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Application of ELECTRE Method for Selection of Diet Instant Noodles

Veronika Novia Hugo[1*], Yulia Ayu Sekarsari[2], Ida Ayu Putu Calista Kencana Putri[3], Qurrotul Ainia J.A[4], I Gede Iwan Sudipa[5]

[1*,2,3,4,5] Informatika, Institut Bisnis dan Teknologi Indonesia, Denpasar, Indonesia

[1*]veronikanovia15@gmail.com; [2]ayulia6297@gmail.com; [3]putrykencana03@gmail.com; [4]ainiaja585@gmail.com ; [5]iwansudipa@instiki.ac.id

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ABSTRACT

Healthy eating is becoming increasingly important, particularly among university students who often prefer convenient foods like instant noodles. However, not all instant noodles provide suitable nutritional content for dieting. This study aims to determine the best instant noodles for diet purposes using the ELECTRE (Elimination and Choice Expressing Reality) method, a multi-criteria decision-making approach. Data were collected from INSTIKI students via a questionnaire that covered criteria such as calorie content, fiber, fat, price, and taste. The ELECTRE method was then applied to analyze the data based on predetermined preferences and criteria weightings. Results identified the most suitable instant noodles for dietary needs, ranked highest in the ELECTRE analysis. This study aims to guide consumers in making healthier choices and provide insights for manufacturers to improve product quality.

1. Introduction

Health is one of the critical aspects of modern life, including a diet that promotes a healthy lifestyle. Among university students, instant noodles are a popular choice due to their convenience, affordability, and ease of preparation. However, many instant noodles are high in calories, low in fiber, and rich in fat, which are not conducive to healthy dietary needs. This poses a challenge in selecting instant noodles that align with a healthy diet (Cena & Calder, 2020).

To address this issue, an evaluation method capable of assessing various instant noodle brands based on specific criteria such as calorie content, fiber, fat, price, and taste is needed (Adejuwon et al., 2020; Du et al., 2023). Such a method must handle multiple criteria objectively and provide actionable recommendations to consumers (Alfiah, 2025; Şahin, 2021; Sudipa et al., 2024; Wahidin et al., 2024).

This study employs the ELECTRE (Elimination and Choice Expressing Reality) method, a multi-criteria decision-making (MCDM) approach. ELECTRE is chosen for its ability to deliver comprehensive analyses by comparing alternatives based on criteria weightings and preferences (Mahendra et al., 2023; Sudipa, Kharisma, et al., 2023). It also identifies the best alternative by considering outranking relationships among the evaluated options (Rony et al., 2023; Sudipa, Wardoyo, et al., 2023).

The primary goal of this study is to determine the most suitable instant noodles for a healthy diet based on preferences of INSTIKI students. The findings aim to benefit consumers by providing dietary product recommendations and guiding manufacturers in improving product quality to better meet dietary needs . Thus, this research is expected to make a real contribution in supporting a healthy

lifestyle, especially for student who are one of the main consumers of instant noodles (Azhar et al., 2018).

2. Literatur Review

A healthy diet as important role in maintaining overall health, especially in a modern era that offers an abundance of instant food options. Instant noodles are a favored choice among university students due to their practicality and affordability. However, the high calorie and fat content and low nutritional value of many instant noodles often fail to support a healthy diet (Adejuwon et al., 2020). According to (Wahdah et al., 2022), university students often select instant noodles based on taste and price, neglecting the nutritional aspects essential for health. To address this challenge, multi-criteria decision-making approaches like ELECTRE have been found effective. (Rizki et al., 2020) demonstrated the successful application of ELECTRE in selecting healthy processed foods based on nutritional content, price, and consumer preferences. ELECTRE's ability to consider outranking relationships makes it especially suitable for complex decision-making scenarios, such as evaluating healthy food options (Harjanti et al., 2023). The application of ELECTRE in the food industry has been discussed in various previous studies. The study by (Micale et al., 2017) shows that this method is successfully used to choose healthy processed food products by considering criteria such as nutritional content, price, and consumer preferences. The results of the study show that ELECTRE can provide more accurate recommendations than other methods, especially in the context of data-driven decision-making. In addition, understanding consumer preferences is an important aspect in the application of this method. Research by (Sudipa et al., 2022) found that consumers often have varied preferences, such as giving more importance to taste than nutritional content. Therefore, the method used must be able to adjust its analysis based on such preferences. Based on this literature review, this study uses the ELECTRE method to evaluate the best instant noodles that are in accordance with the healthy dietary needs of INSTIKI students. By integrating consumer preferences and nutritional criteria, this research aims to provide recommendations that are not only practical but also useful in supporting a healthy lifestyle among students.

3. Research Method

This study uses a questionnaire to evaluate the best instant noodle alternatives for the dietary needs of INSTIKI students. The method used is ELECTRE (Elimination and Choice Expressing Reality), which allows multi-criteria analysis to determine the best alternative based on various factors. This study is designed to provide valid and relevant recommendations to respondents' preferences and nutritional aspects.

A. Data Collection

Primary data in this study was obtained through a questionnaire distributed online using Google Form. The questionnaire is designed to evaluate INSTIKI students' preferences for instant noodles based on predetermined criteria. The criteria used include calories, nutrition, fat, salt, price, taste, diet/healthy label, availability in the market, presentation, carbohydrates, and recommendations from nutritionists. This criterion was selected based on questionnaire. The respondents in this study are INSTIKI students who are randomly selected through the random sampling method. A total of 100 respondents participated in this survey, with the aim of ensuring that the results of the research can be representative of the general student population (Priadinata et al., 2025).

B. Data Collection

The weights for each criterion are determined based on the results of the survey with the Likert scale approach. This scale is used to measure the level of importance of each criterion from the respondent's point of view, with a value of 1 indicating a low level of importance and a value of 5 indicating a very high level of importance (Sugiarta et al., 2025). This process is done to give a

proportionate emphasis to the criteria that are considered more relevant or important in determining which instant noodles are suitable for the diet.

Table 1. Assessment Criteria.

Criteria (C)	Definition	Value Scale
Criteria1	Calorie	3
Criteria2	Nutrients	4
Criteria3	Fat	3
Criteria4	Salt	4
Criteria5	Price	4
Criteria6	Taste	5
Criteria7	Dietary/Healthy Label	5
Criteria8	Stocks in the market	5
Criteria9	Penyajian	4
Criteria10	Carbohydrates	4
Criteria11	Nutritionist	5

Definition of criteria:

1. Calorie
   Cost type (the lower the calorie is better), kcal unit (kilocalories)
2. Nutrients
   Benefit Type (the higher the nutritional value, the better), in grams.
3. Fat
   Cost Type (lower the fat, better), in grams.
4. Salt
   Cost Type (the lower the salt the better, avoid hypertension), in grams.
5. Price
   Cost type (the cheaper the better), Rp/gram unit.
6. Nutritionist
   Benefit type (nutritionist support adds value), binary score unit.
   0 = Not Recommended
   1 = Recommended
7. Label Diet
   Benefit Type (healthy/diet label gives added value), binary score unit.
   0 = No labell
   1 = There is a label
8. Availability in the Market
   Benefit Type (the easier it is to find on the market, the better), the ordinal unit of score.
   1 = Very hard to find
   2 = Pretty easy
   3 = Very easy
9. How to Serve
   Benefit Type (the easier it is to serve, the better), ordinal score.
   1 = Hard
   2 = Medium
   3 = Easy
10. Taste
    Benefit Type (better taste, higher score), ordinal score:
    1 = Bad.
    2 = Ordinary
    3 = Very tasty
11. Carbohydrates
    Cost type (the lower the carb, the better), in grams.

C. Data Analysis

The data analysis process is carried out using the ELECTRE method, the stages of analysis include (Akram & Al-Kenani, 2019; Lin et al., 2019):

[1] Convert survey results into a decision matrix based on the value for each criterion.
[2] Normalize the matrix to equalize the scale between criteria so that the data can be compared consistently.
[3] The application of weights to the normalization matrix to produce a weighted decision matrix.
[4] Calculation of the concordance and discordance matrices to determine the outranking relationship between alternatives.
[5] Elimination of alternatives that do not meet the outranking criteria so that the best alternative is obtained.

D. Final Validation and Evaluation

The final results of the ELECTRE method analysis were validated by comparing them with the recommendations of nutritionists. This step is taken to ensure that the recommendations produced are not only technically relevant, but also support a healthy diet according to nutritional standards.

4. Result and Discussions

In this study, the ELECTRE method was used to rank diet instant noodles based on several criteria that are relevant to the needs of INSTIKI students.

Table 2. Determination of the best diet instant noodle decision with the ELECTRE method

Symbol	Criterion	Heavy
C1	Calorie	3 (Quite Important)
C2	Nutrients	4 (Important)
C3	Fat	3 (Quite Important)
C4	Salt	4 (Important)
C5	Price	4 (Important)
C6	Taste	5 (Very Important)
C7	Dietary/ Healthy Label	5 (Very Important)
C8	Available in the Market	5 (Very Important)
C9	Penyajian	4 (Important)
C10	Carbohydrates	4 (Important)
C11	Nutritionist	5 (Very Important)

Table 3. Determining the Total Nutritional Criteria

Nutrition Sub Criteria	Relative Weight	Bobot Absolut
Protein	4	16
Fiber	3	12

The Relative Weight Value was obtained from the results of the assessment of better protein and fiber bottling for diet. The Absolute Weight value is obtained from the result of multiplying the results of the relative weight of protein and fiber multiplied by the result of nutritional weight

Table 4. Total Normalization of Sub-Criteria

Alternative	C1 (Protein) g	C2 (Fiber) g
A1	0	3
A2	7	3
A3	2	0
A4	9	3
A5	8	3
	14,071	6,000

The values of C1 and C2 were obtained from the collection of protein and fiber values in each instant diet noodle alternative on the packaging label.

Table 5. Total Normalization of Sub-Criteria (2)

Alternative	C1 (Protein) g	C2 (Fiber) g
A1	0	0,5
A2	0,497	0,5
A3	0,142	0
A4	0,640	0,5
A5	0,569	0,5

Table 6. Total Nutrition Results

Alternative	C1 (Protein)g	C2 (Fiber)g	Total Nutrition
A1	0	6	6
A2	7,959	6	13,959
A3	2,274	0	2, 274
A4	10,234	6	16,234
A5	9,097	6	15,097

The total result of nutrients in is obtained from the sum of the C1 and C2 results. After obtaining the total results of the new nutrients, the total nutrition will be combined with other criteria.

Table 7. Alternative values for each overall criterion

Alternative	Criterion										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
A1	90	6,000	2,5	0,02	269,33	1	1	1	3	18	1
A2	260	13,959	2,5	0,29	323,94	3	1	1	3	52	1
A3	180	2,274	2	1,42	45,45	2	0	2	2	40	0
A4	260	16,234	4	0,596	95,38	3	1	3	2	49	1
A5	150	15,097	5	0,87	333,33	3	1	3	2	44	1
	445,197	26,972	7,583	1,792	547,492	5,657	2,000	4,899	5,477	94,684	2,000

To get the final result as above is to use a formula, one example is doing C1

$\sqrt{90^2 + 260^2 + 180^2 + 260^2 + 150^2} = 445,197$

Table 8. Named Matrix (R)

Alternative	Criterion										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
A1	0,202	0,222	0,330	0,011	0,492	0,177	0,5	0,204	0,548	0,190	0,5
A2	0,584	0,518	0,330	0,162	0,592	0,530	0,5	0,204	0,548	0,549	0,5
A3	0,404	0,084	0,264	0,792	0,083	0,354	0	0,408	0,365	0,422	0
A4	0,584	0,602	0,528	0,332	0,174	0,530	0,5	0,612	0,365	0,518	0,5
A5	0,337	0,560	0,659	0,485	0,609	0,530	0,5	0,612	0,365	0,465	0,5

This result is obtained from the division between the results of the criteria in each alternative and the final result.

This is the result of the weighting for each criterion.

Table 9. Matrix Weighting (V)

Alternative	Criterion										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
A1	0,606	0,890	0,989	0,033	1,968	0,884	2,5	1,021	2,191	0,760	2,5
A2	1,752	2,070	0,989	0,485	2,367	2,652	2,5	1,021	2,191	2,197	2,5
A3	1,213	0,337	0,791	2,377	0,332	1,768	0	2,041	1,461	1,690	0
A4	1,752	2,408	1,583	0,997	0,697	2,652	2,5	3,062	1,461	2,070	2,5
A5	1,011	2,239	1,978	1,456	2,435	2,652	2,5	3,062	1,461	1,859	2,5

The result of this Matrix Weighting is obtained from the multiplication between the results of the Termalized Matrix and the result of the criterion weighting.

Table 10. Concordance

	1	2	3	4	5	6	7	8	9	10	11
C12	0	0	1	0	0	0	1	1	1	0	1
C13	0	1	1	0	1	0	1	0	1	0	1
C14	0	0	0	0	1	0	1	0	1	0	1
C…	…	…	…	…	…	…	…	…	…	…	…
C51	1	1	1	1	1	1	1	1	0	1	1
C52	0	1	1	1	1	1	1	1	0	0	1
C53	0	1	1	0	1	1	1	1	1	1	1
C54	0	0	1	1	1	0	0	0	0	0	0

Table 11. Result of C

C12	3,7,8,9,11	22
C13	2,3,5,7,9,11	25
C14	5,7,9,11	18
C…	…	…
C51	1,2,3,4,5,6,7,8,10,11	41
C52	2,3,4,5,6,7,8,11	34
C53	2,3,5,6,7,8,9,10,11	39
C54	3,4,5	10

This is the result of concordance which has a value of 1 and the final result is obtained from the result of adding the weight C12 = W3 + W7 + W8 + W9 + W11 = 3+5+5+4+5 = 22

C =

.	22	25	18	14	79
45	.	37	30	26	138
20	8	.	7	10	45
37	37	45	.	35	154
41	34	39	10	.	124

.	0	0	0	0
1	.	1	1	0
0	0	.	0	0
1	1	1	.	1
1	1	1	0	.

The results here are obtained from a comparison of the results in each criterion with the total results of the criteria, which is 27. <27 = 0, >27 = 1

Table 12. Discordance

	1	2	3	4	5	6	7	8	9	10	11
D12	1	1	0	1	1	1	0	0	0	1	0
D13	1	0	0	1	0	1	0	1	0	1	0
D14	1	1	1	1	0	1	0	1	0	1	0
D15	…	…	…	…	…	…	…	…	…	…	…
D51	0	0	0	0	0	0	0	0	1	0	0
D52	1	0	0	0	0	0	0	0	1	1	0
D53	1	0	0	1	0	0	0	0	0	0	0
D54	1	1	0	0	0	1	1	1	1	1	1

Table 13. Result of D

D12	1,2,4,5,6,10	1
D13	1,4,6,8,10	0,937
D14	1,2,3,4,6,8,10	1
D15	…	…
D51	9	0,358
D52	1,9,10	0,363
D53	1,4	0,368
D54	1,2,6,7,8,9,10,11	0,426

This is the result of concordance which has a value of 1 formula

D12 = Max {|0,606-1,752|;|0,890-2,070|;|0,033-0,485|;|1,968-2,652|;|0,884-2,652|;|0,760-2,197|}

= Max{|0,606-1,752|;|0,890-2,070|;|0,989-0,989|;|0,033-0,485|;|1,968-2,652|;|0,884-2,652|;|2,5- 2,5|1,021-1,021|2,191-2,191|; 0,760-2,197|; 2,5-2,5|}

= Max {1,146; 1,180; 0,452; 0,684; 1,768; 1,437

= Max {1,146; 1,180; 0; 0,452; 0,684; 1,768; 0; 0; 0; 1,437; 0}

= 1,180/1,180

= 1

D =

.	1	0,937	1	1	3,937
0	.	0,756	1	1	2,756
1	1	.	1	1	4
0,623	0,818	0,552	.	1	2,993
0,358	0,363	0,368	0,426	.	1,515

.	1	1	1	1
0	.	0	1	1
1	1	.	1	1
0	1	0	.	1
0	0	0	0	.

The results here are obtained from a comparison of the results in each criterion with the total result of the criterion, which is 0.760. <0,760 = 0, >0,760 = 1

Table 14. Result

A1	.	0	0	0	0
A2	0	.	0	1	0
A3	0	0	.	0	0
A4	0	1	0	.	1
A5	0	0	0	0	.

Based on the results of the calculations carried out, the best alternative that ranks first is A4 (Lemonilo Fried Noodles 65 gr), followed by A2 (Tropicana Slim Shirataki Noodles) in second place. This result shows that A4 has the best performance in meeting the predetermined criteria, while A2 also shows superiority, even though it is below A4.

Table 15. Details of the calculation results.

Alternative (A)	Definition	Ranking
A4	Leonilo Mie Goreng 65gr	1
A2	Tropicana Slim Shirataki Noodles	2
A1	Ashtiataki Shirataki Noodle	3
A3	Ayam Bawang Vermicelli	4
A5	Music by Shirataki	5

The results of this study provide an overview that Lemonilo Mie Goreng 65 gr (A4) is superior to other products in meeting the set criteria. The advantages of this product most likely come from a combination of good nutritional value, preferred taste, and ease of presentation. Tropicana Slim Shirataki Noodles (A2), despite being ranked second, shows potential as a good alternative to dieting, especially for college students who need low-calorie meals with lower carb content. From these results, it can be concluded that products that combine aspects of taste, health, and convenience are the main choice for INSTIKI students who want to maintain a healthy diet. These findings are also in line with the trend of increasing awareness of the importance of healthy food among students. However, there are some limitations in this study, such as the limited number of samples of instant noodle alternatives analyzed. For future research, it is recommended to expand the number of alternatives and consider external factors, such as price and consumers' personal preferences, in order to produce a more comprehensive analysis.

5. Conclusion

The study aims to apply the ELECTRE method in determining the best choice of diet instant noodles for INSTIKI students. Based on the results of the analysis, Lemonilo Mie Goreng 65 gr (A4) ranks first, showing that this product has advantages in meeting the set criteria, such as nutritional value, taste, and ease of consumption. Tropicana Slim Shirataki Noodles (A2) came in second place, indicating that this product is also a good choice for college students who are concerned about a healthy diet, especially in a low-calorie diet. The ranking produced by the ELECTRE method provides objective results based on the weighting of criteria, so that it can help consumers, especially students, in choosing products that suit their needs. The results of this study are expected to provide insight for students in choosing diet instant noodle products that suit their preferences and nutritional needs. In addition, this research can also be the basis for further research that can explore more product alternatives and consider additional criteria, such as price, taste preferences, and product sustainability.

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