The Determination of Market Area using Single Additive Weightening (SAW)

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Abstract. The purpose this research is determine the right market share to choose the best market area for increase sales volume. Simple additive weighting (SAW) is method useful to determine market area, this method can choose the best area based on several criteria includes age, gender, income of each region and the number of tourist sites as well as shopping centres. The result, showing that the best market area is Bekasi, Indonesia. Because Bekasi, Indonesia has a higher value from the other candidate. So Bekasi, Indonesia is the market area that has high potential to give positive impact on sales volume.

1. Introduction
Market share is one of aspect which can made a positive effect to profitability [1]. Some companies use promotion method to increase sales volume, but it can work if only the market area is the best place which can give a positive effect on sales volume. So it’s very important to determine the right market share to choose the best market area [2].

Based on researches, stated that promotion, the right market share and market area, is the important things and, has a positive impact on sales volume that can use by company to increase their income, or to determine new branch location [3-5]. However, the results are not always as expected, sometimes the promotions used do not have a positive impact on sales volume. This can happen because the company has not yet segmented the market with the highest marketing potential.

Therefor determine the right Market share can be interpreted as part of the market that is controlled by a company, or the percentage of sales of a company to total sales of its biggest competitors at a certain time and place [6]. This research use age, gender, income of each region and the number of tourist sites as well as shopping centers as criteria [7]. With Simple Additive Weighting (SAW), we can determine the recommendation of potential market that has the most potential value. This method relative quick because the calculation has a simple process and one of the most used multi attribute decision making techniques [8]. Then, determine the right market area using Simple Additive Weighting (SAW) give a positive effect to increase sales volume.

2. Method
This section discusses how the data were collected and the methods used to analyses the data. First step is determine candidate the potential market area from sales data. Then calculate every candidate into matrix and ranking process using simple additive weighting (SAW). The candidate which has the best value means it’s a potential market area. Figure 1 show the step in this researches: (Figure 1)
3. Results and discussion

3.1. Customer based transaction analysis
This is needed to determine the marketing area candidate based on sales data by 2017. Based on the results of the analysis taken the top three cities that have the highest number of sales, they are Bogor city, Depok city and Bekasi city are the candidates used for the next analysis stage.

3.2. Geographic market segmentation analysis
Based on the results of customer analysis and transactions owned by the company. So, at this stage, the input used is the data of three candidate cities, and the data of citizens aged between 20-35 years. Here are the steps to get the value of market opportunities in table 1:

| City       | Citizen age 20 – 35 years (X) | Total Entire Population (TSP) | Value of Market Opportunity (X / TSP) * 100% |
|------------|-------------------------------|------------------------------|--------------------------------------------|
| Kota Bogor | 734.783                       | 1.479.000                    | 49.68%                                     |
| Kota Depok | 489.431                       | 2.161.000                    | 22.64%                                     |
| Kota Bekasi| 765.676                       | 2.714.800                    | 28.20%                                     |

3.3. Target market analysis
Stages of market target testing conducted to measure how people's purchasing power to purchase a product, by looking at the factor of the number of malls, restaurants and tourist attractions. The selection of this criterion is based on where the consumer has the interest, ability (purchasing power) of a product or service [9]. The predetermined target market criteria will be assisted by Simple Additive Weighting (SAW) recommendation method.
3.3.1. Provide data to be analyzed. The data below is the data that became the indicator of assessment in the next stage. Here is the data of the number of tourist attractions, shopping centers and restaurants in every city that became the candidate. (Table 2)

Table 2. Number of criteria in each candidate city.

| No | City  | Tourist Attraction | Shopping Center | Restaurant |
|----|-------|--------------------|-----------------|------------|
| 1. | Bogor | 45                 | 14              | 135        |
| 2. | Bekasi| 8                  | 40              | 120        |
| 3. | Depok | 18                 | 15              | 45         |

3.3.2. Convert data into X matrix form. After getting the data to be analysis in table 2 then made into the form of matrix X based on the formula [10]. Below is the result of matrix equation X:

\[ X = \begin{bmatrix} 45 & 14 & 135 \\ 8 & 40 & 120 \\ 18 & 15 & 45 \end{bmatrix} \]  

(1)

3.3.3. Defining criteria and weight (W). Factors the number of malls, tourist attractions and restaurants selected for review of middle to upper class lifestyle that has a lifestyle, personality and motivation to purchase different products with other groups [10]. The criteria and weights for each factor is 25 % for restaurant, 25% for shopping center and 50% for tourist attraction this value is different for each company. Then the results obtained based on equation. The following is the result of the equation obtained:

\[ W = [0.25 \ 0.25 \ 0.50] \]  

(2)

3.3.4. Criteria analysis. The selection of market testing criteria of restaurants, shopping center and tourist attractions is a benefit variable for the company. This means that the company benefits from restaurants, shopping centers and tourist attractions to determine market places in the areas to be analyzed.

3.3.5. Normalizing the decision matrix. Perform normalized the decision matrix by calculating the value of the rated performance rating from alternative on criterion [11].

\[ r_{ij} = \left( \frac{r \text{ min value of } r}{\max \text{ value of } r} \right) \]  

(3)

- For the number of tourist attractions included in the attribute of profit (benefit), because the greater the value is considered the better. Then :

  \[ r_{11} = \frac{48}{\max (45; 8; 18)} = \frac{48}{48} = 1 \]

  Value 1 for Bogor

  \[ r_{21} = \frac{8}{\max (45; 8; 18)} = \frac{8}{48} = 0.167 \]

  Value 0.167 for Bekasi

  \[ r_{31} = \frac{18}{\max (45; 8; 18)} = \frac{18}{48} = 0.375 \]

  Value 0.375 for Depok
Then the conclusion of the above calculation with the criteria of the highest number of tourist attractions in Bogor City with a value of 1.

- For the number of shopping center included in the attribute of profit (benefit), because the greater the value is considered the better. Then:
  
  \[ r'_{21} = \frac{14}{\max(14;40;15)} = \frac{14}{40} = 0.35 \]
  
  Value 0.35 for Bogor

  \[ r'_{22} = 1 \]
  
  Value 1 for Bekasi

  \[ r'_{23} = \frac{15}{\max(14;40;15)} = \frac{15}{40} = 0.375 \]
  
  Value 0.375 for Depok

Then the conclusion of the above calculation with the criteria of the number of shopping centers of the highest value found in the city of Bekasi with a value of 1.

- For the number of restaurants included in the attribute of profit (benefit), because the greater the value is considered the better. Then:

  \[ r'_{31} = \frac{135}{\max(135;120;45)} = \frac{135}{135} = 1 \]
  
  Value 1 for Bogor

  \[ r'_{32} = \frac{120}{\max(135;120;45)} = \frac{120}{135} = 0.888 \]
  
  Value 0.888 for Bekasi

  \[ r'_{33} = \frac{45}{\max(135;120;45)} = \frac{45}{135} = 0.333 \]
  
  Value 0.333 for Depok

So the conclusion of the above calculation with the highest value restaurant criteria are located in Bogor City with a value of 1.

After the calculation is done by normalizing the decision X matrix, it will get the matrix R. Below is Matrix R:

\[
X = \begin{bmatrix}
1 & 0.35 & 1 \\
0.167 & 1 & 0.888 \\
0.375 & 0.375 & 0.333
\end{bmatrix}
\]

3.3.6. Perform the ranking process. At this stage after obtaining the matrix R it will be calculated ranking with equation formula based on the formula [12].

\[ V = \sum_{j=1}^{n} w_j r'_{ij} \]  \hspace{1cm} (4)

Then we get the value for the each candidate, figure 2 describe that the higher value is bekasi, Indonesia. (Figure 2)
Figure 2. Map for the potential market area.

Then the conclusion of the calculation of the final result of ranking, Bekasi, Indonesia is superior to other areas with a value of 0.731. Because the best value from the candidate who has highest value from Simple Additive Weighting (SAW) for this decision is the result [12].

According to nuraini [6] market share can controlled by company, or higher percentages of sales at a certain time and place. Its mean bekasi, Indonesia has a higher potential for market area, the company can sales her product, or opened new shop or implementation promotion strategy for increase a profitability company.

4. Conclusion
Using Simple Additive Weighting (SAW) we decide that best market area for the company is Bekasi city. It’s suitable for apply the promotion strategy also have high potential to give positive impact on sales volume.

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