

Application of A Decision Support System on Additive Ratio Assessment (ARAS) Method in Determining Best-Selling Korean Snacks

Susliansyah¹, Heny Sumarno², Hendro Priyon³, Linda Maulida⁴, Fintri Indriyani⁵
^{1,2,3,4,5} Universitas Bina Sarana Informatika, Jakarta, Indonesia
Email: susliansyah.slx@bsi.ac.id¹, heny.hnm@bsi.ac.id²,
hendrop250@gmail.com³, linda.lma@bsi.ac.id⁴, fintri.fni@bsi.ac.id⁵

Abstract

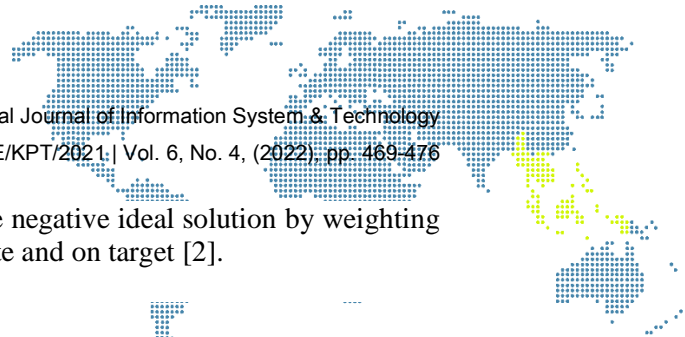
Nikmat group is a franchise company engaged in food and one of the brands owned by the company is GILDAK. GILDAK is a Korean snack business whose branches are everywhere. The different problem faced by each GILDAK branch located in each city is not being able to determine which snack menus are the most sold because consumers' tastes are different in each city, thus causing the franchisee to be inaccurate in determining what raw materials to use. in stock a lot, so as not to cause raw materials to run out. The Decision Support System (DSS) method that will be used in problem solving to determine the best-selling Korean service is the Additive Ratio Assessment (ARAS) method which has six stages such as determining the decision matrix, determining normalization, determining weights, determining normalized matrices, determining the value of the function. optimization and the highest ranking level. The results obtained from these calculations can be seen in the 5th stage, namely the best-selling snacks are Itaewon crispy chicken snacks ranked first with a value of 0.07783 (K1), original corndog snacks ranked second with a value of 0.07426 (K12) and gimpo snacks ranked third. with a value of 0.06907 (K9). It can be said that this method can be applied by companies in decision making.

Keywords: Decision Support System, ARAS, Korean Snacks, Bestsellers

1. Introduction

Food is the most important need for humans that is consumed in order to produce energy for humans themselves, but at this time many people think that light food is able to meet the needs of the body, especially women, remembering to get an ideal body shape, healthy without complicated by consuming healthy food but not too heavy in carbon. Snacks are processed foods that are consumed outside the most basic menu, snacks are also not only obtained from street vendors in general but can also be found in contemporary concepts at affordable prices for example cafes, restaurants. Millennial young entrepreneurs make new innovations by combining the concept of a cafe or restaurant with a snack menu in order to make it a special attraction for millennials to gather.

Nikmat group is a franchise company engaged in food and one of the brands owned by the company is GILDAK. GILDAK is a Korean snack business whose branches are already everywhere such as Jakarta, Depok, Bogor, Bekasi, Tangerang, Bandung, Surabaya, Pangkal Pinang and others. The problem faced by each GILDAK branch in each city is that they have not been able to determine which snack menus are the most sold because consumer tastes vary in each city, causing the franchisee to be inaccurate in determining what raw materials to use. must be in stock a lot, so as not to cause raw materials to run out. The Decision Support System (DSS) method that will be used in the study to determine the best-selling Korean snacks is the Additive Ratio Assessment (ARAS) method. Applying the ARAS method because broadly speaking a lot of ranking criteria using the principle that the chosen alternative must have the closest distance to the



positive ideal solution and the farthest distance to the negative ideal solution by weighting each criterion [1], so that the results are more accurate and on target [2].

2. Research Methodology

Decision Support Systems are interactive information systems that are used to produce the best decisions for management in solving the problems they face [3]. This system can also assist managers in making semi-structured and unstructured [4] [5] decisions, where no one person will know for sure how decisions should be taken. Basically DSS is almost the same as SIM because it uses a database as a data source [6]. DSS originates from SIM because it emphasizes the function of supporting decision makers throughout its stages, even though the actual decision remains the exclusive authority of the decision maker. ARAS was introduced by Zavadskas and Turskis in 2010 [7]. Additive Ratio Assessment (ARAS) is a method used to rank criteria conceptually [6] ranking using a utility degree by comparing the overall index value of each alternative to the overall optimal index value [8]. The ARAS method has several stages of calculation as follows [9] [10]:

1. Determining the decision matrix The decision matrix is arranged based on the value of each i -th alternative against a j -th criterion, namely.

$$X = X_{ij}, i = 1, 2, \dots, m, j = 1, 2, \dots, n \quad (1)$$

2. Determine the optimal value of each criterion (X_{oj})

If the decision maker has no choice in determining the optimal value, then it can be determined by

$$X_{oj} = \max_i x_{ij}, \text{ if is the gain attribute benefid} \\ \max_i x_{ij}, \text{ if is the gain attribute cost} \quad (2)$$

3. Calculating the decision matrix with normalized optimal value. Decision matrices compiled based on pairwise comparisons of each alternative on a criterion must be normalized to a scale that can be compared. The normalized decision matrix is $R = r_{ij}$, with

$$r_{ij} = \frac{x_{ij}}{\max_{i=0}^m x_{ij}} \text{ if is the gain attribute benefid} \\ \frac{x_{ij}}{\min_{i=0}^m x_{ij}} \text{ if is the gain attribute cost} \quad (3)$$

4. Calculating the decision matrix with normalized optimal value weighted (V) The weighted normalized decision matrix is calculated by multiplying the normalized decision matrix elements (r_{ij}) with the criteria weight elements (w_j). Mathematically it can be written,

$$V = v_{ij}, \text{ with } v_{ij} = r_{ij} w_j, i = 0, 1 \dots, m, j = 1, 2 \dots, n \quad (4)$$

5. Calculating the overall value index for each alternative (s_i)

The overall index value of each alternative is calculated by adding up the elements of the decision matrix weighted normalized on each alternative. Mathematically it can be written,

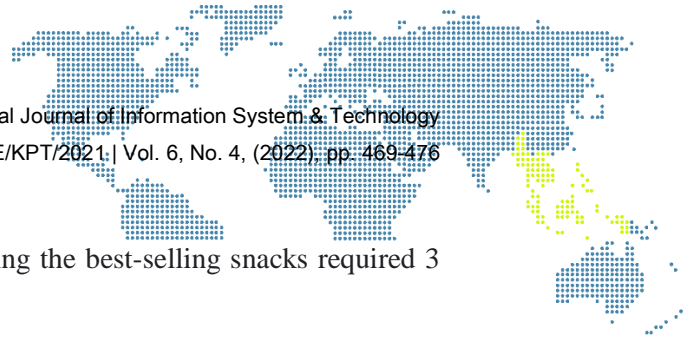
$$S_i = \sum_{j=1}^n v_{ij}, i = 0, 1 \dots, m \quad (5)$$

Where is the overall index value on the i -th alternative.

6. Calculating the utility degree of each alternative Q_i

The utility degree value is calculated by dividing the overall index value in the i -th alternative by the value overall index on the optimal alternative. Mathematically it can be written.

$$Q_i = \frac{S_i}{S_o}, i = 1, 0 \dots, m \quad (6)$$



3. Results and Discussion

At the stage of conducting research on determining the best-selling snacks required 3 criteria. The criteria can be seen in the table below:

Table 1. Criteria for Determining Best Selling Korean Snacks

Criteria	Explanation	Type	Weight (%)
C1	Taste	Benefit	0,3
C2	Price	Cost	0,5
C3	Packaging	Benefit	0,2

Table.1 is an explanation of the weighting of each taste criterion, price criterion and packaging criterion

The criteria that have been determined by the company such as taste criteria (C1), price criteria (C2) and packaging criteria (C3) will be converted into value. The conversion can be seen in the table below:

Table 2. Explanation of taste criteria (C1)

Taste Criteria	Value
50-60	1
61-70	2
71-80	3
81-90	4
91-100	5

Table.2 is an explanation of the taste criteria (C1) in the form of scores of 1 (very bad), 2 (bad), 3 (good enough), 4 (good) and 5 (very good).

Table 3. Explanation of price criteria (C2)

Price Criteria	Value
0 – 10.000	1
10.100 – 20.000	2
20.100 – 30.000	3
31.000 – 40.000	4
41.000 – 50.000	5

Table.3 is an explanation of the price criteria (C1) in the form of scores of 1 (very bad), 2 (bad), 3 (good enough), 4 (good) and 5 (very good).

Table 4. Explanation of packaging criteria (C3)

Packaging Criteria	Value
50-60	1
61-70	2
71-80	3
81-90	4
91-100	5

Table.4 is an explanation of the packaging criteria (C1) in the form of scores of 1 (very bad), 2 (bad), 3 (good enough), 4 (good) and 5 (very good).

The alternatives that have been obtained by the company consist of 16 snacks with the value of each criterion. The table can be seen below:



Table 5. Alternative Snack Data

Number	Snack Name	Criteria		
		Taste	Price	Packaging
1	Itaewon crispy chicken	98	33.000	96
2	Itaewon mozzy chick	90	38.000	80
3	Hongdae crispy dory	75	33.000	85
4	Seoul chicken skin	80	25.000	90
5	Chicken wings	90	33.000	80
6	Gimbap crab	80	42.000	75
7	Gimbap tteok	60	42.000	70
8	Gimbap mix	70	42.000	80
9	Gimpo	88	42.000	90
10	Cheese ball	95	26.000	70
11	Squid nugget	75	21.000	80
12	Corndog Ori	97	31.000	90
13	Corndog Potato	70	33.000	80
14	Busan odeng	86	21.000	82
15	Busan o-bokki	86	33.000	82
16	Ramyoen	60	9.000	60

Table.5 is an explanation of 16 alternative snack data that already have each criterion along with the value of each criterion.

From the alternative data obtained from the company, an alternative suitability rating will be made for each criterion. The table can be seen below:

Table 6. Alternative Conformity Ratings on Each Criterion

Number	Alternative	Criteria		
		Taste	Price	Packaging
1	A1	5	3	5
2	A2	4	3	3
3	A3	3	3	4
4	A4	3	2	4
5	A5	4	3	3
6	A6	3	3	3
7	A7	1	3	2
8	A8	2	3	3
9	A9	4	3	4
10	A10	5	2	2
11	A11	3	2	3
12	A12	5	3	4
13	A13	3	3	3
14	A14	4	2	4
15	A15	4	3	4
16	A16	1	1	1

Table.6 is an explanation of each criterion in the alternative snack data into criteria conversion data. The stages in performing calculations with the ARAS method are as follows:



a) Formation of a Decision Making Matrix

Table 7. Decision matrix with optimal value

Number	Alternative	Criteria		
		Taste	Price	Packaging
0	A0	5	3	5
1	A1	5	3	5
2	A2	4	3	3
3	A3	3	3	4
4	A4	3	2	4
5	A5	4	3	3
6	A6	3	3	3
7	A7	1	3	2
8	A8	2	3	3
9	A9	4	3	4
10	A10	5	2	2
11	A11	3	2	3
12	A12	5	3	4
13	A13	3	3	3
14	A14	4	2	4
15	A15	4	3	4
16	A16	1	1	1

b) After normalization

5	3	5
5	3	5
4	3	3
3	3	4
3	2	4
4	3	3
3	3	3
1	3	2
2	3	3
4	3	4
5	2	2
3	2	3
5	3	4
3	3	3
4	2	4
4	3	4
1	1	1
59	45	57

From the results of the calculation of the decision matrix above, it can be obtained the results of the calculation of the decision matrix that have been normalized.

0.08475	0.06667	0.08772
0.08475	0.06667	0.08772
0.06780	0.06667	0.05263
0.05085	0.06667	0.07018



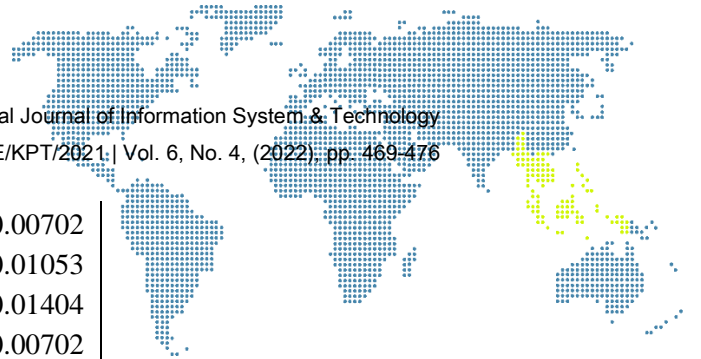
$$A^* = \begin{bmatrix} 0.05085 & 0.04444 & 0.07018 \\ 0.06780 & 0.06667 & 0.05263 \\ 0.05085 & 0.06667 & 0.05263 \\ 0.01695 & 0.06667 & 0.03509 \\ 0.03390 & 0.06667 & 0.05263 \\ 0.06780 & 0.06667 & 0.07018 \\ 0.08475 & 0.04444 & 0.03509 \\ 0.05085 & 0.04444 & 0.05263 \\ 0.08475 & 0.06667 & 0.07018 \\ 0.05085 & 0.06667 & 0.05263 \\ 0.06780 & 0.04444 & 0.07018 \\ 0.06780 & 0.06667 & 0.07018 \\ 0.01695 & 0.02222 & 0.01754 \end{bmatrix}$$

c) Determine the Weight

	D1	D2	D3
0.02542	0.03333	0.01754	
0.02542	0.03333	0.01754	
0.02034	0.03333	0.01053	
0.01525	0.03333	0.01404	
0.01525	0.02222	0.01404	
0.02034	0.03333	0.01053	
0.01525	0.03333	0.01053	
0.00508	0.03333	0.00702	
0.01017	0.03333	0.01053	
0.02034	0.03333	0.01404	
0.02542	0.02222	0.00702	
0.01525	0.02222	0.01053	
0.02542	0.03333	0.01404	
0.01525	0.03333	0.01053	
0.02034	0.02222	0.01404	
0.02034	0.03333	0.01404	
0.00508	0.01111	0.00351	
	0.3	0.5	0.2

d) Determine the weight of the normalized matrix, by multiplying the normalized matrix against the weight of the criteria.

0.02542	0.03333	0.01754
0.02542	0.03333	0.01754
0.02034	0.03333	0.01053
0.01525	0.03333	0.01404
0.01525	0.02222	0.01404
0.02034	0.03333	0.01053
0.01525	0.03333	0.01053



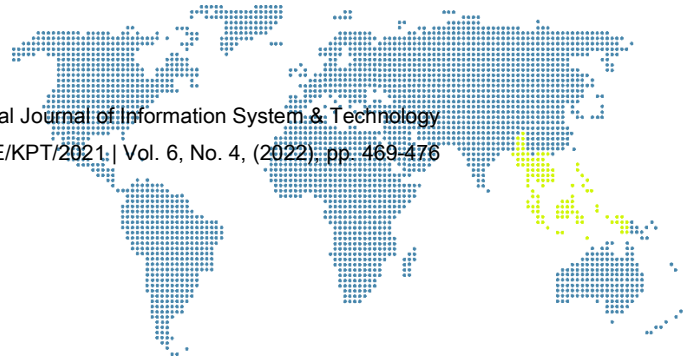
0.00508	0.03333	0.00702
0.01017	0.03333	0.01053
0.02034	0.03333	0.01404
0.02542	0.02222	0.00702
0.01525	0.02222	0.01053
0.02542	0.03333	0.01404
0.01525	0.03333	0.01053
0.02034	0.02222	0.01404
0.02034	0.03333	0.01404
0.00508	0.01111	0.00351

e) Determine the value of the optimization function, by adding up the criterion values for each alternative from the matrix multiplication results with the weights that have been done before.

S0	0.07630
S1	0.07630
S2	0.06420
S3	0.06262
S4	0.05151
S5	0.06420
S6	0.05911
S7	0.04544
S8	0.05403
S9	0.06771
S10	0.05466
S11	0.04800
S12	0.07279
S13	0.05911
S14	0.05660
S15	0.06771
S16	0.01970
	0.98030

f) Determine the highest ranking level of each alternative, by dividing the alternative value against alternative 0(A0).

K1	0.07783
K2	0.06549
K3	0.06388
K4	0.05255
K5	0.06549
K6	0.06030
K7	0.04635
K8	0.05512
K9	0.06907
K10	0.05576
K11	0.04897



K12 0.07426
K13 0.06030
K14 0.05773
K15 0.06907
K16 0.02010

4. Conclusion

This study uses the Additive Ratio Assessment (ARAS) method to find out from the number of Korean snacks sold by the guild, which snacks are in great demand by buyers. The results obtained from the calculation of the method can be seen in the 5th stage, namely the best-selling snacks are Itaewon crispy chicken snacks ranked first with a value of 0.07783 (K1), original corndog snacks ranked second with a value of 0.07426 (K12) and gimpo snacks ranked third with a value of 0.06907 (K9). It can be said that this method can be applied by companies in decision making.

References

- [1] E. Ndruru and E. N. Purba, "Penerapan Metode ARAS Dalam Pemilihan Lokasi Objek Wisata Yang Terbaik Pada Kabupaten Nias Selatan," *METHOMIKA: Jurnal Manajemen Informatika & Komputerisasi Akuntansi*, vol. 3, no. 2, pp. 151–159, 2019.
- [2] C. Tarigan, E. F. Ginting, and R. Syahputra, "Sistem Pendukung Keputusan Dalam Menentukan Kinerja Pengajar Dengan Metode Additive Ratio Assessment (ARAS)," *J-SISKO TECH (Jurnal Teknologi Sistem Informasi dan Sistem Komputer TGD)*, vol. 5, no. 1, pp. 16–24, 2022, doi: 10.53513/jsk.v5i1.4245.
- [3] M. Mesran, J. Afriany, and S. H. Sahir, "Efektifitas Penilaian Kinerja Karyawan Dalam Peningkatan Motivasi Kerja Menerapkan Metode Rank Order Centroid (ROC) dan Additive Ratio Assessment (ARAS)," *Prosiding Seminar Nasional Riset Information Science (SENARIS)*, vol. 1, no. September, pp. 813–821, 2019, doi: 10.30645/senaris.v1i0.88.
- [4] D. S. W. Lubis and E. Murlisah, "Sistem Pendukung Keputusan Pemilihan Guru Terbaik Menggunakan Metode Additive Ratio Assessment (ARAS)," *Seminar Nasional Teknologi Komputer & Sains (SAINTEKS)*. pp. 448–455, 2019.
- [5] H. Susanto, "Penerapan Metode Additive Ratio Assessment (Aras) Dalam Pendukung Keputusan Pemilihan Susu Gym Terbaik Untuk Menambah Masa Otot," *Majalah Ilmiah INTI*, vol. 5, no. 2, pp. 86–90, 2018.
- [6] H. Syahputra, M. Syahrizal, S. Suginam, S. D. Nasution, and B. Purba, "SPK Pemilihan Konten Youtube Layak Tonton Untuk Anak-Anak Menerapkan Metode Additive Ratio Assessment (ARAS)," in *Seminar Nasional Teknologi Komputer & Sains (SAINTEKS)*, 2019, vol. 1, no. 1, pp. 678–685.
- [7] D. M. Midyanti, R. Hidyati, and S. Bahri, "Perbandingan Metode Edas Dan Aras Pada Pemilihan Rumah Di Kota Pontianak," vol. 4, no. 2, pp. 119–124, 2019.
- [8] T. R. Sitompul and N. A. Hasibuan, "Sistem Pendukung Keputusan Seleksi Tenaga Kerja Untuk Security Service Menggunakan Metode Aras," *Jurnal Media Informatika Budidarma*, vol. 2, no. 1, pp. 1–9, 2018, doi: 10.30865/mib.v2i1.812.
- [9] R. A. S. Prayoga and P. Susanti, "Sistem Pendukung Keputusan Pemilihan Perumahan dengan Metode ARAS (Studi Kasus Kabupaten Ponorogo)," *Jurnal Sains dan Informatika*, vol. 8, no. 1, pp. 31–40, 2022, doi: 10.34128/jsi.v8i1.387.
- [10] K. R. Ndruru, "Penerapan Metode Additive Ratio Assessment (ARAS) dan Rank Order Centroid (ROC) Dalam Pemilihan Jaksa Terbaik Pada Kejaksaan Negeri Medan," in *Seminar Nasional Teknologi Komputer & Sains (SAINTEKS)*, 2020, pp. 367–372.