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Recommendation System for Determining Micro, Small and Medium Enterprise Business Locations

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***Abstract*—From entreprenurship perspective, determining the right business location is, of course, will become a significant factor for the business's growth in the future. Therefore, a system to facilitate prospective and strategic business locations, for achieving the right selling targets is sure needed. Android mobile based system with GPS technology features can make it easier to determine business location. In our application, we try to tackle this problem by using Simple Additive Weighting (SAW). We took several criteria for strategic business location decision making in our SAW implementation, which comprehend of rental rates, accessibility, location crowd, target market, security, and the number of competitors. Then, by evaluating the finished application, we concluded that the development of an application for Micro, Small and Medium Enterprises (MSMEs) recommendations is to facilitate prospective entrepreneurs to determine a strategic business location to build an entrepreneur.**

***Index Terms*—Android, GPS, MSMEs, Recommendation, Simple Additive Weighting**

I. INTRODUCTION

The use of information technology in the form of the internet by the community is beneficial in improving in terms of economic growth in a region. Many people have been able to transact buying and selling a product from the creative industry through the internet so that the industry players need media for the promotion and marketing of products from the creative industries [1].

Location recommendation system for establishing a business built to help entrepreneurs in making decisions to establish business locations. One method used is Simple Additive Weighting (SAW), with the recommendation system to determine the location of this business the criteria that will be the priority for selecting business locations are rental prices, accessibility, crowd, location, target market, security, and number of competitors [2] [3].

Previous research has carried out to make a decision support system using the Simple Additive Weighting (SAW) method of selecting a place of business, a selection decision support system for new branches and other locations. Some studies that use the SAW method in making decisions include choosing the establishment of a place of herbal medicine business [4], selecting the location of a new branch of a fish food store [5], determining the location of a business [6], determining a new location for a cafe [7] and determining the location of a branch Brown Cottage [8].

Based on preliminary research through surveys and interviews with the community as potential entrepreneurs, it was found that in starting MSME businesses, many prospective business actors had difficulty finding strategic locations in placing their MSMEs businesses.

Prospective business actors must go directly to visit one location to another to find information related to the business location, cause difficulties and require a long time in making decisions. Not a few also that after opening a business, it turns out that the location used is not still the target as expected before.

This research aimed at resolving these problems, so that prospective business people who would open a business, were facilitated in determining the location of their business under their wishes. This research uses the android platform so that it can help in positioning with a global positioning system (GPS). The current research located in the city of Bandung, West Java.

II. LITERATURE REVIEW

Micro, Small and Medium Enterprises (MSMEs) have a vital role in economic growth and development, not only in developing countries but also in developed countries. MSMEs in Indonesia is expected to continue to play an optimal role in the

absorption of labor to combat unemployment. According to BPS data, the number of MSMEs continues to increase and continues to dominate the number of companies.

Already since the beginning of the new order era until now the Indonesian government has run many programs to encourage the development of MSMEs. However, until now, compared to developed country, MSMEs in Indonesia are still weak in many ways, including still more focused on low-tech production, such as food, apparel, furniture, and crafts.

Based on existing secondary data, especially from BPS and literature studies, this book discusses the development of MSMEs in Indonesia with an emphasis on several important issues, such as export performance, competitiveness, significant constraints, technology transfer, and the level of involvement of women as entrepreneurs [9] [10].

The Simple Additive Weighting (SAW) method is often also known as the weighted sum method. The basic concept of SAW mode is to look for weighted sums of performance ratings on each alternative on all attributes. The SAW method requires the process of normalizing the decision matrix (X) to a scale that can compare with all existing alternative ratings [11].

Below are the steps to calculate the SAW method:

1. Determine the candidate, namely Ai.
2. Determine the criteria that will use as a reference in decision making, namely Cj.
3. Provide a match rating value of each candidate on each criterion.
4. Determine the preference or interest weight (W) for each criterion.

   W = [W1 W2 W3 ... Wj] (1)
5. Make a match rating table of each candidate on each criterion.
6. Make an X decision matrix that is formed from the match rating table of each candidate on each criterion. The x value of each candidate (Ai) in each criterion (Cj) has been determined, where i = 1,2, ... m and j = 1,2, ... n.

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1j} \\ \vdots & & & \vdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} \end{bmatrix} \quad (2)$$

7. Normalize the X decision matrix by calculating the normalized (rij) performance rating value of candidate Ai in the Cj criteria.

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max_i(x_{ij})} \\ \dfrac{Min_i(x_{ij})}{x_{ij}} \end{cases} \quad (3)$$

8. The results of the normalized (rij) performance rating values form a normalized (R) matrix.

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1j} \\ \vdots & & & \vdots \\ r_{i1} & r_{i2} & \cdots & r_{ij} \end{bmatrix} \quad (4)$$

9. The final result of preference value (Vi) is obtained from the sum of the multiplication of normalized matrix elements (R) with preference weight (W) corresponding to the matrix column elements (W).

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \quad (5)$$

The results of the calculation of a larger Vi value indicate that the candidate Ai is the best candidate [12].

In February 2005 and was a revolution in how maps were on the web by allowing users to draw maps so they could navigate. This map using Google Maps solution at the time was still new and needed a particular server [13]. Google Maps used in this application to display a map of the location.

The recommendation system is a system designed to predict an item that matches the user's interests, which item will recommend to the user. Prediction of user interest information can be obtained based on user behavior action patterns or often said as user profiles. One way that does to form a user profile is, for example, when a user makes a loan transaction, the loan data will be stored as a user profile. Based on the user profile that has formed, it will be known the interest of the book that is liked by the user [14] [15].

III. RESEARCH METHOD

This research method has two stages, namely the data collection stage and the software development stage. The following is the flow of research that can be seen in Fig. 1.

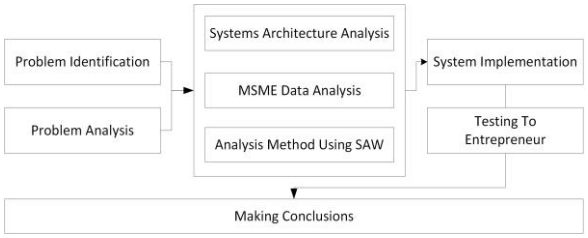


Fig. 1. Stage of research

System architecture analysis aims to describe how a system sends data requests and sends a response to the requested data up to the user, the system architecture can be seen in Fig. 2.

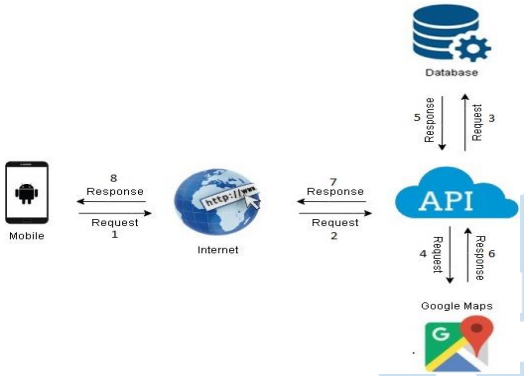


Fig. 2. System architecture

From the Fig. 2 above, it can be seen the flow of data requests that occur from application users to obtain information from a recommendation system to determine a strategic business location.

Analysis of MSMEs recommendations uses the SAW method to determine the location recommended by the system. At this stage, it aims to analyze the data obtained at the data collection stage to determine the details of each of the criteria. The recommendation flow from SAW can see in Fig. 3.

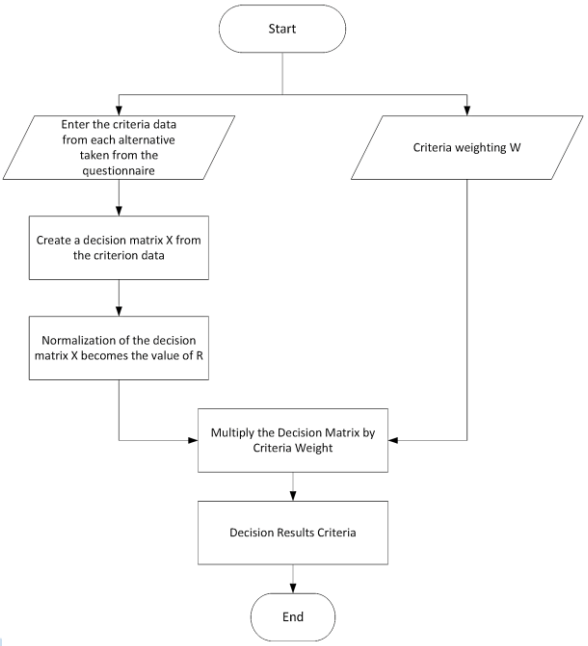


Fig. 3. Stages of SAW recommendations

IV. Results and Discussion

After conducting interviews with entrepreneurs, there are six criteria used in this research, including:

1. Rental Price
2. Accessibility
3. Location Crowd
4. Target Market
5. Security
6. Amount of Competitors

A. Recommendation Method Analysis

Direct interviews with 30 entrepreneurs determine decision-making attributes (criteria), decision-making criteria and values. This value can be changed in the application based on the conditions desired by the user.

C1 = Rental Price = 15%

C2 = Accessibility = 20%

C3 = Location Crowd = 30%

C4 = Target Market = 15%

C5 = Security = 10%

C6 = Amount of Competitors = 10%

There are 30 alternative decision making namely:

A1= Kec. Andir, A2= Kec. Antapani, A3= Kec. Arcamanik, A4= Kec. Astana Anyar, A5= Kec. Ciparay, A6= Kec. Bandung Kidul, A7= Kec. Bandung Kulon, A8= Kec. Bandung Wetan, A9=

Kec. Batununggal, A10= Kec. Bojongloa Kaler, A11= Kec. Bojongloa Kidul, A12= Kec. Buahbatu, A13= Kec. Cibeunying Kaler, A14= Kec. Cibeunying Kidul, A15= Kec. Cibiru, A16= Kec. Cicendo, A17= Kec. Cidadap, A18= Kec. Cinambo, A19= Kec. Coblong, A20= Kec. Gedebage, A21= Kec. Kiaracondong, A22= Kec. Lengkong, A23= Kec. Mandalajati, A24= Kec. Panyeulikan, A25= Kec. Rancasari, A26= Kec. Regol, A27= Kec. Sukajadi, A28= Kec. Sukasari, A29= Kec. Sumur Bandung, A30= Kec. Ujungberung.

From each criterion the value determined: low= 2, medium= 3, high= 4 and very high = 5. The following is a table of criteria that have determined rental prices can see in Table I.

TABLE I. RATING OF RENTAL PRICES

Rental Price (Rp)	Nominal
10.000.000 – 30.000.000	Very cheap
30.000.000 – 50.000.000	Cheap
50.000.000 – 60.000.000	Medium
60.000.000 – 100.000.000	Expensive

It is said to be very cheap if the price of Rp. 10,000,000 up to Rp. 30,000,000. It is cheap if the price is Rp. 30,000,000 to Rp. 50,000,000, medium from Rp. 50,000,000 up to Rp. 60,000,000. Expensive from Rp. 60,000,000 up to Rp. 100,000,000. With a weight of rental price, the value can see in Table II.

TABLE II. RENTAL PRICES VALUE (C1)

Rental Price	Value
Expensive	2
Medium	3
Cheap	4
Very cheap	5

Accessibility is the route of public transportation that passes in a strategic business location. If there is public transportation that passes through that location, it said that access to that location is very easy to reach. If it can be accessed using a car and motorcycle, but there is no public transportation, it said that access to that location is easy, whereas if it can only be accessed using a motorcycle, then it is said to be medium. If the location is only accessible on foot, it is said difficult. Accessibility (C2) with a weight, the value can see in Table III.

TABLE III. ACCESSIBILITY VALUE (C2)

Accessibility	Value
Difficult	2
Medium	3
Easy	4
Very Easy	5

Following is the criteria table of the location crowd criteria, the crowded location can see in Table IV.

TABLE IV. LOCATION CROWD LEVEL

Crowd	Criteria
20.000 – 50.000 people	Not crowded
50.000 – 70.000 people	Pretty Crowded
70.000 – 100.000 people	Crowded
100.000 – 150.000 people	Very crowded

The number of sub-district residents in the city of Bandung said not too crowded. The population is 20,000 souls up to 50,000 souls. It said to be quite crowded, with 50,000 souls up to 70,000 souls. It is said to be 70,000 souls up to 100,000 souls. It is said to be very crowded. 100,000 souls up to 150,000 souls. (C3) with weight, values can see in Table V.

TABLE V. LOCATION CROWD VALUE (C3)

Location Convenience	Value
Not crowded	2
Quite crowded	3
Crowded	4
Very crowded	5

The following is a criteria table of the target market criteria. The intended target market is the target market from these locations, such as schools or offices. The target market (C4) can see in Table VI.

TABLE VI. TARGET MARKET VALUE (C4)

Target Market	Value
5 Km≤ 6 Km	2
3 Km ≤ 4 Km	3
1 Km ≤ 2 Km	4
200 M ≤ 500 M	5

The following is a criteria table of security criteria, and security records are said to be low if a crime occurs more than twice a month. One to two crimes a month are said to occur. It is said to be high if there is a crime once in a month. It is said to be very high if there has never been a crime in one month. Security (C5) with weight, values can be seen in Table VII.

TABLE VII. SECURITY VALUE (C5)

Security Level	Value
Low	2
Medium	3
High	4
Very High	5

The following is a criteria table of the amount of competition. The amount of competition around the location is said to be Low if similar business competitors amount to 1 to 5. It said that medium 5 to 10. It said high 10 to 20. It is said to be very high from 20 to 30. Amount of competition (C6) with the weight of the value can see in Table VIII.

TABLE VIII. AMOUNT OF COMPETITION VALUE (C5)

Amount of Competition	Value
Very High	2
High	3
Medium	4
Low	5

After the criteria and weight values of each criterion have determined, the following completion steps can see in Table IX.

TABLE IX. CRITERIA MATCH RATING

Alternative	Criteria					
	C1	C2	C3	C4	C5	C6
Kec. Andir	3	4	4	5	4	2
Kec. Antapani	3	5	5	5	4	2
Kec. Arcamanik	3	4	3	3	3	3
Kec. Astana Anyar	4	3	3	4	3	3
Kec. Ciparay	4	3	2	3	3	5
Kec. Bandung Kidul	4	2	2	2	3	4
Kec. Bandung Kulon	3	2	2	2	3	3
Kec. Bandung Wetan	3	3	2	2	3	3
Kec. Batununggal	3	3	2	3	2	2
Kec. Bojongloa Kaler	3	3	3	2	2	2
Kec. Bojongloa Kidul	3	2	2	3	2	3
Kec. Buahbatu	3	3	4	3	2	3
Kec. Cibeunying Kaler	3	2	2	3	2	3
Kec. Cibeunying Kidul	3	2	3	2	3	3
Kec. Cibiru	4	2	2	3	2	3
Kec. Cicendo	3	2	3	2	3	3
Kec. Cidadap	3	2	2	3	2	3
Kec. Cinambo	3	3	2	3	3	3
Kec. Coblong	3	4	5	5	4	3
Kec. Gedebage	3	3	3	4	3	3
Kec. Kiaracondong	3	3	4	4	4	3
Kec. Lengkong	3	3	4	5	3	3
Kec. Mandalajati	3	3	3	3	4	3
Kec. Panyeulikan	3	4	3	3	4	3
Kec. Rancasari	4	3	4	3	3	3
Kec. Regol	3	3	3	3	4	4
Kec. Sukajadi	4	4	5	5	4	3
Kec. Sukasari	3	4	3	3	4	3
Kec. Sumur Bandung	3	3	4	3	2	3
Kec. Ujungberung	3	3	3	2	3	3

$$X = \begin{bmatrix} 3 & 4 & 4 & 5 & 4 & 2 \\ 3 & 5 & 5 & 5 & 4 & 2 \\ 3 & 4 & 3 & 3 & 3 & 3 \\ 4 & 3 & 3 & 4 & 3 & 3 \\ 4 & 3 & 2 & 3 & 3 & 5 \\ 4 & 2 & 2 & 2 & 3 & 4 \\ 3 & 2 & 2 & 2 & 3 & 3 \\ 3 & 3 & 2 & 2 & 3 & 3 \\ 3 & 3 & 2 & 3 & 2 & 2 \\ 3 & 3 & 3 & 2 & 2 & 2 \\ 3 & 2 & 2 & 3 & 2 & 3 \\ 3 & 3 & 4 & 3 & 2 & 3 \\ 3 & 2 & 2 & 3 & 2 & 3 \\ 3 & 2 & 3 & 2 & 3 & 3 \\ 4 & 2 & 2 & 3 & 2 & 3 \\ 3 & 2 & 3 & 2 & 3 & 3 \\ 3 & 2 & 2 & 3 & 2 & 3 \\ 3 & 3 & 2 & 3 & 3 & 3 \\ 3 & 4 & 5 & 5 & 4 & 3 \\ 3 & 3 & 3 & 4 & 3 & 3 \\ 3 & 3 & 4 & 4 & 4 & 3 \\ 3 & 3 & 4 & 5 & 3 & 3 \\ 3 & 3 & 3 & 3 & 4 & 3 \\ 3 & 4 & 3 & 3 & 4 & 3 \\ 4 & 3 & 4 & 3 & 3 & 3 \\ 3 & 3 & 3 & 3 & 4 & 4 \\ 4 & 4 & 5 & 5 & 4 & 3 \\ 3 & 4 & 3 & 3 & 4 & 3 \\ 3 & 3 & 4 & 3 & 2 & 3 \\ 3 & 3 & 3 & 2 & 3 & 3 \end{bmatrix}$$

Determining the preference weight or level of interest (W) for each criterion as follows:

W = [15, 20, 30, 15, 10, 10]

Normalize the X decision matrix. With the formula:

Rij = Xij if j is the Max (Xij) profit criteria (benefit)
Rij = Min (Xij) if j is the cost criterion Xij (cost)

Xij provides an advantage to decision-makers, on the contrary, the cost criteria if Xij raises costs for decision-makers. The results of X normalization calculations for each criterion are as follows:

$$R = \begin{bmatrix} 1 & 0,8 & 0,8 & 1 & 1 & 1,00 \\ 1 & 1 & 1 & 1 & 1 & 1,00 \\ 1 & 0,8 & 0,6 & 0,6 & 0,75 & 0,67 \\ 0,75 & 0,6 & 0,6 & 0,8 & 0,75 & 0,67 \\ 0,75 & 0,6 & 0,4 & 0,6 & 0,75 & 0,40 \\ 0,75 & 0,4 & 0,4 & 0,4 & 0,75 & 0,50 \\ 1 & 0,4 & 0,4 & 0,4 & 0,75 & 0,67 \\ 1 & 0,6 & 0,4 & 0,4 & 0,75 & 0,67 \\ 1 & 0,6 & 0,4 & 0,6 & 0,5 & 1,00 \\ 1 & 0,6 & 0,6 & 0,4 & 0,5 & 1,00 \\ 1 & 0,4 & 0,4 & 0,6 & 0,5 & 0,67 \\ 1 & 0,6 & 0,8 & 0,6 & 0,5 & 0,67 \\ 1 & 0,4 & 0,4 & 0,6 & 0,5 & 0,67 \\ 1 & 0,4 & 0,6 & 0,4 & 0,75 & 0,67 \\ 0,75 & 0,4 & 0,4 & 0,6 & 0,5 & 0,67 \\ 1 & 0,4 & 0,6 & 0,4 & 0,75 & 0,67 \\ 1 & 0,4 & 0,4 & 0,6 & 0,5 & 0,67 \\ 1 & 0,6 & 0,4 & 0,6 & 0,75 & 0,67 \\ 1 & 0,8 & 1 & 1 & 1 & 0,67 \\ 1 & 0,6 & 0,6 & 0,8 & 0,75 & 0,67 \\ 1 & 0,6 & 0,8 & 0,8 & 1 & 0,67 \\ 1 & 0,6 & 0,8 & 1 & 0,75 & 0,67 \\ 1 & 0,6 & 0,6 & 0,6 & 1 & 0,67 \\ 1 & 0,8 & 0,6 & 0,6 & 1 & 0,67 \\ 0,75 & 0,6 & 0,8 & 0,6 & 0,75 & 0,67 \\ 1 & 0,6 & 0,6 & 0,6 & 1 & 0,50 \\ 0,75 & 0,8 & 1 & 1 & 1 & 0,67 \\ 1 & 0,8 & 0,6 & 0,6 & 1 & 0,67 \\ 1 & 0,6 & 0,8 & 0,6 & 0,5 & 0,67 \\ 1 & 0,6 & 0,6 & 0,4 & 0,75 & 0,67 \end{bmatrix}$$

After that, do the ranking process using equations information :

Vi = ranking for each alternative
Wj = weight value of each criterion
Rij = normalized performance rating value

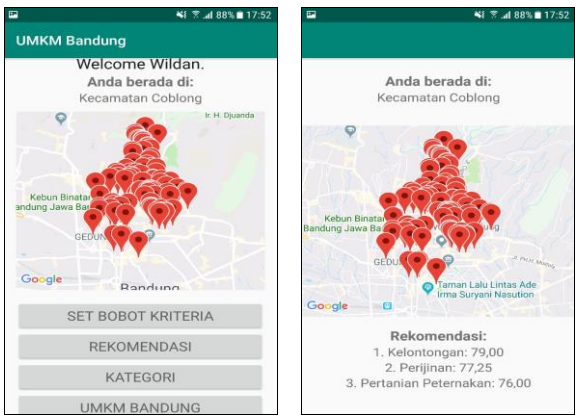
V1= (15)(1)+(20)(0,8)+(30)(0,8)+(15)(1)+(10)(1)+(10)(1) = 90
V2= (15)(1)+(20)(1)+(30)(1)+(15)(1)+(10)(1)+(10)(1) = 100
V3= (15)(1)+(20)(0,8)+(30)(0,6)+(15)(0,6)+(10)(0,75)+(10)(0,67) = 72,17
V4= (15)(0,75)+(20)(0,6)+(30)(0,6)+(15)(0,8)+(10)(0,7)+(10)(0, 7) = 67,42
V5= (15)(0,75)+(20)(0,6)+(30)(0,4)+(15)(0,6)+(10)(0,7)+(10)(0,4) = 55,75
V6= (15)(0,75)+(20)(0,4)+(30)(0,4)+(15)(0,4)+(10)(0,7)+(10)(0,50 = 49,75
V7= (15)(1)+(20)(0,4)+(30)(0,4)+(15)(0,4)+(10)(0,75)+(10)(0,65) = 55,17
V8= (15)(1)+(20)(0,6)+(30)(0,4)+(15)(0,4)+(10)(0,75)+(10)(0,67) = 59,17
V9= (15)(1)+(20)(0,6)+(30)(0,4)+(15)(0,6)+(10)(0,5)+(10)(1) = 63,00
V10= (15)(1)+(20)(0,6)+(30)(0,6)+(15)(0,4)+(10)(0,5)+(10)(1) = 66,00
V11= (15)(1)+(20)(0,4)+(30)(0,4)+(15)(0,6)+(10)(0,5)+(10)(0,67) = 55,67
V12= (15)(1)+(20)(0,6)+(30)(0,8)+(15)(0,6)+(10)(0,5)+(10)(0,67) = 71,67
V13= (15)(1)+(20)(0,4)+(30)(0,4)+(15)(0,6)+(10)(0,5)+(10)(0,67) = 55,67
V14= (15)(1)+(20)(0,4)+(30)(0,6)+(15)(0,4)+(10)(0,75)+(10)(0,67) = 61,17
V15= (15)(0,7)+(20)(0,4)+(30)(0,4)+(15)(0,6)+(10)(0,5)+(10)(0,6) = 51,92
V16= (15)(1)+(20)(0,4)+(30)(0,6)+(15)(0,4)+(10)(0,75)+(10)(0,67) = 61,17
V17= (15)(1)+(20)(0,4)+(30)(0,4)+(15)(0,6)+(10)(0,5)+(10)(0,67) = 55,67
V18= (15)(1)+(20)(0,6)+(30)(0,4)+(15)(0,6)+(10)(0,75)+(10)(0,67) = 62,17
V19= (15)(1)+(20)(0,8)+(30)(1)+(15)(1)+(10)(1)+(10)(0,67) = 92,67
V20= (15)(1)+(20)(0,6)+(30)(0,6)+(15)(0,8)+(10)(0,75)+(10)(0,67) = 71,17
V21= (15)(1)+(20)(0,6)+(30)(0,8)+(15)(0,8)+(10)(1)+(10)(0,67) = 79,67
V22= (15)(1)+(20)(0,6)+(30)(0,8)+(15)(1)+(10)(0,75)+(10)(0,67) = 80,17
V23= (15)(1)+(20)(0,6)+(30)(0,6)+(15)(0,6)+(10)(1)+(10)(0,67) = 70,67
V24= (15)(1)+(20)(0,8)+(30)(0,6)+(15)(0,6)+(10)(1)+(10)(0,67) = 74,67
V25= (15)(0,7)+(20)(0,6)+(30)(0,8)+(15)(0,6)+(10)(0,7)+(10)(0,67) = 70,4
V26= (15)(1)+(20)(0,6)+(30)(0,6)+(15)(0,6)+(10)(1)+(10)(0,50) = 69,00
V27= (15)(0,75)+(20)(0,8)+(30)(1)+(15)(1)+(10)(1)+(10)(0,67) = 88,92
V28= (15)(1)+(20)(0,8)+(30)(0,6)+(15)(0,6)+(10)(1)+(10)(0,67) = 74,67
V29= (15)(1)+(20)(0,6)+(30)(0,8)+(15)(0,6)+(10)(0,5)+(10)(0,67) = 71,67
V30= (15)(1)+(20)(0,6)+(30)(0,6)+(15)(0,4)+(10)(0,75)+(10)(0,67) = 65,17

There are 3 major results for ranking for MSME locations, namely:

V1 = Kec. Andir with value 90
V2 = Kec. Antapani with value 100
V19 = Kec. Coblong with value 92.67

B. *System Implementation*

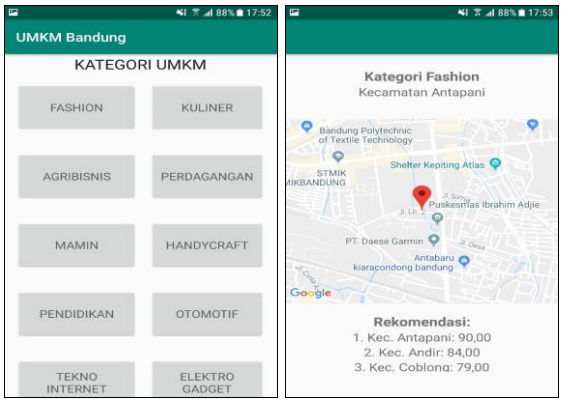
The smartphone android used when implementing this application is using a smartphone that uses by entrepreneurs. The minimum requirements of a smartphone to implement this application is using processor snapdragon 625, memory 2GB, free space of ROM is 10 MB, operating system Android 4.4 Kitkat, network using HSPA/LTE and must have Global Positioning System (GPS) sensor. The implementation of a mobile application interface can see in Fig. 4 until Fig. 6.



(a) (b)

Fig. 4. Recommendation using GPS location

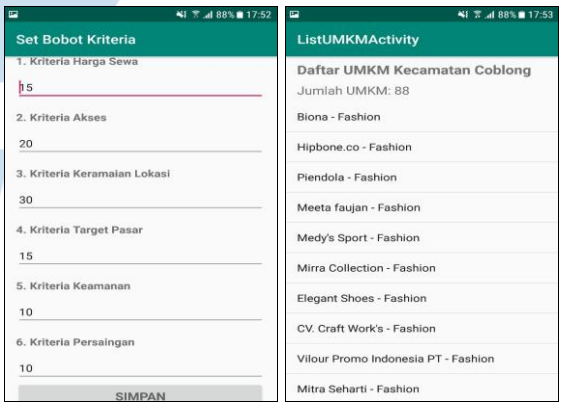
In figure 4, it can explain that after the application is run, by default, it will detect the location of smartphone users by activating the global positioning system (GPS) sensor. In Fig 4 (a), four menu choices are consisting of a set of criteria weights, recommendations, categories, and UMKM Bandung. Whereas Fig 4 (b) shows the information on the recommended business sector to be opened in the detected area. Fig 4 (b) will appear if the user selects the recommendation menu in Fig 4 (a).



(a) (b)

Fig. 5. MSMEs recommendation using category

Fig. 5 (a) shows a list of MSMEs categories that can be selected. The application will display the most recommended locations to open based on the category options. Fig. 5 (b) shows that for the fashion category, it recommended opening in the Antapani sub-district area.



(a) (b)

Fig. 6. Setting the weight of criteria

In Fig. 6 (a), it can seem that the user can also change the rating weights of each criterion. This feature provided so that users are free to make a criterion the highest weight based on the desired situation and condition. In Fig. 6 (a), the user chooses the criteria for location crowd to be the highest value than the other criteria.

In Fig. 6 (b), users can also see a list of MSMEs in the selected location. Thus, the user indirectly also gets information related to the closest competitor that is available when opening a business in an area.

To input MSMEs data in an area, a website-based backend system use, as shown in Fig. 7, and Fig. 8. MSMEs data obtained from the relevant government agencies. This application using JSON as a web service so that the mobile application android can access the database stored on the server [16].

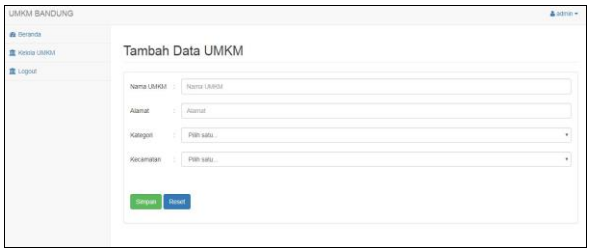


Fig. 7. Interface for input data MSMEs

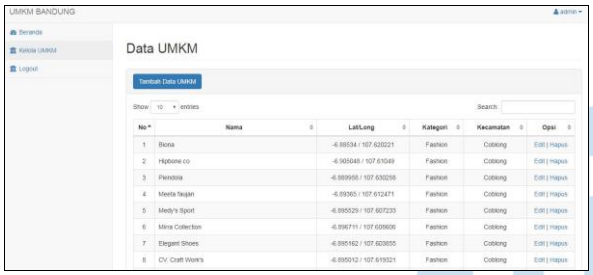


Fig. 8. Back-end interface

C. *User Acceptance Testing*

Testing done by giving a questionnaire format to 30 prospective entrepreneur respondents, which are based on the target users and carried out calculations and then look for the percentage of each answer, can be seen in Table X.

TABLE X. ACCEPTANCE TESTING

Question 1 : Do you agree that this application of the MSMEs recommendation system can make it easier for you to determine your business location?				
SS	ST	RG	TS	STS
20	6	4	0	0
Average = (136/150) * 100 % = 90,6 %				
Question 2 : Do you agree that the application of the MSMEs recommendation system can help you determine where MSMEs are on target with marketing targets?				
SS	ST	RG	TS	STS
23	7	0	0	0
Average = (143/150) * 100 % = 95,3 %				
Question 3 : Do you agree that the MSMEs recommendation system application helps you get information about business locations using an android smartphone?				
SS	ST	RG	TS	STS
25	3	1	0	0
Average = (139 / 150) * 100% = 92,6 %				
Final Average = (90,6+95,3+92,6) / 3 = 92,83 %				

Based on the results of testing in Table X, it found that the functional objectives of this research could be categorized as successful because they obtained a total value of 92,83% from a maximum value of 100%.

V. CONCLUSION

The results obtained from this research are to start a business, must pay attention to several criteria. Applications built in research can provide recommendations to prospective entrepreneurs when opening a new business. It expected that the recommendations given could minimize the occurrence of failures in business. Research conducted at this time focus on Android-based mobile applications. Further research will focus on web-based and dashboard information systems so that all users who do not use an Android smartphone can also use this system.

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