



Decision Support System to Choose Drinks with The Weight Product (WP) Method

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ABSTRACT

Mataram city is one of the cities in the Unitary State of the Republic of Indonesia (NKRI), especially the capital city of West Nusa Tenggara province. Mataram City has 15,746 micro-enterprises. One of these micro-enterprises is a coffee shop. The number of coffee shops in the Mataram city area is currently approximately 50 coffee shops. Many forms and choices of drinks sell in coffee shops make buyers confused when choosing which beverage product to consume. Necessary to decide to choose beverage products with a Decision Support System Using the Weighted Products order to assist in the selection of beverages when placing an order at a coffee shop that suits the needs of buyers. Only 2 basic types of drinks are usually ordered at coffee shops, namely coffee, and milk. Multiply all the alternative weighted attributes, as the strength for the positive attribute values and the profit are used for negative, while the cost is used for the S_i vector. The multiplication results are added together to get alternative results. Do the division between S_i and the sum of S_i ($\sum S_i$). Produce the best alternative sequence used for decision-making. the decision to choose drinks in the city of Mataram using the Weighted Product (WP) with several criteria, namely price, composition, type of drink, and size. From the results of calculations carried out the type of coffee milk drink obtained the highest value, namely 0.016, then for the second rank the type of long black drink with a value of 0.0157, and for the third rank, the type of avocado milkshake drink with a value of 0.015.

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1. Introduction

Mataram city is one of the cities in the Unitary State of the Republic of Indonesia (NKRI), especially the capital city of West Nusa Tenggara province. The city of Mataram has an area of 61.3, with a population of 495,314 people, where the city of Mataram consists of 6 sub-districts, namely Ampenan District, Sekarbela District, Mataram District, Selaparang District, Cakranegara District, and Sandubaya District [1]. Mataram City has 15,746 micro-enterprises [2]. One of these micro-enterprises is a coffee shop. It is a cafe or small restaurant that sells a variety of coffee drinks, non-alcoholic, snacks or snacks, with supporting facilities [3]. The growth of the coffee industry does not only occur in big cities, but also in West Nusa Tenggara Province. In Mataram City itself, there are many modern coffee shops that provide various types of coffee drinks with various flavors and types of local coffee and types of coffee. national and even foreign countries. Besides that, the atmosphere of a different coffee shop, has its own experience for the citizens of the city of Mataram in enjoying the drink of coffee connoisseurs. The rapid growth of this industry with its various characteristics provides many alternatives and a variety of



choices for consumers, especially coffee lovers in the city of Mataram. The number of coffee shops in the Mataram city area is currently approximately 50 coffee shops [4].

During the growth of coffee shops in the city of Mataram, several coffee shops provide variants of drinks, both in the form of drinks in the form of coffee drinks and variants of drinks other than coffee. Moreover, for coffee drinks, different types of coffee will have different effects. For example, the variants of coffee drinks that are commonly found are long black, espresso, vanilla latte, mochaccino and others. Meanwhile, for variant drinks other than coffee, it can be in the form of drinks made from milk, for example avocado milkshake, vanilla milkshake, taro milkshake and others. Many forms and choices of drinks sell in coffee shops make buyers confused when choosing which beverage product to consume. So, it is necessary to decide choose beverage products with a Decision Support System Using the Weighted Products order to assist in the selection of beverages when placing an order at a coffee shop that suits the needs of buyers. In this study, only 2 basic types of drinks are usually ordered at coffee shops, namely coffee and milk.

The Weighted Product (WP) method is one of the methods used to solve the Multi Attribute Decision Making (MADM) problem. MADM is to determine the weight value for each attribute, then proceed with a ranking process that will select the alternatives that have been given [5]. Other studies that have been carried out using the Weighted Product (WP) method include research relating to the selection of the best laptop to assist recommendations in selecting the best laptop at the Bekasi Mandiri Vocational School by using 5 criteria, namely: processor, RAM, hard drive, VGA, and price. [6]. The selection of the best computer technicians is in accordance with the expertise competencies possessed by using five criteria including computer understanding, network understanding, education, discipline, and personality [7]. The criteria are determined to be a reference in making decisions on the product weight method using four criteria, namely price, color print, black print, and weight for the best printer selection decision [8]. The advantage of the Weighted Product (WP) method is that there are cost and benefit variables that are useful for determining the criteria that affect the results of the decision value [8]. While the drawbacks of the Weighted Product (WP) method are only for use in value processes that have range values [5]. Other research using the Weight Product is used to determine the priority of mustahik who are entitled to receive assistance from BAZIS DKI JAKARTA, the criteria used are seen from monthly income, place of residence, and vehicle used [9].

2. THEORETICAL BASIS

2.1 Weighted Product

Weighted Product (WP) is one of the methods in the decision-making method that is commonly used to combine the values for each attribute, where each attribute has a weight value that can be increased, which will eventually produce a ranking value for each of these attributes. This process is almost the same as the normalization process [5], the calculation formula for determining the weight value of S is as follows.

$$S_i = \prod_{j=1}^n X_{ij} W^j$$

The explanation of the formula (S_i) is as follows:

With $i = 1, 2, \dots, m$;

$J = 1, 2, \dots, n$ and

$\sum w_j = 1$.

S_i = substitute for alternative values in the form of vector S

X = criterion value

n = process stage

w_j = weight criteria, positive criteria for profit criteria and a negative value for cost criteria

The stages regarding the Weight Product algorithm process are as follows:

1. Make improvements to the addition of weights so that the total weight becomes $w_j = 1$.

2. Multiply all the alternative weighted attributes, as the strength for the positive attribute values and the profit are used for negative, while the cost used for the S_i vector.
3. The multiplication results are added together to get alternative results
4. Do the division between S_i and the sum of S_i ($\sum S_i$)
5. So as to produce the best alternative sequence used for decision making.

2.2 Flowchart For Weight Product

flowchart of the application of the weighted product method regarding decision making to choose drinks
The research methods are as follows:

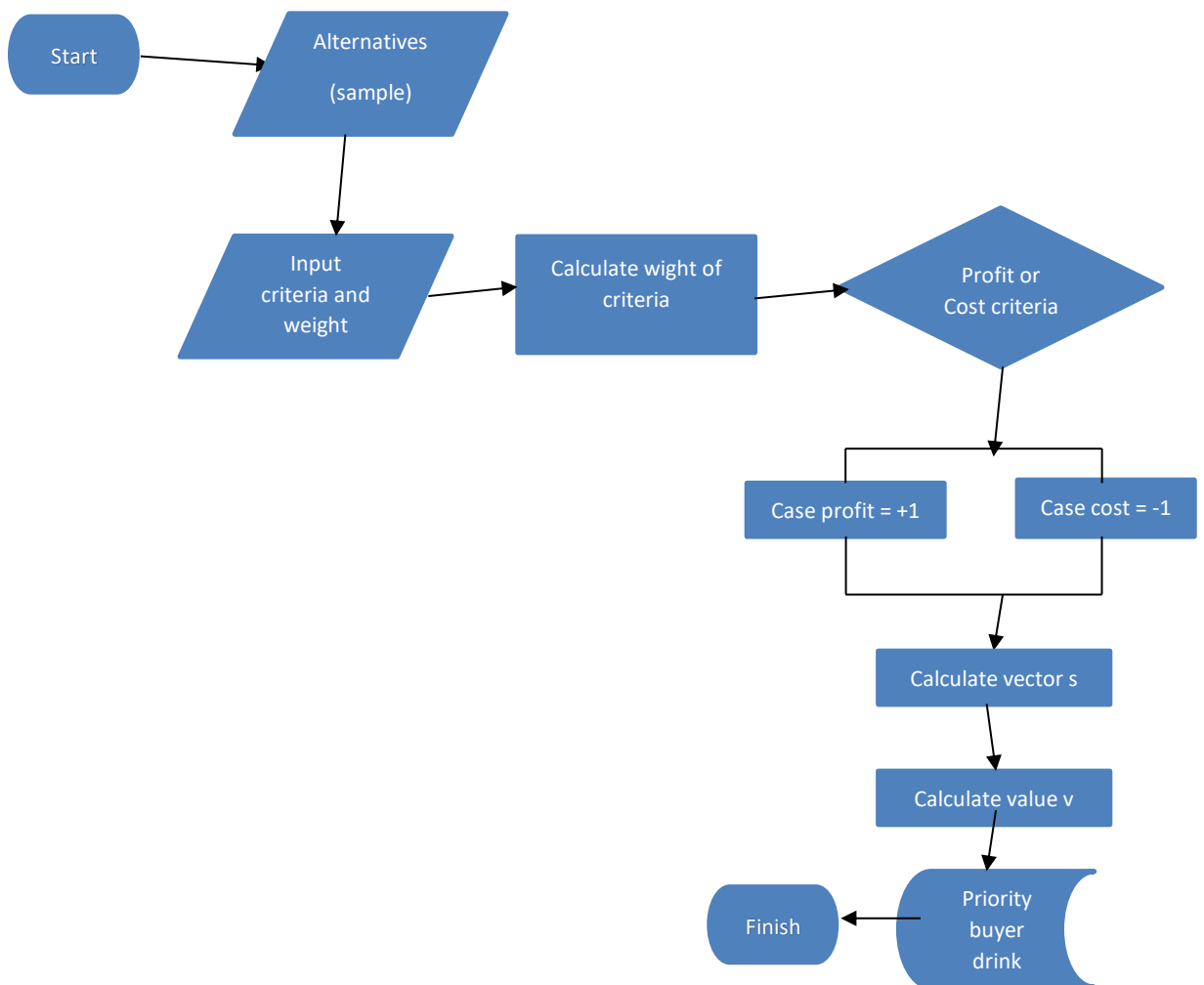


Fig 1. Research Method

3. RESULTS AND DISCUSSION

3.1 Population and Research Samples

To find several samples from a population can use the Slovin formula. Slovin's formula is a formula by calculating the minimum number of samples in a study by estimating a ratio [11]:

$$n = \frac{N}{1 + N(e)^2}$$

The explanation of the formula (n) is as follows:

n = number of samples

N = Total population

e = Error Rate in sampling

$$n = \frac{100}{1 + 100 (5\%)^2} = \frac{100}{1,25} = 80$$

By using an error rate of 5% from 100 respondents, the resulting respondents in this research are 80 respondents.

3.2 Data Analysis

In collecting data, it can be done by asking questions about the selection of coffee drinks and milk drinks. This research uses the Likert scale method which consists of 5 answer points for each question posed. The following is in table 1 as follows:

Tabel 1.
Scoring of Questionnaire Answers

No	Answer	Code	Value
1	Totally agree	SS	5
2	Agree	S	4
3	sometimes agree	KS	3
4	Disagree	TS	2
5	Strongly disagree	ST	1

To determine the selection of drinks using the Weighted Product (WP) method, several criteria are needed namely: price, composition, type of drink and size. This criterion was chosen because it has a considerable influence in determining the selection of drinks in a coffee shop.

The criteria and weighting can be seen in table 2 as below. Meanwhile, table 3 is the rating scale used.

Tabel 2.
Criteria and Weighting

No	Criteria	Weighting	Cost / Benefit	Code
1	Price	5	Cost	K1
2	Composition	3	Benefit	K2
3	Type of drink	3	Benefit	K3
4	Size	4	Cost	K4
Total		15		



Tabel 3.
Rating Scale

No	Answer	Code	Value
1	Always	Sl	5
2	Often	Sr	4
3	Sometimes	Kd	3
4	Seldom	Jr	2
5	Never	Tp	1

Table 4.
sample of data used in this study totaling 80 data, sample coded Sa1 to Sa80.

Sample	K1	K2	K3	K4
Sa1	5	5	4	3
Sa2	5	4	3	4
Sa3	4	5	4	5
Sa4	4	5	5	3
Sa5	4	5	5	3
Sa6	4	3	5	4
Sa7	5	3	4	3
Sa8	4	2	5	3
Sa9	4	4	3	1
Sa10	5	5	5	2
Sa11	5	5	5	5
Sa12	5	4	5	3
Sa13	5	4	4	2
Sa14	4	4	3	4
Sa15	5	5	1	4
Sa16	4	3	5	5
Sa17	5	5	5	3
Sa18	5	5	5	2
Sa19	5	5	5	3
Sa20	5	3	5	3
Sa21	4	5	4	4
Sa22	4	5	4	4
Sa23	3	4	5	3
Sa24	3	4	5	4
Sa25	5	4	5	4
Sa26	5	5	4	3
Sa27	5	3	4	3
Sa28	5	5	4	5
Sa29	3	4	4	3
Sa30	4	4	3	5
Sa31	4	5	4	3
Sa32	4	1	4	3
Sa33	5	4	4	2

Sa34	5	5	5	3
Sa35	5	5	5	3
Sa36	5	3	5	3
Sa37	4	5	3	2
Sa38	5	5	5	5
Sa39	3	5	5	3
Sa40	5	4	5	3
Sa41	5	3	3	5
Sa42	4	5	5	4
Sa43	4	5	5	4
Sa44	4	3	5	3
Sa45	5	4	1	4
Sa46	4	4	5	3
Sa47	4	3	5	4
Sa48	4	5	5	5
Sa49	5	2	5	3
Sa50	4	5	2	3
Sa51	5	3	4	4
Sa52	4	5	4	4
Sa53	5	4	4	4
Sa54	4	4	5	4
Sa55	5	4	5	3
Sa56	3	5	3	4
Sa57	4	3	3	4
Sa58	5	5	3	3
Sa59	3	5	5	5
Sa60	4	2	5	2
Sa61	5	5	4	2
Sa62	4	5	4	4
Sa63	3	3	5	4
Sa64	5	5	5	4
Sa65	5	5	5	4
Sa66	5	4	3	2
Sa67	4	4	4	5
Sa68	5	4	4	3
Sa69	5	3	4	3
Sa70	5	5	5	4
Sa71	5	3	5	3
Sa72	4	5	3	3
Sa73	4	5	3	4
Sa74	4	2	5	3
Sa75	4	5	1	2

Sa76	5	1	4	2
Sa77	5	5	4	5
Sa78	5	5	5	4
Sa79	3	5	5	4
Sa80	4	2	5	3

3.3 Calculation of the Weighted Product (WP)

3.3.1 Making improvements to the weights

Repairing the weights is done by using the formula for improving the weights for each of the criteria to be used. By using the weight improvement formula: $\sum W_j = 1$ [10]. Table 5 is the result of the calculation of the weight improvement.

$$W_j = \frac{W_j}{\sum_{j=1}^n W_j}$$

$$W_1 = \frac{5}{5+3+3+4} = \frac{5}{15} = 0,33$$

$$W_2 = \frac{3}{5+3+3+4} = \frac{3}{15} = 0,2$$

$$W_3 = \frac{3}{5+3+3+4} = \frac{3}{15} = 0,2$$

$$W_4 = \frac{4}{5+3+3+4} = \frac{4}{15} = 0,27$$

Table 5
Calculation results of weight improvement

No	Criteria	Weight	Cost / Benefit	Code	Addition of Weight
1	Price	5	Cost	K1	0,33
2	Composition	3	Benefit	K2	0,2
3	Type of drink	3	Benefit	K3	0,2
4	Size	4	Cost	K4	0,27
Total		15			1

3.3.2 Normalization calculation of vector S

After calculating the improvement on the weights, the next step is to perform calculations on the normalization of the vector s. Table 6 is the result of the calculation of the normalization of the vector s according to the formula used. With the formula:

$$\prod_{j=1}^n X_{ij}^{w_j}$$

$$S^1 = (5^{-0.33})(5^{0.2})(4^{0.2})(3^{-0.27}) = 0.79$$

$$S^2 = (5^{-0.33})(4^{0.2})(3^{0.2})(4^{-0.27}) = 0.66$$

$$S^3 = (4^{-0.33})(5^{0.2})(4^{0.2})(5^{-0.27}) = 0.74$$

$$S^4 = (4^{-0.33})(5^{0.2})(5^{0.2})(3^{-0.27}) = 0.89$$

$$S^5 = (4^{-0.33})(5^{0.2})(5^{0.2})(3^{-0.27}) = 0.89$$

.

$$S^{80} = (4^{-0.33})(2^{0.2})(5^{0.2})(3^{-0.27}) = 0.79$$

$$\begin{aligned} S_{total} &= S_1 + S_2 + S_3 + S_4 + S_5 + \dots S_{80} \\ &= 0.79 + 0.66 + 0.74 + 0.89 + 0.89 + \dots 0.79 \\ &= 62,38 \end{aligned}$$

Tabel 6
The results of the normalization of vector s

Sample	Vector S
S1	0.79
S2	0.66
S3	0.74
S4	0.89
S5	0.89
s.d S80	0.79
Total	62.38

3.3.3 Calculation of preferred value V weight

Calculation of the V weight preference value is a calculation carried out as an alternative result of the V weight preference. This is done as the result of the calculation using the Weight Product (WP) method. Table 7 is the result of calculating a weight preference value, then the formula used is:

$$V_i = \frac{\prod_{j=1}^n X_{ij} w_j}{\prod_{j=1}^n (X_i) w_j}$$

$$V_1 = \frac{0.79}{62.38} = 0.012$$

$$V_2 = \frac{0.66}{62.38} = 0.010$$

$$V_3 = \frac{0.74}{62.38} = 0.011$$

$$V_4 = \frac{0.89}{62.38} = 0.014$$

$$V_5 = \frac{0.89}{62.38} = 0.014$$

.

$$V_{80} = \frac{0.79}{62.38} = 0.012$$

Table 7.
Calculation Results of Vector Preference V

Sample	Vecctor V
S1	0.012
S2	0.010
S3	0.011
S4	0.014
S5	0.014
s.d S80	0.012

3.3.4 The Rangking Order

After getting the results of the preference vector V, the next step is to rank the results from the calculation of the highest value to the lowest value. Table 8 will show the five best values from the ranking results against the calculations that have been carried out in the previous stage.

Table 8
Ranking Result

Alternative	Vector S	Vector V	Types of Drink	Rank
S9	0.99	0.0166	Coffee Milk	1
S39	0.98	0.0157	Long Black	2
S23	0.94	0.0150	Avocado Milkshake	3
S10	0.93	0.0149	Ice Coffee	4
S18	0.92	0.0148	Strawberry Milkshake	5

In table 8 above, it can be seen from the results of the highest ranking in the selection of beverages in the Mataram city area which is ranked 1st, namely the type of Coffee Milk drink with a result of 0.0166, ranked 2nd with the type of Long Black drink with a result of 0.0157, ranked 3rd with the type of drink Avocado Milkshake, ranked 4th with the type of iced coffee drink, and ranked 5th with the type of drink Strawberry Milkshake.

4. Conclusion

Based on the results of the calculations that have been carried out, it can be concluded that the decision to choose drinks in the city of Mataram using the Weighted Product (WP) with several criteria, namely price, composition, type of drink, and size. can help decision makers in choosing drink orders while at the coffee shop. From the results of calculations carried out the type of coffee milk drink obtained the highest value, namely 0.016, then for the second rank the type of long black drink with a value of 0.0157, and for the third rank, the type of avocado milkshake drink with a value of 0.015.

References

- [1] Badan Pusat Statistik. Jumlah Penduduk. [Online], 2022, Mataram. Accessed: <https://mataramkota.bps.go.id/indicator/12/96/1/jumlah-penduduk.html>
- [2] Data NTB. UMKM Berdasarkan Jenisnya. [Online], 2022, Mataram. Accessed: <https://data.ntbprov.go.id/dataset/umkm-berdasarkan-jenisnya/resource/1a0a8307-7362-4d3f-a130-fb425eb59047>
- [3] Hendra Juniard, Addinul Yakin, Tajidan, " Analisis Faktor-Faktor Yang Mempengaruhi Keputusan Pembelian Di kedai Kopi Lokal Kota Mataram", *Agroteksos*, 30(2), Agustus, 2020 EISSN: 2685-4368, P-ISSN: 0852-8268
- [4] Ntb Satu. Kedai Kopi. [Online], 2022, Mataram. Accesed: <https://ntbsatu.com/2022/02/23/kedai-kopi-menjamur-di-mataram-kualitas-atau-ikut-tren.html>
- [5] Y. Zai, Mesran, and E. Buulolo, "Sistem Pendukung Keputusan untuk Menentukan Buah Rambutan Dengan Kualitas Terbaik Menggunakan Metode Weighted Product (WP)," *Media Informatika Budidarma (MIB)*, vol. 1, no. 1, pp. 8–11, 2017
- [6] R. R. Aria and S. Susilowati, "SISTEM PEMILIHAN LAPTOP TERBAIK DENGAN MENGGUNAKAN METODE WEIGHTED PRODUCT (WP)," vol. 16, no. 1, pp. 15–20, 2019.

- [7] P. N. Medan and J. Almamater, "SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN TEKNISI KOMPUTER TERBAIK DENGAN MENGGUNAKAN METODE WEIGHTED PRODUCT," Jurnal Teknik Ibnu Sina, vol. 4, no. 2, pp. 33–38, 2019.
- [8] H. Nurinadi and Y. Brianorman, "PERBANDINGAN DALAM PEMILIHAN PRINTER MENGGUNAKAN WP," no. November, pp. 38–43, 2020.
- [9] Harry Okta Maulana, Imam M Shofi, Nurul Faizah Rozy, Fenty Eka Muzayyana Agustin, "Application for Determining Mustahiq based on the Priority using Weight Product Method (Case Study: BAZIS DKI Jakarta", 2017 5th International Conference on Cyber and IT Service Management (CITSM)
- [10] Wardah Ramadhanty, Siti Ernawati, "SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN VITAMIN-C DI MASA PANDEMI COVID-19 MENGGUNAKAN METODE WEIGHTED PRODUCT (WP)", Vol. 2, No. 2, September 2021, hlm. 73 – 80
- [11] W. A. Wirawan, A. Aghastya, and A. L. Lailya, "Permodelan Alat Penghitung Jumlah Penumpang Kereta Berbasis Mikrokontroler Atmega 2560," Jurnal Perkeretaapian Indonesia, vol. 3, no. 1, pp. 55– 61, 2019