DECISION SUPPORT SYSTEM TO DETERMINE THE BEST TAX PAYER NOMINEE AT REGIONAL GOVERNMENT USING SAW & AHP

[1]WAHYU AZIZ PRASTIYO, [2*]R. DIMAS ADITYO, [3]SYARIFUL ALIM

Department of Informatics Engineering, Universitas Bhayangkara Surabaya

Jl. Ahmad Yani No.114, Ketintang, Kec Gayungan, Surabaya, Jawa Timur, 60231

e-mail: [1]wahyuaziz63@gmail.com, [2]dimas@ubhara.ac.id, [3]syarifulalim@ubhara.ac.id

[*]Corresponding author

ABSTRACT

Tax, as generally known, are important aspect for Indonesia country sustainability. Taxpayer compliance is a condition where the taxpayer has completed all of their tax obligations and get their tax rights. These compliance are identified when they send back SPT and their compliance of paying tax debts. Decision support system is a part of computerized information system. AHP-SAW is one kind of a method which developed by combining weight and comparison between criteria to determine the best alternative. Using the method, this research will help the tax office to choose which hotel and restaurant are eligible to get the best criteria in tax compliance. Based on the test result, for hotel, accuracy obtained is 78.6% on average, where Hotel Wijaya 1 always get the first rank. For restaurant, the accuracy obtained is 84.7%, where RM Ramio always get the first rank. Business entity criteria has big impact on ranking process where in a 100% accuracy test, this criteria got bigger value than other criteria.

Keywords: *Tax, Hotel, Restaurant, Decision Support System, AHP-SAW, Accuracy*

1. INTRODUCTION

Tax as generally known are important aspect for Indonesia country sustainability. In carrying out development and government, either central or regional government need a lot of funds. As one of the element of country earning, tax has a big role in country development and get more relied in funding government's expense. By paying tax, regional earning will increase.

Taxpayer compliance is a condition where the taxpayer has completed all of their tax obligations and get their tax rights. These compliance are identified when they send back SPT and their compliance of paying tax debts. From these compliance, regional government can make a decision to nominate the best taxpayer by using a decision support system. Decision support system is a part of computerized information system. It is not a tool to generate a decision, but a system which help the decision maker by giving information from processed relevant data and a system which are needed to make faster and more accurate decision (Dasi, 2010). Because of those, this system is not meant to replace the decision making. Based on this background, this research purpose is to help decision making in determining the best taxpayer in regional government using SAW & AHP method. By using this information system, regional government is expected to be easier to find a compliant taxpayer nominee.

2. BACKGROUND THEORY

2.1 Tax

Tax is mandatory fee which paid by people to their country and will be utilized for government and public interest. People who pay would not get the direct benefit from tax, because it is used for public interest, not private. Tax is one of government fund resource to do the country development. Based on constitution tax collection can be forced.

2.1 AHP (Analitycal Hierarchy Process)

AHP Formula

2.2.1 Normalize matrix

a) Sum the value of each column in pairwise comparison matrix by using this equation
$n \sum_{i=0}^{z} x_{ij}$
Where,
n = sum value of each column
z = the number of alternatives

i = 1,2,3,…..z
x = cell value

Table 1 Pairwise comparison matrix

Criteria	C1	C2	C3	C4	C5
C1	1	1	3	1	3
C2	1	1	2	1	1
C3	0,333	0,5	1	1	2
C4	1	1	1	1	3
C5	0,333	1	0,5	0,333	1

b) Divide each value by the sum of column, using this equation

$$m = \frac{x_{ij}}{n}$$

Where,
m = normalized value
x = cell value
n = sum of column

Table 2 Sum result of each column

Criteria	C1	C2	C3	C4	C5
C1	1	1	3	1	3
C2	1	1	2	1	1
C3	0,333	0,5	1	1	2
C4	1	1	1	1	3
C5	0,333	1	0,5	0,333	1
N	3,666	4,5	7,5	4,333	10

2.2.2 Weight Priority

$$\boldsymbol{bp = \frac{\sum_{j=0}^{n} x_{ij}}{n}}$$

Where

bp = mean value of priority weight

n = number of alternatives

j = 1,2,3,….n

x = cell value

2.2.3 Calculate Eigen Max

$$\boldsymbol{\lambda max} = \frac{\sum \boldsymbol{\lambda}}{\boldsymbol{n}}$$

Where λ max = maximum eigen value, n = number of criteria

2.2.4 Calculate Consistency Index (CI)

$$\boldsymbol{CI} = \frac{\boldsymbol{\lambda_{max}} - \boldsymbol{n}}{\boldsymbol{n-1}}$$

Where n = number of element

2.3 SAW (Simple Additive Weighting)

Simple Additive Weighting (SAW) often acknowledged as weighted sum method. Basic principle of SAW method is finding weighted sum of each alternatives performance rating on every attribute (Fishburn, 1967) (MacCrimmon, 1968). SAW method needs normalized decision matrix (X) to be processed into a scale which can be compared with each alternatives. This is the most known method and much used to solve Multiple Attribute Decision Making (MADM) problems. MADM itself is a method used to find optimal alternative with certain criteria.

2.3.1 SAW Formula

Normalize matrix based on equation which adjusted with attribute type (benefit or cost) so normalized matrix R obtained.

$$\mathbf{min}\, \boldsymbol{R_{ij}} = \frac{\boldsymbol{X_{ij}}}{\mathbf{max}(\boldsymbol{X_{ij}})} \quad \text{or} \quad \mathbf{max}\, \boldsymbol{R_{ij}} = \frac{\mathbf{min}(\boldsymbol{X_{ij}})}{\boldsymbol{X_{ij}}}$$

Where
Max Xij = maximum value from each column
Min Xij = minimum value from each column
Xij = row and column value from matrix
Rij = normalized performance rating from alternative Ai on attribute Cj; i = 1,2,3,…m

Next step is to etermine the rank of each alternative

Formula : $V_i = \sum_{j=1}^{n} W_j R_{ij}\backslash$

Where :

V_i = rank of each alternative
W_j = weight value of each criteria
R_{ij} = normalized performance rating of matrix R

3. METHOD

3.1 System Analysis

In this step system analysis is done to identify all taxpayer nominee at Sumenep region. Therefore the data collection is needed to help the decision making, which is to determine the best taxpayer.

3.2 Problem Analysis

In Indonesia, the tax office is known as Direktorat Jenderal Pajak or called DJP, which have duty to formulate and implement standardization technical policy in tax. However there are still many hotel and restaurant owner are not compliant in taxpaying. Therefore the developed system is needed to help by the tax office to determine the best taxpayer in their region.

3.3 Data Analysis

In this step the data related to determining the best taxpayer are collected. Data collected are Hotel and Restaurant Tax Data at Sumenep region. And also criteria used in this research are (C1) Business Entity, (C2) Tax Debt, (C3) Audit, (C4) Company Type, (C5) Nominal. Alternatives used in this research are (A1) Hotel and (A2) Restaurant.

3.4 Flowchart

System flowchart is graphical representation of steps and procedure sequence of a software. Flowchart can help analysis and programmer to solve problem into smaller segment and help analysing other way to operate the software. Below are the system flowchart :

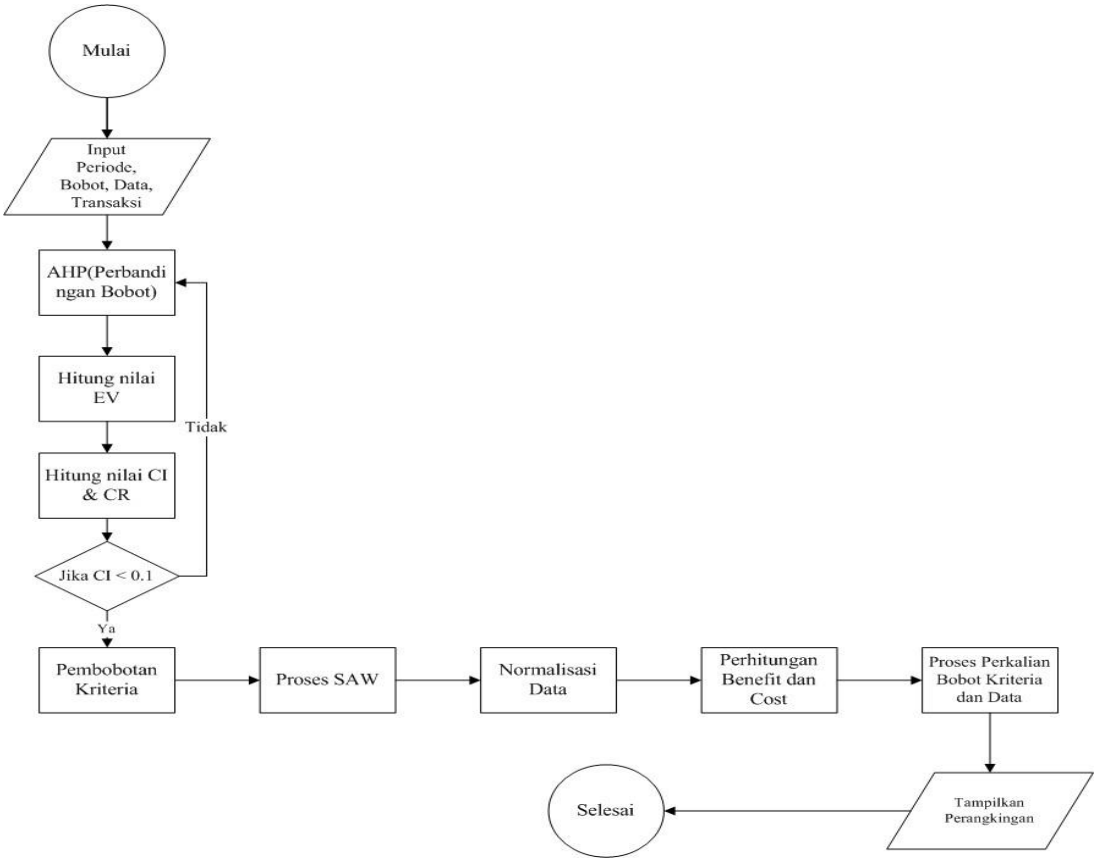

Figure 1. System Flowchart

Initially period value, weight value, and transaction data are inputted to system. Then the next process is split into 2 process, which are AHP and SAW. The AHP steps are as following, calculate pairwise comparison, calculate maximum eigen value, calculate CI and CR. If the value is less than 0.1 then the weighting process is used, otherwise recalculate the weight. After AHP, the next process is SAW. SAW is used to normalize data, then calculate the attribute whether its a benefit or cost type attribute. When its done, the alternatives will be ranked based on the weight determined by AHP.

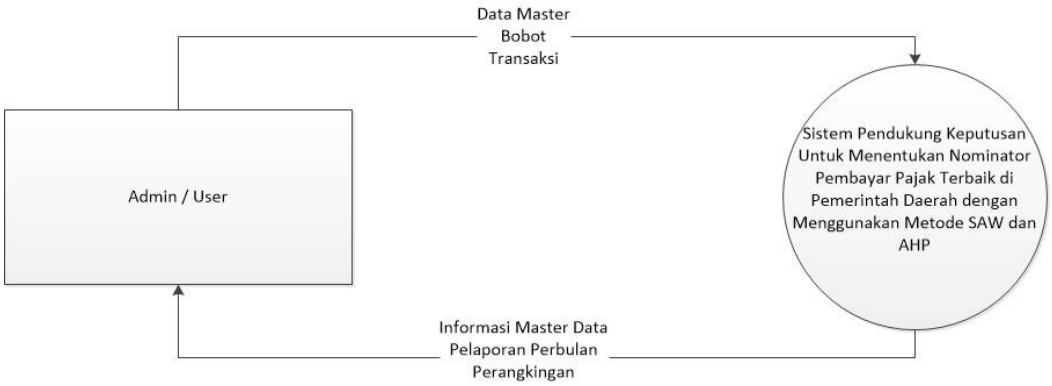

Figure 2. System Context Diagram

Context diagram is an upper level diagram, it is a globally diagram of an information system that shows data flow coming in or out of the system. The picture shows that Admin can send Data Master. Admin will give weight, and send transaction to system. The system will then process the result, and create information to Master Data in form of reports and ranks.

3.5 Data Flow Diagram

A. Data Flow Diagram Level 1

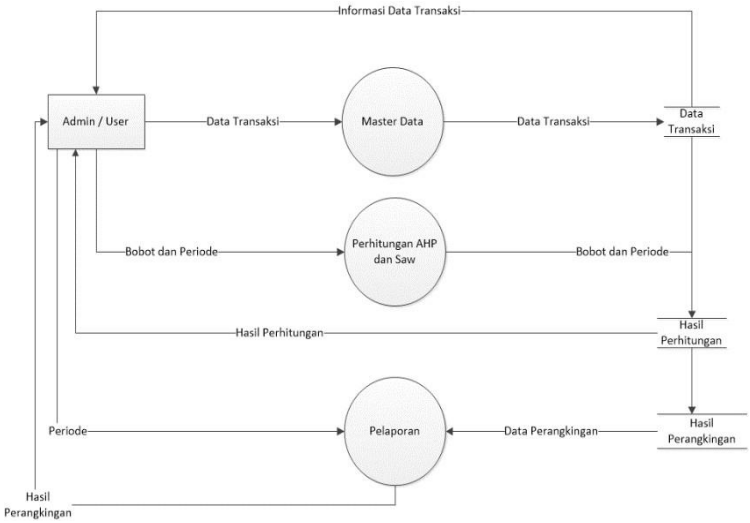

Figure 3. DFD Level 1

B. Data Flow Diagram Level 2

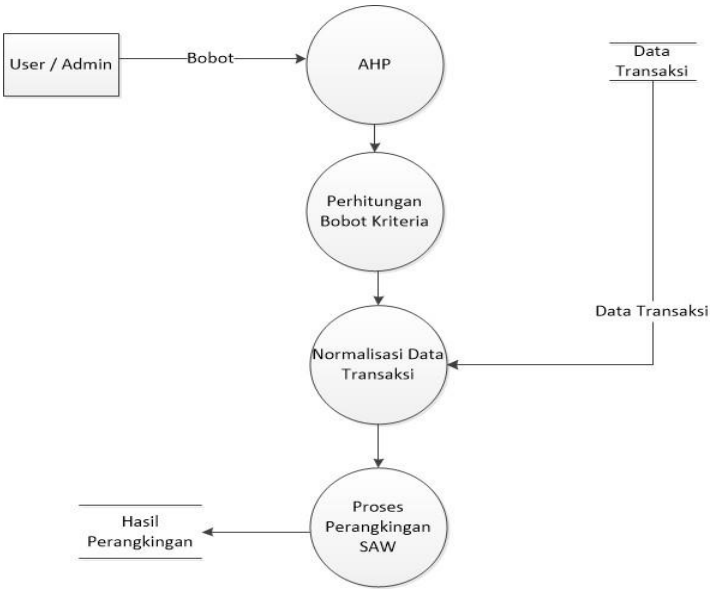

Figure 4. DFD Level 2

3.6 Entity Relationship (ERD)

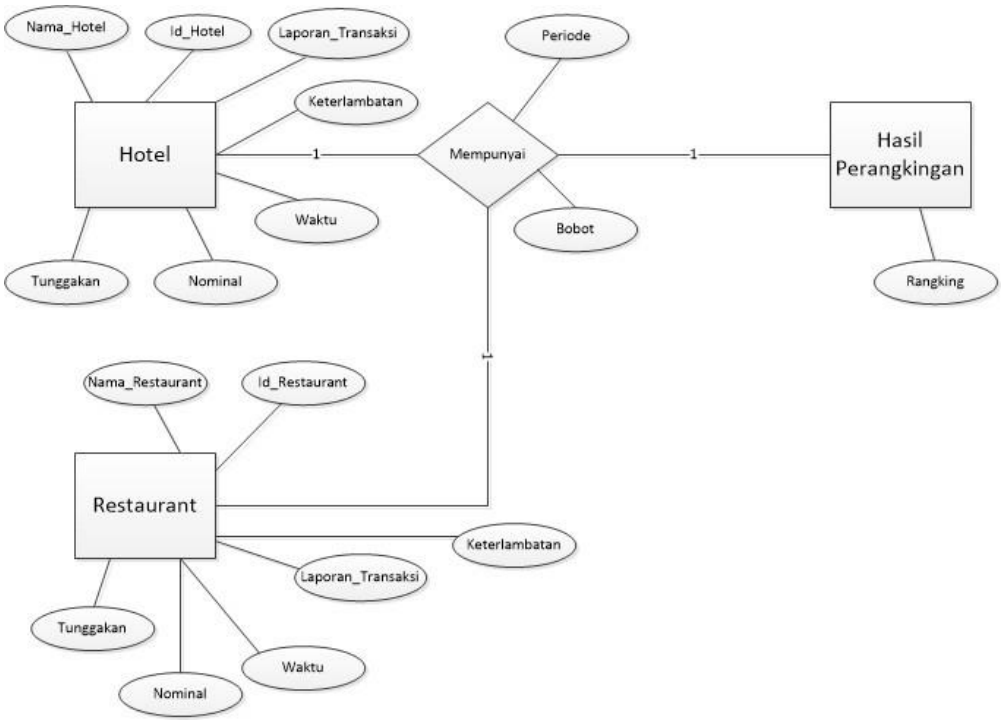

Figure 5. Entity relationship diagram

Entity relationship diagram (ERD) is main data model which help to organize single object data into entities and determine relationship between entities. The picture explains the relationship among hotel data table and restaurant data table. They have transaction which will be connected to rank result table with period and weight entity.

The relationship between hotel/restaurant table and rank result is one-to-one, meaning one hotel/restaurant will have one rank.

4. RESULT AND DISCUSSION

Software testing is one of the activity set planned to test or evaluate the expected result. Testing activity consists of one set or collection of steps where specific test case can be designed. The result obtained from 10 times testing are shown below:

Table 3 Accuracy test

No. of test	Accuracy	
	Hotel	Restaurant
1	100	81
2	79	100
3	63	81
4	57	71
5	89	100
6	89	62
7	78	81
8	68	81
9	74	100
10	89	90
Average	78.6	84.7

Table 3 shows summary of test using different weight. In the 1st hotel test, accuracy 100% is obtained, while in restaurant 100% is obtained during 2nd, 5th, 9th test. In the test where the accuracy are 100%, Business entity has the biggest impact with 0.285 weight while in restaurant the biggest impact is Tax Debt with 0.256 weight (2nd test), Business entity with 0.229 weight (5th test), and Business entity with 0.317 weight (9th test). From the test, it can be concluded that Business entity has the most impact on the ranking process. And also Hotel Wijaya 1 always get the first rank, RM Ramio for restaurant always get the first rank. Average accuracy for 10 times testing for hotel is 78.6% and restaurant is 84.7%.

5. CONCLUSION and SUGGESTION

5.1 Conclusion

Based on the research result, there are some conclusions :

1. Average accuracy for 10 times testing for hotel is 78.6% and Hotel Wijaya 1 always get the first rank in each test.
2. Average accuracy for 10 times testing for restaurant is 84.7% and RM Ramio always get the first rank in each test.
3. For hotel, 100% accuracy is obtained in the 1st test, while for restaurant 100% accuracy is obtained in the 2nd, 5th, and 9th test. Business entity criteria has the biggest impact on hotel evaluation, with 0.285 weight. While on restaurant, Tax debt criteria has the biggest impact in 2nd test with 0.256 weight, Business entity criteria has the biggest impact in 5th ant 9th test with 0.229 weight and 0.317 weight.
4. Based on test result, business entity criteria has the most impact on rank process.

5.2 Suggestion

After going through the evaluation process, there are some suggestions to further improve the developed decision support system, such as:

1. Another sub-criteria could be added to weight AHP criteria.
2. Another MCDM method could be used as a comparison.

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