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Web-Based Decision Support System Determination of Recipients of Covid-19 Pandemic Social Assistance Using the SAW and AHP Methods

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A B S T R A C T

During the COVID-19 pandemic, this was not only followed by an increase in the number of positive cases caused by various reactions from people who did not care about this outbreak, but also followed by an increase in poverty, early community mobility, and security insecurity . The government plans to provide special social assistance for middle to lower class people in the face of this COVID-19 pandemic. The distribution of social assistance as a realization of the social safety net program during the COVID-19 pandemic leaves a lot of homework to do. Starting from data collection, the accuracy of target recipients of aid, to the distribution. The mechanisms for distributing aid are complicated and often not well targeted due to inappropriate criteria for beneficiaries and inaccurate / inaccurate data. Until there was a protest from residents who should have received assistance but they did not get this assistance, and vice versa. This study proposes the Analytical Hierarchy Process (AHP) method for weighting the value of each criterion and the Simple Additive Weighting (SAW) method for the ranking.

1. Introduction

Nutrition is the process of digesting food through a series of mechanism processes in the body to be able to convert food substances into chemicals needed in the body as a metabolic process, and produce energy.[1].

During the COVID-19 pandemic, it has not only resulted in the number of positive cases caused by various reactions from the public who are less concerned about this outbreak, but also followed by an increase in poverty rates, early community mobility, and vulnerability to security.[1].

The government plans to provide assistance to special social groups for: the lower middle class community in dealing with the COVID-19 pandemic. Some of the assistance consisted of: non-cash assistance in the form of food packages and cash assistance in the form of money. Determining who is entitled to receive assistance needs to be carried out with extreme care so that the assistance provided is right on target to certain communities. This resident of RW 08 Pulo Panjang, Cinere is part of Cinere Village, Cinere District, Depok City which is also one of the RWs on Jl Pulo Panjang Cinere, which also has a unit from the Corona Alert Task Force (SIGACOR). In handling the spread of Covid-19 in RW 08, in addition to carrying out Health Protocols in RW 08, also has the task of providing social assistance to all residents who are economically affected in the RW 08 environment. The distribution of this social assistance is also a realization of: a social safety net program with the COVID-19 pandemic condition which leaves a lot of homework. Starting: data collection, accuracy of target recipients, to distribution.

The receipt of assistance from the sub-district which is also received by the RW is not sufficient to help all residents who register themselves who are economically affected by the Covid-19 pandemic, so it needs to be set as a priority for residents who really need to be given social assistance, then there are no criteria and weights that have been set. of each criterion in determining the recipients of social assistance during the Covid 19 pandemic, so it is not about the targets that cause protests from residents who should also receive assistance but those who do not receive the assistance, and vice versa. The mechanism for distributing aid has

not yet: used the right method in determining the recipients of social assistance during the Covid-19 pandemic, so that the subjectivity of determining the recipient of the assistance is high.

In solving the problems that occur in determining the recipients of Covid-19 assistance: a decision support system is needed which is an approach to be able to support decision making. A decision support system that: uses data, provides an easy user interface, and can also incorporate the thinking of decision makers[1]. Previous studies related to decision support methods in determining beneficiaries have also been carried out using: SAW method[2][3], ANP Metode method [4], AHP and SAW method[1],AHP-PROMETHEE II Method[5], ELECTR method [6], PROMETHEE and BORDA method[7], FUZZY C-MEANS method Metode[8], WP method[9] and AHP Method [10].

Based on the data that has been obtained relating to the COVID-19 pandemic social assistance, this research also focuses on the application of the Analytical Hierarchy Process (AHP) method and also the Simple Additive Weighting (SAW) for determining the recipients of social assistance during the Covid-19 pandemic which is also suitable for the criteria set so that it can be more targeted, effective and fair.

The result of this literature study is the formation of a reference in the formulation of the problem of the case to be studied.

2. Research methods

2.1 Method of collecting data

This research method is basically a scientific way of obtaining information with a specific purpose and use. The research method is the method used by researchers in collecting research data. The scientific method, which means that this research activity is based on scientific characteristics, namely rational, empirical, and systematic This research method is used as a research guide and in the implementation of research so that the results achieved do not deviate from the previous objectives.

a. Literature review

In this study to collect data the authors conducted a literature study and interview observations. This observation was carried out by going directly to the area where the non-cash assistance was distributed in the RW 08 Cinere Village area. Interviews were conducted with parties who directly handle the distribution of non-cash assistance, both from parties in the Kelurahan and the local RW.

b. Data analysis technique

This data analysis technique was also used in this study using descriptive analysis in the AHP and SAW methods. This descriptive analysis is carried out by presenting a summary obtained from the results of observations and interviews. While the AHP and SAW are instruments to determine who is the most appropriate to receive assistance in accordance with the criteria that have been agreed upon/set by the aid provider (Kelurahan or local RW). . This AHP is used to calculate the weighting process, because there is no criterion weight to be able to calculate the determination of student majors and SAW and determine the ranking of the recipients of assistance.

c. Testing Technique

The technique of testing this DSS model uses the Consitency Ratio (CR) method.

d. *Simple Additive Weighting* (PBUH)

The Simple Additive Weighting (SAW) method is also known as the weighted addition method. The basic concept of the SAW method is to find the weighted sum of the performance ratings for each alternative on all attributes. The SAW method requires a process of normalizing the decision matrix (X) to a scale that can be compared with all existing alternative ratings. This method is the best known and most widely used method. The SAW method also requires the decision maker to determine the weight or value for each attribute. The total score for the alternatives is obtained from the sum of all the results of the multiplication between the normalized performance rating and the weight of each attribute. In determining the value in the priority weights, benefits and support are needed in calculating the value so that it can be used as normalization[11]. Here is the formula for the benefits and costs:

$$\text{rij}\,\frac{\text{Xij}}{Max\ \text{Xij}}$$

1) If J is a benefit attribute.

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$$\text{rij} \frac{Min\ \text{Xij}}{\text{Xij}}$$

2) If J is a cost attribute (cost).
Information:

1) Rij: Normalized performance rating value
2) Xij: The value of the attribute belonging to each criterion Xij / (maxi)
3) (Xij): The largest value of each criterion (mini)
4) (Xij) / Xij: The smallest value of each criterion
5) Benefit : If the biggest value is the best
6) Cost : If the smallest value is the best

Next, the W * R matrix multiplication will be made and the sum of the multiplication results will be made to obtain the best alternative in ranking the largest value as follows:

$\text{Vi} = \sum_{j=1}^{n} Wj\ rij$ (3)

Information:
Vi: Rank for each alternative
Wj: the weight value of each criterion
Rij: normalized performance ranking score
The W value is a predetermined value, namely the Weight Vector.

e. Analytical Hierarchy Process (AHP)

The Analytical Hierarchy Process (AHP) method is a method for solving a complex and unstructured situation into several components in a hierarchical arrangement, and by assigning a subjective value to each variable relatively, and determining which variable also has the highest priority can affect the results. The use of the AHP method in the Multi Criteria Decision problem, which is also often criticized, is due to the inability of the AHP approach to overcome the imprecision factors experienced by the decision maker.[11].

Table 1.
Intensity of Interest

Intensity of Interest	Information
1	Both elements are equally important
3	One element is slightly more important than the other
5	One element is more important than the other elements
7	One element is clearly more absolutely important than the other elements
9	One element is absolutely important than the other elements
2, 4, 6, 8	Values between two adjacent values

AHP Method Formula:

$\text{CI} = \frac{(\lambda\ \text{Maks} - \text{n})}{\text{n}-1}$ (4)

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

Information:
CI = Consistency Index
n = Many Criteria
CR = Consistency Ratio
RI = Random Index.

3. Results and Discussion

After carrying out the research steps step by step, the results obtained in the form of criteria and alternative recipients of the recipients of the Covid-19 pandemic social assistance. The data was obtained from the local RT/RW and processed using the AHP method to get the weight of each criterion, after getting the weight value, then it was processed again using the SAW method to determine the ranking of prospective beneficiaries. This ranking is necessary because the assistance provided is limited, so that not all potential recipients can receive the assistance. In the application of the AHP and SAW methods, RT/RW

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administrators can easily provide objective lists of names of beneficiaries, because the data is processed in an open/transparent manner,

3.1 Criteria Identification

In identifying the criteria used to determine the recipients of the Covid-19 pandemic social assistance, interviews were carried out which also involved the heads of RT, RW and the SIGACOR RW 08 Task Force, resulting in the criteria for recipients of assistance as shown in the following table:

Table 2.
Criteria

No	Criteria
1	Occupational Status of the Head of the Family (SPKK)
2	Wife's Employment Status (SPI)
3	Home Status
4	Status of Dependents
5	ID card status

After determining the criteria for the beneficiary, then the next step is to make the AHP Hierarchy Structure as shown in Figure 1:

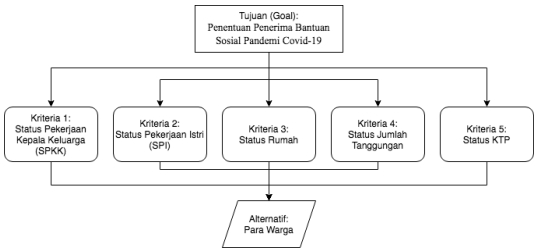

Fig 1.*Goal Criteria*

In Fig 1, it is also seen that in the first layer there are: Goals of this research, namely: then in layer 2, there are five (5) Criteria: Occupational Status of the Head of the Family (SPKK), Wife's Employment Status (SPI), Status Houses and Status of Dependents and KTPs, as well as on the 3rd layer are Alternative / prospective beneficiaries who have submitted to SatGas SIGACOR RW 008, totaling 48 residents. The next step is to determine the value of each of the criteria using the AHP questionnaire.

Based on the comparison value between criteria, then a calculation is carried out using the AHP method.

3.2 Eigenvector Result (Weight)

Eigenvector results (weights) of the various criteria can be seen in the following table:

Table 3.
Criteria Weighting

No	Criteria	Criteria Data Weight
1	Occupational Status of the Head of the Family (SPKK)	0.425
2	Wife's Employment Status (SPI)	0.167
3	Home Status	0.094
4	Status of Dependents	0.056
5	ID card status	0.252

3.3 Use Case diagram

Use Case This diagram is a modeling diagram and a tool that is often used to describe the needs in the system to be built. This Use Case Diagram also includes: login, manage RW resident data, manage RT head data, manage RT data, manage user data, manage criteria data, manage criteria's weight data, manage attribute data, manage comparison data, and manage decision results of aid and transaction report then logout in the following Fig:

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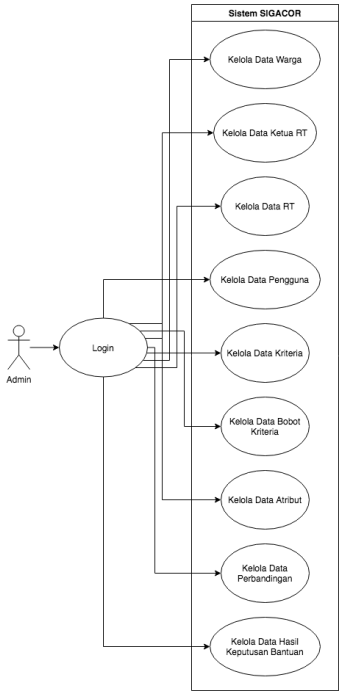

Fig2 Use Case Diagrams

3.4 Activity diagram

*Activity Diagram*is a process that explains how the system works. In the research, the activity diagram starts from the admin as a single user who can control the system if there is additional data entry, the flow can be seen in the following Fig:

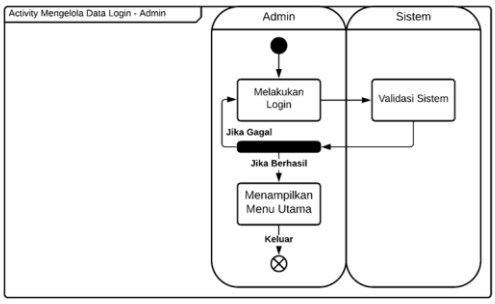

Fig3.*Activity Diagram Login*

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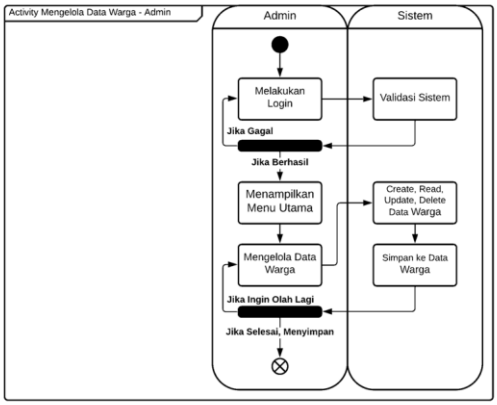

Fig4. Activity Diagram for Managing Citizen Data

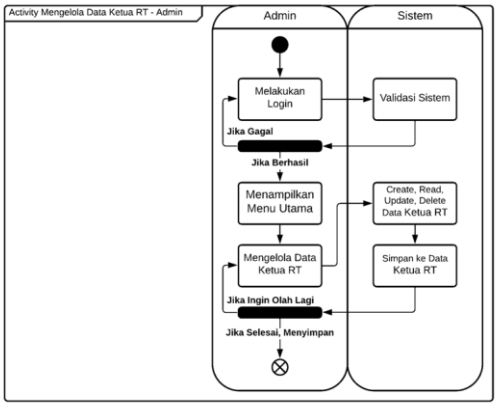

Fig 5. Activity Diagram of Managing RT Head's Data

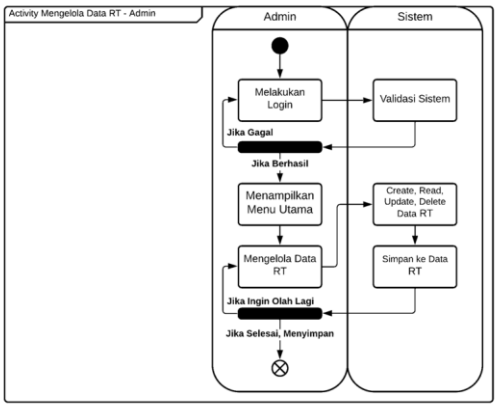

Fig 6. Activity Diagram Manage RT Data

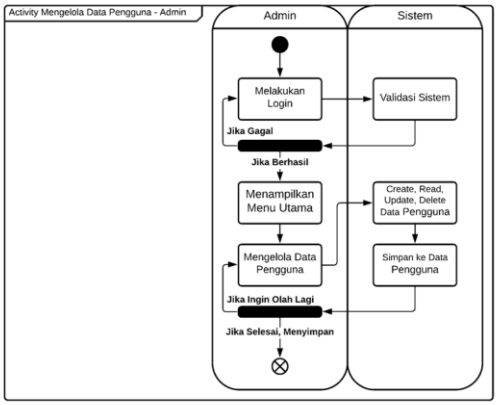

Fig7. Activity Diagram Manage User Data

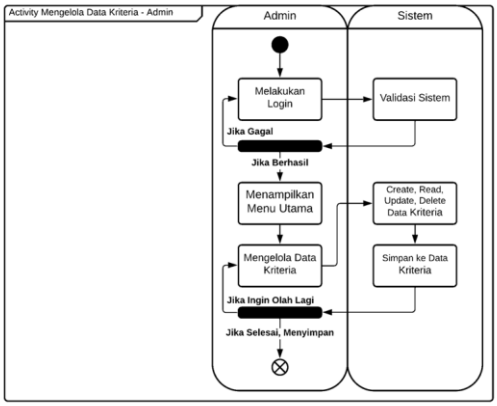

Fig8. Activity Diagram Manage Criteria Data

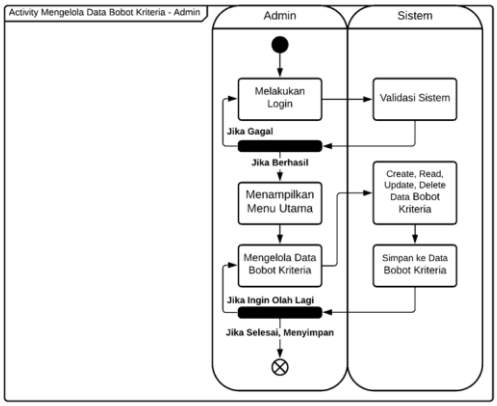

Fig9. Activity Diagram Manage Criteria Weighted Data

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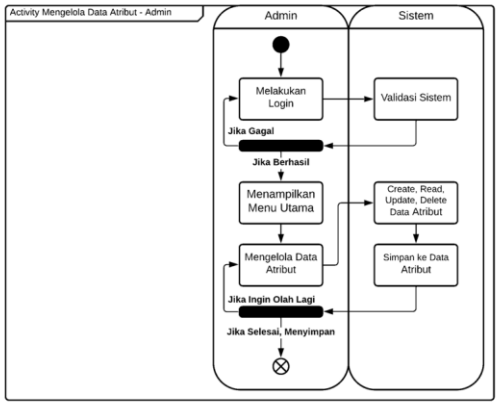

Fig10. Activity Diagram Manage Attribute Data

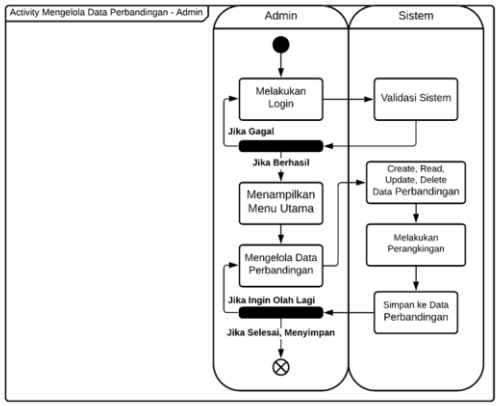

Fig11. Activity Diagram Manage Comparison Data

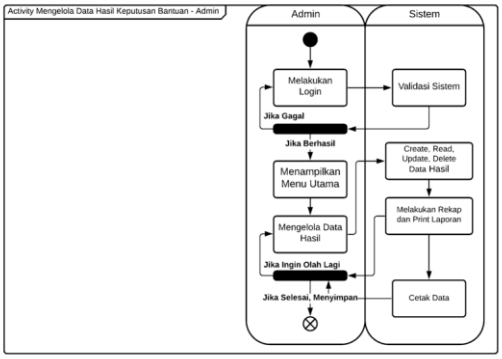

Fig12. Activity Diagram Manage Decision Result Data Help

3.5 Testing

a. Blackbox Testing

Black Box Testing is also a test that is carried out by observing from execution through test data and checking the functionality of the software. So it is analogous to how we see a black box, we can only see its outer appearance. In this study, the Black Box method is used to see errors in functions, which can be seen in the following table:

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Table 4.
BlackboxTesting

Testing Scenario	Expected results	Information
1. Enter Invalid or Blank Username and Password	System Denies Login Access and Displays Error Message	Valid
2. Enter Username and Password Correctly	The System Denies Login Access and Takes Us To The Main Menu	Valid
3. CRUD (Insert, View Change, Delete) Data on Modals (PopUp Menus) and Tables	The system complies well, the functions that have been ordered run smoothly	Valid

Test Scenario Overview:

Fig13. Scenario 1

Fig14. Scenario 2

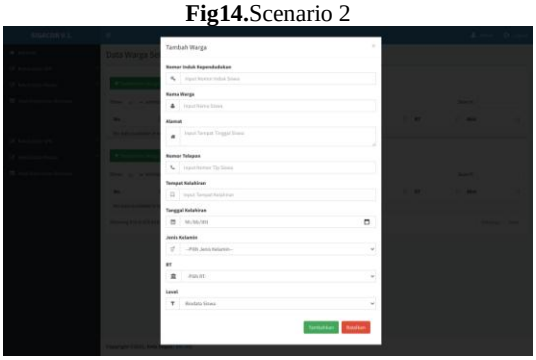

Fig15. Scenario 3

Expected Results Overview:

Fig16. Result 1

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Fig 317. Result 2

Fig18. Result 3

4. Conclusion

From the discussion with the results above, the author can conclude as follows:

a. With this covid assistance website, it can make it easier for many parties to manage covid assistance that is more structured and with valid data.
b. With this website, users can overcome or minimize fraud or corrupted aid funds.
c. This SAW & AHP method can make it easier to make decisions that feel difficult & make it easier to process a lot of data.

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