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Assessing Local Small Businesses: A Decision-Making Framework Using the COPRAS Method

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ABSTRACT

The selection of optimal dining places for students around the INSTIKI campus is often a challenge due to the lack of organized information. This research proposes an evaluation framework using the Complex Proportional Assessment (COPRAS) method, a Multi-Criteria Decision Making (MCDM) approach, to assess and rank restaurants based on various criteria, such as price, food quality, production capacity, distance to campus, and reputation. Data was collected through surveys, field observations, and online reviews, and analyzed using COPRAS. The results showed that the best alternative was Mie Gacoan Pakerisan with the highest utility value (100%). With this approach, students can choose a dining venue that suits their needs, while local small businesses benefit from transparent data-driven evaluation.

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1. Introduction

INSTIKI students often have difficulty in choosing a dining location that suits their needs. The main factors that influence the decision include criteria such as proximity to campus, friendly prices, food hygiene, and the reputation of the place in the eyes of students. However, there are many restaurant options around campus often leave students confused due to the lack of organized and objective information . As a result, dining choices are often made haphazardly or based on suggestions from friends and comments on social media, which tend to be subjective and inconsistent (Kusakci et al., 2022).

The lack of an organized evaluation system to help students choose the best places to eat based on various criteria has become a major problem. A poor choice can lead to an unsatisfactory dining experience and possibly decreased trust in local small businesses. Therefore, there is a need for a systematic method that can thoroughly assess various options and provide reliable advice.

This study aims to address that issue by proposing a framework that uses the Complex Proportional Assessment (COPRAS) method. COPRAS is a Multicriteria Decision Making (MCDM) method that can combine multiple criteria, both qualitative and quantitative, to assess and rank alternatives (VimalaSaravanan et al., 2023). This method was chosen for its advantages in managing a number of criteria efficiently, producing objective rankings, and providing easy-to-understand results (Ashouri et al., 2023).

The research process consisted of identifying suitable evaluation criteria, assigning weights to each criterion according to their importance, collecting restaurant performance data related to these criteria, and using the COPRAS method to calculate and assign final rankings (Masoomi et al., 2022). Through this approach, this study aims to offer a solution for INSTIKI students to choose the optimal place to eat, while supporting the sustainability of local small businesses through transparent and data-driven evaluation .

Utilizing this framework, the research aims to bridge the existing gap by developing a decision analysis model that facilitates students in selecting dining options that best meet their preferences while simultaneously enhancing the visibility and competitiveness of local small businesses around the campus (Kusakci et al., 2022).

2. Literature Review

In evaluating local small businesses, the COPRAS (Complex Proportional Assessment) method serves as a robust multi-criteria decision-making framework that can effectively guide the selection process. This method is particularly relevant for small businesses as it allows for the consideration of various qualitative and quantitative criteria, which are essential in assessing business performance and sustainability (Maulidah et al., 2024; Sudipa et al., 2024). The importance of a structured evaluation process is underscored by the need for small businesses to adopt effective strategies that align with their operational goals and market demands (Kraugusteeliana & Violin, 2024; Mansour et al., 2022). The COPRAS method facilitates the identification of optimal solutions by comparing alternatives based on their performance across multiple criteria. This is particularly beneficial for small businesses that often face resource constraints and must prioritize their investments wisely. For instance, the selection of an appropriate e-commerce platform can significantly impact a small business's market presence and operational efficiency. Factors such as usability, scalability, and cost must be weighed carefully, as highlighted in the literature . The application of COPRAS in this context allows small businesses to systematically evaluate these factors, ensuring that the chosen platform aligns with their strategic objectives(Ahmad et al., 2023; Harjanti et al., 2023; Rony et al., 2023). Moreover, the integration of dynamic capabilities (DC) into the evaluation framework enhances the ability of small businesses to adapt and innovate. Research indicates that small businesses with strong DC are better positioned to implement business model innovations (BMI), which are crucial for maintaining competitiveness in a rapidly changing market environment (Bouwman et al., 2019; Leipziger, 2024; Piantari et al., 2024). By incorporating DC into the COPRAS framework, businesses can assess not only their current performance but also their potential for future growth and adaptation. The role of local Chambers of Commerce in supporting small businesses also merits consideration within the COPRAS framework. Membership in these networks has been shown to correlate with improved business performance, as they provide access to essential resources and networking opportunities (Tiwasing & Sawang, 2021). Evaluating the benefits of such memberships can be integrated into the COPRAS assessment, allowing businesses to weigh the advantages of community engagement against other operational priorities. Furthermore, the sustainability of small businesses is increasingly becoming a focal point in decision-making processes. The COPRAS method can be adapted to include sustainability criteria, enabling businesses to evaluate their long-term viability alongside immediate operational needs. This aligns with the growing emphasis on sustainable business practices, which are essential for meeting the challenges of modern markets. the COPRAS-based selection framework offers a comprehensive approach for evaluating local small businesses. By integrating multiple criteria, including operational efficiency, dynamic capabilities, community engagement, and sustainability, small businesses can make informed decisions that enhance their competitiveness and resilience in the marketplace.

3. Research Method

This research uses the Complex Proportional Assessment (COPRAS) method to assess local small businesses around the INSTIKI campus based on several key criteria that suit the needs of students. This approach is designed to offer a structured solution in choosing the best place to eat by taking into account aspects such as cost, cleanliness, place, and reputation.

2.1 Complex Proportional Assessment (COPRAS)

The Complex Proportional Assessment (COPRAS) method is a multi-criteria decision-making technique used to evaluate alternatives based on positive (favorable) and negative (unfavorable) criteria (Syafitri et al., 2022). COPRAS works on the principle of proportion, which is a direct relationship between the level of alternative utility and the significance of criteria (Kang et al., 2023). This method proportionally assesses the performance of alternatives against various predetermined criteria, then compares the evaluation results with the ideal solution (best) and the worst solution. In this case, the alternative that has the highest utility value will be considered the best choice (Rafli Nur Alam et al., 2022).

The main advantage of the COPRAS method is its ability to combine qualitative and quantitative data in the evaluation of alternatives, which allows for a more holistic and complete analysis(Hia et al., 2022). The method also presents clear and easy-to-understand results, making it easier for decision-makers to understand and evaluate the results. In addition, COPRAS allows for efficient calculation of relative utility, thus assisting in making decisions that are based on accurate and objective information(Baydaş et al., 2024).

Steps in the COPRAS Method:

a. Identification of Evaluation Criteria:
Relevant criteria for evaluating alternatives are determined. These criteria are selected based on the research objectives and needs, and measured using surveys or interviews with relevant respondents (Shanmugasundar et al., 2022).

b. Determination of Criteria Weights:
The weight of each criterion is calculated based on its importance. These weights are determined using questionnaires or other methods that allow to measure the priority level of each criterion (Taherdoost & Mohebi, 2024).

c. Decision Matrix:
Data is collected for each alternative and entered into a decision matrix. Each row in the matrix represents an evaluated alternative, while the columns indicate the performance value of the alternative against each predefined criterion (Saravanan et al., n.d.).

$$X=\begin{bmatrix} x_{11} & x_{12} & \cdots & X_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Where:
x_{ij} = performance value of the i-th alternative against the j-th criterion,
m = number of alternatives,
n = number of criteria.

d. Matrix Normalization:
The values in the decision matrix are normalized to be on an equal scale (Fatah Ridho Perdana et al., 2023). Normalization is done using the following formula:

$$r_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \quad (2)$$

Where:
r_{ij}= normalized value of the i-th alternative on the j-th criteria,
X_{ij} = original value of the decision matrix,
$\sum_{i=1}^{m} x_{ij}$= sum of all scores on the j-th criterion.

e. Weighting the Decision Matrix:
The weight of each criterion(w_j) is applied to the normalized values:

$$r'_{ij} = r_{ij} \cdot w_j \quad (3)$$

Where:
r'_{ij} = weighted normalized value of alternative to i-th against criterion j-th
w_j = Weight of the j-th criteria

f. Determining Positive and Negative Attributes:

Favorable (positive) and unfavorable (negative) criteria are distinguished. Positive attributes are criteria that are more favorable if the alternative value is higher (e.g. low price, high cleanliness), while negative attributes are criteria that are more favorable if the alternative value is lower (e.g. high price, low cleanliness) (Citra et al., 2024).

Positive and negative attributes are counted separately:

1. Number of positive attributes (S_i^+) for the i-th alternative:

$$S_{+i} = \sum_{j=1}^{n} y_{+ij} \tag{4}$$

2. Number of negative attributes (S_i^-) for the i-th alternative:

$$S_{-i} = \sum_{j=1}^{n} y_{-ij} \tag{5}$$

Where:
J^+ = set of positive criteria,
J^- = set of negative criteria.

g. Calculating Relative Utility (Qi)
The relative utility value () is calculated to determine the extent to which alternatives fulfill the criteria:

$$Q_i = S_i^+ + \frac{\sum_{i=1}^{m} S_i^-}{S_i^- \cdot \sum_{i=1}^{m} S_i^+} \tag{6}$$

Where:
Q_i= relative utility value of theiii-th alternative,
S_i^+dan S_i^- = positive and negative attributes for alternative i-th,
$\sum_{i=1}^{m} S_i^+$= total number of positive attributes,
$\sum_{i=1}^{m} S_i^-$= total number of negative attributes.

h. Calculating Utility Value (U):
The utility value is calculated by subtracting the dissatisfaction index from the satisfaction index for each alternative:

$$U_i = \left[\frac{Q_i}{Q_{max}}\right] x100\% \tag{7}$$

Where:
Q_{max}= Maximum relative significance value.

i. Ranking Alternatives:
The alternative with the highest utility value is selected as the best alternative. The other alternatives are ranked based on the lower utility value.

2.2 Flowchart of COPRAS Method Research Stages

This flowchart outlines the stages of research using the COPRAS (Complex Proportional Assessment) method. The process begins with problem identification, data collection, and defining the criteria and alternatives. Next, a decision matrix is created, normalized, and weighted to highlight the importance of each criterion. Then, positive/negative attributes, relative utility values, and utility values are calculated to determine the ranking of alternatives. The research concludes with result analysis, a summary of findings, and recommendations aligned with the research objectives.

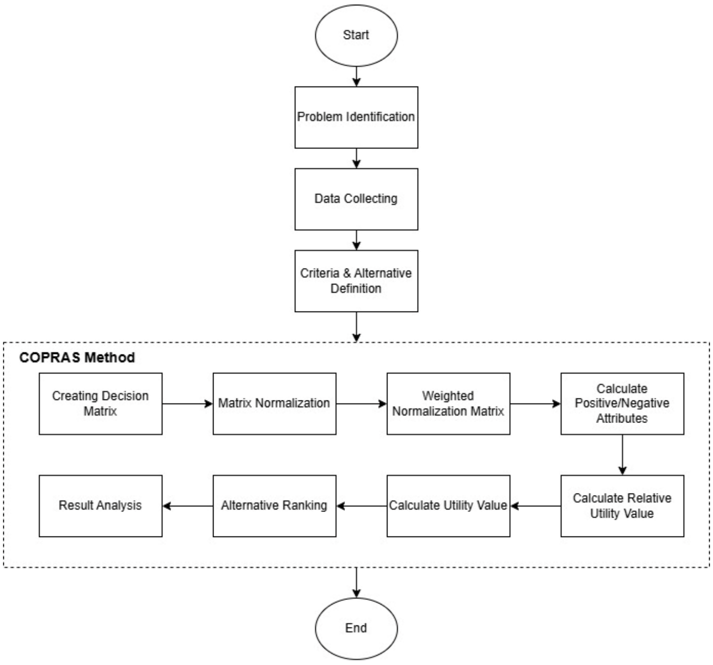

Fig.1. Research Flow

2.3 Data Source

The data sources used in this research are categorized into two types, namely primary data and secondary data, as follows:

a) Primary Data

Primary data is obtained directly from the results of surveys, interviews, and observations in the field. The following are details of primary data sources:

1. Student Questionnaire:
   Questionnaires were distributed to INSTIKI students to determine the weight of evaluation criteria, such as price, food quality, cleanliness, distance, and reputation of the place to eat. Respondents were randomly selected from various study programs and education levels to obtain representative results.
2. Field Observation:
   Data collection was carried out by directly observing the condition of local eateries around the INSTIKI campus, including menus, cleanliness, and location.

b) Secondary Data

Secondary data is obtained from existing sources that are relevant to the research. The following are details of secondary data sources:

1) Online Reviews:
   Data obtained from online review platforms such as online review platforms or social media that provide information about customer experiences of local dining places around campus (Bhardwaj & Kumar, 2023).
2) Campus Reports and Documentation:
   Documents containing maps of the INSTIKI campus area and a list of places to eat that are often recommended by the campus community.
3) Literature and Previous Research:
   Articles, journals, or books that discuss the COPRAS method, multi-criteria decision making, and small business evaluation to support the theoretical basis of the research.

2.4 Alternative Data

Based on the process of collecting questionnaire data to 35 respondents, namely INSTIKI students, 6 alternative local business locations were obtained, especially those engaged in the culinary field.

Table 1. Alternative

Alternative (A)	Food Court
A1	Mie Gacoan Pakerisan
A2	Ayam Kremes Panjer

A3	Dadar Beredar Panjer
A4	Gogo Fried Chiken Panjer
A5	King Gepreks Panjer
A6	Mie KOber Jl.Bedugul

2.5 Criteria Data

Based on the process of collecting questionnaire data to 35 respondents, namely INSTIKI students, 5 criteria were obtained in determining the best local business location, namely Selling Price (C1), Food Quality (C2), Production Capacity (C3), Distance from Campus (C4), Reputation among Students (C5). And there is a weight value for each criterion and type of criteria which is divided into cost or benefit criteria.

Table 2. Criteria

Criteria (C)	Description	Weight	Type
C1	Selling Price	0,25	Cost
C2	Food Quality	0,3	Benefit
C3	Production Capacity	0,2	Benefit
C4	Distance to Campus	0,1	Cost
C5	Reputation among Students	0,15	Benefit

4. Result and Discussions

3.1 Implementation of COPRAS Method

In the manual calculation of the COPRAS method to determine the best Food Court, the steps that must be followed are to determine alternatives and relevant criteria. In this context, there are six alternatives to be evaluated:

1) A1 = Mie Gacoan Pakerisan
2) A2 = Ayam Kremes Panjer
3) A3 = Dadar Beredar Panjer
4) A4 = Gogo Fried Chiken Panjer
5) A5 = King Gepreks Panjer
6) A6 = Mie KOber Jl.Bedugul

there are five criteria to be used as the evaluation reference, namely:

1) C1 = Selling Price
2) C2 = Food Quality
3) C3 = Production Capacity
4) C4 = Distance to Campus
5) C5 = Reputation Among Students

Next is to fill in the value for each alternative. The filling of these values is based on the questionnaire data obtained and can be seen in Table 4.

Table 3. Alternative Value

Alternative (A)	C1	C2	C3	C4	C5
A1	31.000	5	5	100 Meters	5
A2	45.000	2	2	710 Meters	3
A3	50.000	3	3	910 Meters	2
A4	35.000	3	3	760 Meters	3
A5	30.000	3	2	510 Meters	3
A6	40.000	3	3	600 Meters	3

The conversion process of price and distance values uses a Likert scale. Here are the results for price and distance.

Price:

a) < 20000 IDR = 5 (Very cheap)
b) 21000 - 30000 IDR = 4 cheap)
c) 31000 - 40000 IDR = 3 (Moderate)
d) 41000 - 50000 IDR = 2 (Expensive)
e) 51000 - 60000 = 1 (very expensive)

Distance :

a) 0 - 300 Meters = 5 (Very close)
b) 310 - 500 Meters = 4 (Close)
c) 510 - 700 Meters = 3 (Fair)
d) 710 - 900 Meters = 2 (Far)
e) 910 - 1100 Meters = 1 (Very Far)

Table 4. Data Normalization

Alternative (A)	C1	C2	C3	C4	C5
A1	3	5	5	5	5
A2	2	2	2	2	3
A3	2	3	3	1	2
A4	3	3	3	2	3
A5	4	3	2	3	3
A6	3	3	3	3	3

Determining the best food court alternative is done using the following calculations:

a. Creating a decision matrix

$$X = \begin{bmatrix} 3 & 5 & 4 & 5 & 5 \\ 2 & 4 & 3 & 2 & 3 \\ 2 & 3 & 2 & 1 & 3 \\ 3 & 4 & 3 & 2 & 5 \\ 4 & 4 & 3 & 3 & 5 \\ 3 & 3 & 4 & 3 & 4 \end{bmatrix}$$

b. Calculate the normalized matrix

C1 = 3 + 2 + 2 + 3 + 4 + 3 = 17
A_{11}: 3 : 17 = 0,176
A_{21}: 2 : 17 = 0,118
A_{31}: 2 : 17 = 0,118
A_{41}: 3 : 17 = 0,176
A_{51}: 4 : 17 = 0,235
A_{61}: 3 : 17 = 0,176

C2 = 5 + 4 + 3 + 4 + 4 + 3 = 23
A_{12}: 5 : 23 = 0,217
A_{22}: 4 : 23 = 0,174
A_{32}: 3 : 23 = 0,130
A_{42}: 4 : 23 = 0,174
A_{52}: 4 : 23 = 0,174
A_{62}: 3 : 23 = 0,130

C3 = 5 + 3 + 2 + 3 + 3 + 4 = 20
A_{13}: 5 : 20 = 0,250
A_{23}: 3 : 20 = 0,150
A_{33}: 2 : 20 = 0,100
A_{43}: 3 : 20 = 0,150
A_{53}: 3 : 20 = 0,150
A_{63}: 4 : 20 = 0,200

C4 = 5 + 2 + 1 + 2 + 3 + 3 = 16
A_{14}: 5 : 16 = 0,313
A_{24}: 2 : 16 = 0,125
A_{34}: 1 : 16 = 0,063

A_{44}: 2 : 16 = 0,125
A_{54}: 3 : 16 = 0,188
A_{64}: 3 : 16 = 0,188

C5 = 5 + 3 + 3 + 5 + 5 + 4 = 25
A_{15}: 5 : 25 = 0,200
A_{25}: 3 : 25 = 0,120
A_{35}: 3 : 25 = 0,120
A_{45}: 5 : 25 = 0,200
A_{55}: 5 : 25 = 0,200
A_{56}: 4 : 25 = 0,160

As a result of the calculation, the matrix X_{ij} is obtained.

$$X_{ij} = \begin{bmatrix} 0{,}176 & 0{,}217 & 0{,}250 & 0{,}313 & 0{,}200 \\ 0{,}118 & 0{,}174 & 0{,}150 & 0{,}125 & 0{,}120 \\ 0{,}118 & 0{,}130 & 0{,}100 & 0{,}063 & 0{,}120 \\ 0{,}176 & 0{,}174 & 0{,}150 & 0{,}125 & 0{,}200 \\ 0{,}235 & 0{,}174 & 0{,}150 & 0{,}188 & 0{,}200 \\ 0{,}176 & 0{,}130 & 0{,}200 & 0{,}188 & 0{,}160 \end{bmatrix}$$

c. Determine the weighted decision matrix
C1 (0,25) :
A_{11}: 0,176 * 0,25 = 0,044
A_{21}: 0,118 * 0,25 = 0,029
A_{31}: 0,118 * 0,25 = 0,029
A_{41}: 0,176 * 0,25 = 0,044
A_{51}: 0,235 * 0,25 = 0,059
A_{61}: 0,176 * 0,25 = 0,044

C2 (0,30) :
A_{12}: 0,217 * 0,30 = 0,065
A_{22}: 0,174 * 0,30 = 0,052
A_{32}: 0,130 * 0,30 = 0,039
A_{42}: 0,174 * 0,30 = 0,052
A_{52}: 0,174 * 0,30 = 0,052
A_{62}: 0,130 * 0,30 = 0,039

C3 (0,20) :
A_{13}: 0,250 * 0,20 = 0,050
A_{23}: 0,150 * 0,20 = 0,030
A_{33}: 0,100 * 0,20 = 0,020
A_{43}: 0,150 * 0,20 = 0,030
A_{53}: 0,150 * 0,20 = 0,030
A_{63}: 0,200 * 0,20 = 0,040

C4 (0,10) :
A_{14}: 0,313 * 0,10 = 0,031
A_{24}: 0,125 * 0,10 = 0,013
A_{34}: 0,063 * 0,10 = 0,006
A_{44}: 0,125 * 0,10 = 0,013
A_{54}: 0,188 * 0,10 = 0,019
A_{64}: 0,188 * 0,10 = 0,019

C5 (0,15):
A_{15}: 0,200 * 0,15 = 0,030

A_{25}: 0,120 * 0,15 = 0,018
A_{35}: 0,120 * 0,15 = 0,018
A_{45}: 0,200 * 0,15 = 0,030
A_{55}: 0,200 * 0,15 = 0,030
A_{65}: 0,160 * 0,15 = 0,024

As a result of the normalized matrix with weights, the matrix X_{ij} is obtained.

$$X_{ij} = \begin{bmatrix} 0,044 & 0,065 & 0,050 & 0,031 & 0,030 \\ 0,029 & 0,052 & 0,030 & 0,013 & 0,018 \\ 0,029 & 0,039 & 0,020 & 0,006 & 0,018 \\ 0,044 & 0,052 & 0,030 & 0,013 & 0,030 \\ 0,059 & 0,052 & 0,030 & 0,019 & 0,030 \\ 0,044 & 0,039 & 0,040 & 0,019 & 0,024 \end{bmatrix}$$

d. Calculating S_i^+ and S_i^-
S_i^+ = weighted sum of benefit criteria (C2, C3, C5)
S_i^- = weighted sum of cost criteria (C1, C4)

Benefit Attributes
A_1 : 0,065 + 0,050 + 0,030 = 0,145
A_2 : 0,052 + 0,030 + 0,018 = 0,100
A_3 : 0,039 + 0,020 + 0,018 = 0,077
A_4 : 0,052 + 0,030 + 0,030 = 0,112
A_5 : 0,052 + 0,030 + 0,030 = 0,112
A_6 : 0,039 + 0,040 + 0,024 = 0,103

Cost Attributes
A_1 : 0,044 + 0,031 = 0,075
A_2 : 0,029 + 0,013 = 0,042
A_3 : 0,029 + 0,006 = 0,035
A_4 : 0,044 + 0,013 = 0,057
A_5 : 0,059 + 0,019 = 0,078
A_6 : 0,044 + 0,019 = 0,063

Total number of attribute costs = 0,350

Table 5. Relative weight calculation

1/S-i	S^{-*}(1/S-i)
13,333	0,075 * 111,949 = 8,396
23,809	0,042 * 111,949 = 4,702
28,571	0,035 * 111,949 = 3,918
17,543	0,057 * 111,949 = 6,381
12,820	0,078 * 111,949 = 8,732
15,873	0,063 * 111,949 = 7,053
111,949	

e. Determine the priority order
Q_1 : 0,145 + (0,350/8,396) = 0,145 + 0,041 = 0,186
Q_2 : 0,100 + (0,350/4,702) = 0,100 + 0,074 = 0,174
Q_3 : 0,077 + (0,350/3,918) = 0,077 + 0,089 = 0,166
Q_4 : 0,112 + (0,350/6,381) = 0,112 + 0,054 = 0,166
Q_5 : 0,112 + (0,350/8,732) = 0,112 + 0,040 = 0,152
Q_6 : 0,103 + (0,350/7,053) = 0,103 + 0,049 = 0,152

Highest Value is (Q_max) = 0,186

f. Calculate the performance index value (U_i)
U1 : 0,186/0,186 * 100 = 100
U2 : 0,174/0,186 * 100 = 93,548
U3 : 0,166/0,186 * 100 = 89.247
U4 : 0,166/0,186 * 100 = 89.247
U5 : 0,152/0,186 * 100 = 81.720
U6 : 0,152/0,186 * 100 = 81.720

g. Final table organized based on several calculations and used to determine the ranking. The results of this calculation provide clear information about the most suitable alternatives, namely A1 to the less suitable ones, namely A5 and A6 based on the criteria used.

Table 6. Final Ranking

Alternative (A)	Prioriy Order	U_i	Ranking
A1	100	100%	**1**
A2	93,548	93%	**2**
A3	89,247	89%	**3**
A4	89.247	89%	**4**
A5	81,72	81%	**5**
A6	81,72	81%	**6**

Based on the results in table 6, it can be explained the findings in this study, namely the COPRAS method is able to solve the problem of local business locations in accordance with the criteria and preferences of respondents regarding alternatives and criteria in decision making, from 6 selected alternatives, the selection process is then carried out and shows alternative A1 as the best alternative. So that it can produce alternative decision support in determining the location of choice.

5. Conclusion

This research shows that the Complex Proportional Assessment (COPRAS) method is effective in evaluating and ranking food places around the INSTIKI campus based on various relevant criteria. The best alternative identified is Mie Gacoan Pakerisan, which fulfills all criteria with the highest utility score. This framework not only helps students in making better decisions, but also provides opportunities for small business owners to improve their competitiveness. This research suggests that the COPRAS method be applied more widely to evaluate small businesses in other sectors, as well as improvements by adding more complex criteria or methods for more in-depth analysis.

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