is an algorithm for decision making. The SAW algorithm is also known as an algorithm with additive weighting method. The method requires normalization process of decision matrix \((x)\) into a scale and can be compared to the entire available alternative ratings. The study showed that SAW can be applied to determine the acceptance of UPZ assistance by the calculation results of 16. The result of calculation and recommendation of decision support system for person who receive the UPZ acceptance, have the same data on output, namely Astin Dwi Wulan.

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The determination of the acceptance of UPZ scholarships is still experiencing difficulties, so a system is needed that can assist BAZNAS in determining the receipt of UPZ scholarships.

References of this research are decision support system using Simple Additive Weighting capable of displaying the result of the weighting and calculation based on the criteria in easy and straightforward and Simple Additive Weighting method can produce the expected result was found in [1]. Other study using Simple Additive Weighting can make a decision more effective, efficient was found in [2] and Simple Additive Weighting can make a decision more accurate was found in[3]. Ciptayani & Dewi [4] using Simple Additive Weighting on decision support system make a decision making more accurate. Afshari et al [5] produce that SAW ignores the fuzziness of executives judgment during the decision-making process. Pratiwi et al [6] using SAW to generate the recommendation majoring result that will be given to students in the recommendation list. Setyawan et al [7] implemented SAW and WP to analyzed the differences in execution time. The research produces that SAW method relatively quick because SAW has a simpler process. Siahaan et al [8] using SAW to solve decision that can not be completed manually. Esclamando et al [9] using SAW to create a function to calculate the ranking score. Geetha & Sekar [10] using SAW to determine the optional combination of operating parameters of an engine. Irvanizahm [11], Sam et al [12], Susilowati et al [13], Ibrohim & Sumiati [14] and Melia [15] using SAW to display a list of data alternative by sorting the best alternative values. SAW method can be used in that case study. Hidayat & Utami [16] using SAW to determine weighting sum of each alternative. Other study [17] SAW method can choose the best alternative from several alternatives by using each criterion. Atmojo et al [18] using SAW to get smartphone recommendation based on a criterion. Ningsih et al [19] using SAW to determine the worthy or not the inpatient in hospitals pringsewu. Other study [20] using SAW to calculate all criteria to determine the best collage in pringsewu.

Based on the research already mentioned it can be concluded that SAW can be applied to alternative recommendation cases by ranking. So as to encourage researchers to apply SAW to the determination of acceptance of UPZ case study assistance conducted at Muhammadiyah Salaman Vocational School. In this study, the criteria used to determine the receipt of UPZ assistance funds were ‘pendidikan ayah’, ‘pekerjaan ayah’, ‘penghasilan ayah’, ‘pendidikan ibu’, ‘pekerjaan ibu’, ‘penghasilan ibu’, and ‘jumlah saudara kandung’.

2. Method

2.1. Simple Additive Weighting (SAW)

The research method is a scientific way to get information based on purpose. The research method used is experiment. The experiment was carried out by applying the SAW method to determine the acceptance of UPZ assistance at Muhammadiyah Salaman Vocational School. In this study, the criteria used to determine the receipt of UPZ assistance funds were ‘pendidikan ayah’, ‘pekerjaan ayah’, ‘penghasilan ayah’, ‘pendidikan ibu’, ‘pekerjaan ibu’, ‘penghasilan ibu’, and ‘jumlah saudara kandung’.

Equations or calculation formula of the method is:

\[ V_i = \sum_{j=0}^{n} w_j r_{ij} \]  (1)

Information:

\( V_i = \) alternative final value
\( w_j = \) weight each criteria
3. Results and Discussion

Determination of acceptance of UPZ assistance is a decision made by the management so that it is expected that the determination of UPZ aid recipients can be done objectively. The criteria used to determine the recipients of UPZ assistance were ‘pendidikan ayah’, ‘pekerjaan ayah’, ‘penghasilan ayah’, ‘pendidikan ibu’, ‘pekerjaan ibu’, ‘penghasilan ibu’, and ‘jumlah saudara kandung’. Criteria are calculated using the SAW (Simple Additive Weighting) method so that alternatives are ranked. The following calculation of the SAW method is shown in the following steps:

3.1. SAW Calculation

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

Table 1. The Weight of Each Criteria

| Code | Criteria          | Weight | Inf |
|------|-------------------|--------|-----|
| K1   | Pendidikan ayah   | 2      | Ben |
| K2   | Pekerjaan ayah    | 3      | Ben |
| K3   | Penghasilan ayah  | 4      | Ben |
| K4   | Pendidikan ibu    | 3      | Ben |
| K5   | Pekerjaan ibu     | 4      | Ben |
| K6   | Penghasilan ibu   | 3      | Ben |
| K7   | Jumlah saudara kandung | 4 | Ben |

Table 1 shows that the criteria for ‘pendidikan ayah’ is K1 with the weight of criterion 2, ‘pekerjaan ayah’ is K2 with the weight of criterion 3, ‘penghasilan ayah’ is K3 with the weight of criterion 4, ‘pendidikan ibu’ is K4 with the weight of criterion 3, ‘pekerjaan ibu’ is K5 with the weight of criterion 4, ‘penghasilan ibu’ is K6 with the weight of criterion 3 and the ‘jumlah saudara kandung’ is K7 with the weight of criterion 4. As well as determining each of these criteria benefit or cost.

Table 2. Value Conversion

| No  | Data             | K1 | K2 | K3 | K4 | K5 | K6 | K7 |
|-----|------------------|----|----|----|----|----|----|----|
| 1   | Astin Dwi Wulan  | 1  | 3  | 2  | 3  | 4  | 4  | 2  |
| 2   | Rahayuning Pamuji| 3  | 3  | 2  | 3  | 2  | 2  | 2  |
| 3   | Nur Laela        | 1  | 3  | 2  | 1  | 3  | 2  | 2  |

Based on table 2 all data that is known is converted to numbers so that the data can be 1 to 5.

Table 3. Vector Value

| No  | Data             | K1 | K2 | K3 | K4 | K5 | K6 | K7 |
|-----|------------------|----|----|----|----|----|----|----|
| 1   | Astin Dwi Wulan  | 0.25| 0.75| 0.5| 0.75| 1  | 1  | 0.5|
| 2   | Rahayuning Pamuji| 0.75| 0.75| 0.5| 0.75| 0.5| 0.5| 0.5|
| 3   | Nur Laela        | 0.25| 0.75| 0.5| 0.25| 0.75| 0.5| 0.5|

Table 3 is known as a S vector value table. S vector values are generated from the values of each criterion calculated according to the SAW formula. The formula used adjusts each set of criteria, namely benefit or cost.
Table 4. Preference Values

| No | Data                  | K1  | K2  | K3  | K4  | K5  | K6  | K7  |
|----|-----------------------|-----|-----|-----|-----|-----|-----|-----|
| 1  | Astin Dwi Wulan       | 0.5 | 2.25| 2   | 2.25| 4   | 3   | 2   |
| 2  | Rahayuning Pamuji     | 1.5 | 2.25| 2   | 2.25| 2   | 1.5 | 2   |
| 3  | Nur Laela             | 0.5 | 2.25| 2   | 0.75| 3   | 1.5 | 2   |

Table 4 shows that the preference value is generated from the multiplication of each vector value against the specified weight. The weights used are 2, 3, 4, 3, 4, 3, 4.

Table 5. Result

| No | Data                  | Result |
|----|-----------------------|--------|
| 1  | Astin Dwi Wulan       | 16     |
| 2  | Rahayuning Pamuji     | 13.5   |
| 3  | Nur Laela             | 12     |

3.2. Testing Result

Based on the results of the above test it can be seen that in Figure 2 the test results using the saw method produce that Astin Dwi Wulan is ranked first or the highest value. So that Astin Dwi Wulan can be used as the first recipient of UPZ assistance.

From table 5 the results of the calculation are generated from the sum of all values owned by each alternative data. Based on the results of these calculations indicate that the highest value is found at Astin Dwi Wulan. The results of the calculation of table 5 can be presented in Figure 1.

Fig. 1. Calculation result

4. Conclusion

Based on the results of this study, it can be concluded that SAW can be used for ranking the acceptance of UPZ assistance. It was produced that Astin Dwi Wulan became the first recipient of the designed system. The research suggestion is that methods can be combined with classification methods such as k-means, c-means, and knn.

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References

[1] R. Rahim, “Study Approach of Simple Additive Weighting For Decision Support System,” no. April, 2017.

[2] T. P. Putri and P. H. P. Rosa, “Decision Support System to Choose Digital Single Lens Camera with Simple Additive Weighting Method,” vol. 3, no. 2, pp. 167–176, 2016.

[3] N. Setiawan et al., “Simple Additive Weighting as Decision Support System for Determining Employees Salary,” vol. 7, pp. 309–313, 2018.

[4] C. Series, “Decision support system of e-book provider selection for library using Simple Additive Weighting Decision support system of e-book provider selection for library using Simple Additive Weighting,” pp. 0–8, 2018.

[5] A. Afshari, M. Mojahed, and R. M. Yusuff, “Simple Additive Weighting approach to Personnel Selection problem,” vol. 1, no. 5, pp. 511–515, 2010.

[6] D. Pratwi, J. P. Lestari, and D. A. R., “Decision Support System to Majoring High School Student Using Simple Additive Weighting Method,” vol. 10, no. 3, pp. 153–159, 2014.

[7] A. Setyawan, F. Y. Arini, and I. Akhli, “Comparative Analysis of Simple Additive Weighting Method and Weighted Product Method to New Employee Recruitment Decision Support System (DSS) at PT. Warta Media Nusantara,” vol. 4, no. 1, pp. 34–42, 2017.

[8] M. Donni, L. Siahaan, A. B. Surtaki, and A. H. Lubis, “Implementation of Simple Additive Weighting Algorithm in Particular Instance,” no. July, 2017.

[9] A. Esclamado, J. C. D. L. Reyes, K. D. Piquero, “RESEARCH ARTICLE A HYBRID DYNAMIC RECOMMENDER SYSTEM USING SIMPLE ADDITIVE WEIGHTING METHOD FOR SERVICE SEARCH WITH COLLABORATIVE FILTERING * Maricel and Maria Theresa Tulang,” 2017.

[10] N. K. Geetha and P. Sekar, “Optimal Combination of Operating Parameters – Simple Additive Weighting Method,” vol. 2, no. 11, pp. 467–470, 2015.

[11] I. Irvanizam, “Multiple Attribute Decision Making with Simple Additive Weighting Approach for Selecting the Scholarship Recipients at Syiah Kuala University,” no. ICELTICs, pp. 245–250, 2017.

[12] M. Sam, “A Modified Algorithm for Full Fuzzy Transportation Problem with Simple Additive Weighting,” pp. 684–688, 2018.

[13] F. Paper, T. Susilowati, and W. Andewi, “DECISION SUPPORT SYSTEM TO DETERMINE SCHOLARSHIP RECIPIENTS AT SMAN 1 BANGUNREJO USING SAW METHOD,” pp. 29–37.

[14] M. Ibrohim, “Decision Support System for Determining the Scholarship Recipients using Simple Additive Weighting,” vol. 151, no. 2, pp. 10–13, 2016.

[15] Y. Melia, “Multi Attribute Decision Making Using Simple Additive Weighting and Weighted Product in Investment Introduction ;,” vol. 3, no. 7, pp. 1–15, 2016.

[16] F. Paper, A. Hidayat, and I. T. Utami, “DECISION SUPPORT SYSTEM TO DETERMINE THE LOCATION NEW CAFE SUNCAFE AS A TOURIST CULINARY TOUR IN DISTRICT PRINGSEWU BY,” pp. 10–11.

[17] F. Haswan, “Decision Support System For Election Of Members Unit Patients Pamsong Praja,” vol. 1, no. 1, pp. 21–25, 2017.

[18] R. Nugroho, P. Atmojo, B. Pardamean, B. S. Abbas, A. D. Cahyani, and I. D. Manulang, “FUZZY SIMPLE ADDITIVE WEIGHTING BASED , DECISION SUPPORT SYSTEM APPLICATION FOR ALTERNATIVE CONFUSION REDUCTION,” vol. 11, no. 4, pp. 666–680, 2014.

[19] F. Paper, S. R. Ningshi, and F. Satria, “DECISION SUPPORT WORTHINESS INPATIENT ROOM AT REGIONAL PUBLIC HOSPITAL PRINGSEWU USING SIMPLE ADDITIVE WEIGHTING,” pp. 22–28.

[20] F. Paper et al., “SIMPLE ADDITIVE WEIGHTING FOR MODELING DSS TO DETERMINE THE BEST COLLEGE IN,” pp. 8–16.