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Application Of The COPRAS Method In Selecting The Best Boarding House For Students

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ABSTRACT

Selecting a boarding house is an important decision for students, especially those who come from outside the area and require a comfortable, safe, and suitable place to live. The large number of boarding house options with varying facilities and rental prices often makes it difficult for students to determine the best choice. Therefore, a decision support system is needed to assist the selection process objectively and effectively. This study aims to implement the Complex Proportional Assessment (COPRAS) method in selecting the best boarding house for students based on several predetermined criteria. The criteria used in this study include rental price, distance to campus, facilities, and security. The COPRAS method was chosen because it is capable of evaluating both benefit and cost criteria proportionally. The results of the study indicate that the COPRAS method can rank boarding house alternatives based on their priority values. Based on the calculation results, Alternative A1 (Kost M & U) was identified as the best boarding house with the highest priority value compared to the other alternatives. Therefore, the implementation of the COPRAS method can help students determine boarding house choices that best match their needs and preferences in a faster, more accurate, and objective manner.

INTRODUCTION

Housing is one of the basic human needs that functions as a means to seek shelter and carry out various daily activities. The development of residences, whether houses, boarding houses, or apartments, grows very rapidly and quickly. In big cities, housing in the form of rental houses, boarding houses, and apartments becomes one of the options for a place to live (Siregar & Susanto, 2022). When choosing a boarding house, students usually consider several factors such as rental price, distance to campus, available facilities, level of security, and environmental comfort. The large number of boarding house options with different characteristics often makes it difficult for students to determine the choice that best suits their needs and financial capacity. This includes rental costs, provided facilities, distance to campus, security level, room size, and comfort. The variety of prices and specifications offered often creates a dilemma for students in making the right decision (Arini & Susanto, 2026).

The process of choosing a boarding house that is done manually tends to be subjective and takes a considerable amount of time. Students have to compare one boarding house with another based on various existing criteria. In addition, it is not uncommon for students to only consider a certain aspect, such as low price or proximity to campus, without paying attention to other important factors. This can lead to decisions that are less than optimal and not in line with the long-term needs of students.

The development of information technology today allows the implementation of Decision Support Systems to help solve problems in the decision-making process. A Decision Support System (DSS) is a system capable of solving a problem when making a decision; this system can be the best choice based on criteria and weights (Cholil & Setyawan, 2021). Decision Support Systems (DSS) can be used to help users choose the best alternative based on certain criteria more objectively, quickly, and accurately. One method that can be applied in DSS is the Copras method.

The Copras method was chosen because this multi-criteria decision-making method uses stepwise ranking and evaluates alternative procedures regarding significance and level of utility (Fadilla et al., 2022). This method is capable of evaluating alternatives based on benefit and cost criteria. This method has the advantage of determining the priority level of alternatives by considering the weight of each criterion proportionally. By using the Copras method, the process of assessing and ranking boarding house alternatives can be carried out systematically, thereby producing the best boarding house recommendations for students.

This study aims to apply the Copras method in selecting the best boarding house for students based on several criteria, namely rental price, distance to campus, facilities, and security. The results of the study are expected to help

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students in determining the boarding house choice that suits their needs and provide recommendations objectively based on the Copras method calculations.

LITERATURE REVIEW

Several previous studies have discussed the development of Decision Support Systems (DSS) using Multi Criteria Decision Making (MCDM) methods to assist users in selecting the best alternative based on multiple criteria. Decision Support Systems are widely used to solve semi-structured decision-making problems by evaluating several alternatives objectively and systematically (Taherdoost & Mohebi, 2024).

According to Taherdoost & Mohebi (2024), the Complex Proportional Assessment (COPRAS) method is one of the MCDM approaches that provides a systematic framework for evaluating alternatives based on both benefit and cost criteria. The method is considered effective because it can determine the utility degree and ranking of alternatives proportionally according to the importance of each criterion.

Furthermore, research by Sitanggang & Mesran (2022) explains that the application of the COPRAS method in decision support systems can improve the accuracy of selecting alternatives by considering various criteria simultaneously. Similarly, (Fathurrozi et al., 2022) state that COPRAS is capable of analyzing multiple alternatives and producing rankings based on utility values, making the decision-making process more effective and objective (Sitanggang, 2022).

In the field of decision support systems, Saragih et al. (2025) highlight that COPRAS has been successfully implemented in determining development priorities based on several weighted criteria. Meanwhile, (Epariani & Zaehol Fatah, 2025) explain that COPRAS offers advantages such as improving decision quality, efficiency, consistency, and transparency in the selection process (Saragih et al., 2025).

Related to the selection of student accommodation (kost), previous studies generally utilized methods such as SAW, TOPSIS, and AHP to evaluate alternatives based on criteria including rental price, distance from campus, facilities, security, room size, and comfort. These studies indicate that multi-criteria decision-making approaches are effective in helping students choose accommodation that best matches their needs and preferences. For example, (Septiana & Apsiswanto, 2023) applied a combination of AHP and SAW methods for boarding house recommendations by considering rental cost, facilities, distance, room size, security, environment, and boarding regulations. Likewise, (Muhammad Daffa Sumarto et al., 2023) developed a decision support system using the SAW method with criteria such as price, distance to campus, facilities, security, and room size. Furthermore, (Hanin et al., 2023) compared the SAW and TOPSIS methods in student boarding house selection and found that both methods were capable of producing accurate recommendations based on multiple criteria.

However, most previous studies focus on accommodation selection using methods other than COPRAS. Only a limited number of studies have specifically applied the COPRAS method in the context of student boarding house (kost) selection. Therefore, this study aims to implement the COPRAS method in selecting the best kost for students by considering criteria such as price, distance, facilities, and security. The expected outcome is a decision support system capable of providing objective recommendations and assisting students in choosing the most suitable accommodation according to their preferences and needs (Taherdoost & Mohebi, 2024).

METHOD

This research uses a quantitative method with a Decision Support System approach to determine the best boarding house for students using the Copras method. The Copras method is used because it is capable of performing the assessment and ranking process of alternatives based on benefit and cost criteria proportionally, making the decision results more objective.

This research uses a Decision Support System which will then be tested with the data that has been collected and the results will be presented. The Copras method is very efficient to use in selecting the best alternative based on many criteria, including in choosing a boarding place for students (Rumahorbo et al., 2021).

Here is the framework of the Complex Assessment Proportional (Copras) method (Fadilla et al., 2022).

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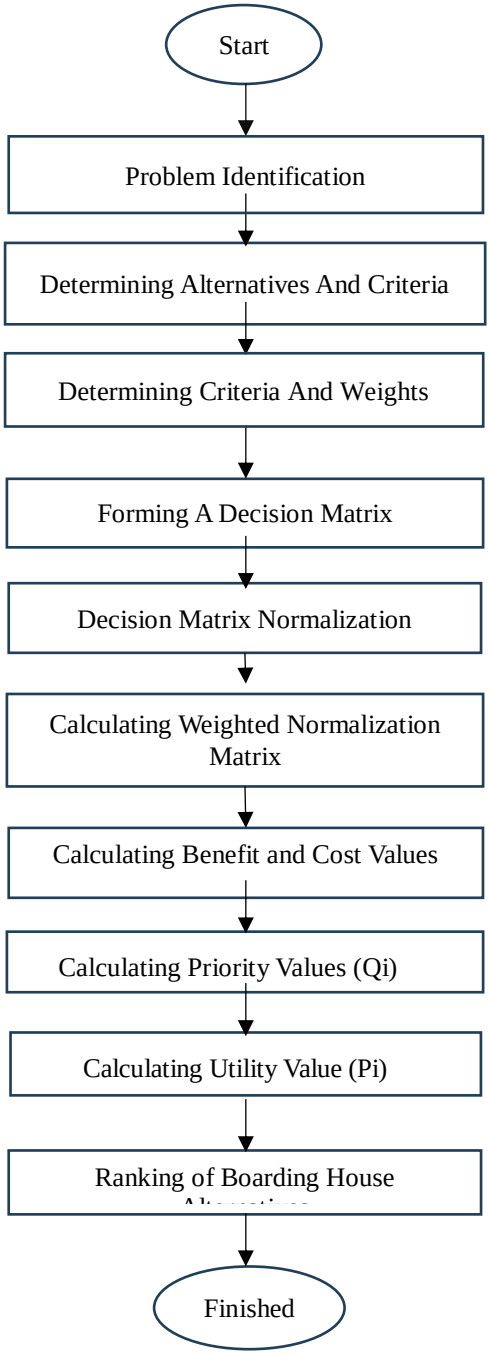

Figure 1. Flowchart Method COPRAS

Explanation of Flowchart Stages:

Start

The initial stage of the research began with determining the research topic, namely the application of the COPRAS method in selecting the best boarding house for students.

Problem Identification

At this stage, identification is carried out regarding the problems often experienced by students in choosing a boarding house. Students often face difficulties due to the many choices of boarding houses with different prices, facilities, distances, and levels of security. Therefore, a system is needed that can assist the decision-making process objectively.

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Determining Alternatives And Criteria

The next step is to collect data on several boarding house alternatives that will be used as research objects. Data is obtained through observation or direct information gathering regarding:

- Boarding house rental price
- Distance from boarding house to campus
- Available facilities
- Level of security

The data will later be used in the calculation process of the COPRAS method.

Determining Criteria And Weights

After the alternative data is obtained, the next step is to determine the criteria used in the assessment along with their weights. Weights are given based on the level of importance of each criterion to the students' needs.

For example:

- Rental price → Cost
- Distance to the campus → Cost
- Facilities → Benefit
- Security → Benefit

The greater the weight of a criterion, the greater its influence on the decision outcome.

Forming a Decision Matrix

At this stage, all alternative boarding house data are arranged into a decision matrix. The decision matrix contains the values of each alternative based on the criteria that have been determined.

Simple example:

Table 1. Alternative Data And Criteria Values For Housing Selection

Alternative	Price	Distance	Facilities	Security
A1	800.000	1 km	4	4
A2	700.000	2 km	3	4

This matrix serves as the basis in the calculation process of the COPRAS method.

Decision Matrix Normalization

The normalization stage is carried out to equalize the value scale of each criterion so that they can be compared fairly. The normalization results in more proportional values so that all criteria can be calculated in a single evaluation process.

Calculating the Weighted Normalization Matrix

The normalization results are then multiplied by the weight of each criterion to obtain the weighted normalization value. This stage aims for each criterion to have an influence according to its level of importance.

Calculating Benefit And Cost Values

At this stage, a separation is made between benefit and cost criteria. Benefit refers to criteria where the higher the value, the better, such as facilities and security. Cost refers to criteria where the lower the value, the better, such as price and distance. The result of this stage is the total value of benefits and costs for each boarding house alternative.

Calculating Priority Values (Qi)

Priority values are used to determine the feasibility level of each boarding house alternative. A higher value indicates that the alternative is better compared to other alternatives..

Calculating Utility Value (Pi)

At this stage, the calculation of the utility value (Pi) is carried out based on the priority value (Qi) obtained previously. The utility value is used to determine the feasibility level of each boarding house alternative. The higher the utility value obtained, the better the alternative.

Ranking of Boarding House Alternatives

After the priority values are obtained, all boarding house alternatives are ranked from highest to lowest value. The alternative with the highest value becomes the best boarding house recommendation for students.

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Finished

The final stage of the research indicates that the entire research and calculation process has been completed and the research results are ready to be used as recommendations for selecting the best boarding house for students..

Criteria

Research criteria are aspects used as the basis for assessment in determining the best boarding house for students. In this study, several criteria are used that are considered influential in the boarding house selection process, namely rental price, distance to campus, facilities, and security. Each criterion has an attribute type in the form of cost and benefit. Cost criteria are criteria that have better values if the values are smaller, while benefit criteria are criteria that have better values if the values are larger. In the assessment criteria, there are sub-criteria in several questions for each criterion.

Explanation of Criteria:

1. Rental Price (C1)
   Rent is the cost that students have to pay to rent a boarding house every month. The lower the rent, the better it is for students, so it is included in the cost criteria.
2. Distance to Campus (C2)
   Distance to campus is one of the important factors because it can affect students' transportation time and costs. The closer the boarding house is to the campus, the better, so it is included in the cost criteria.
3. Facilities (C3)
   Facilities include the amenities and infrastructure available at the boarding house such as WiFi, bathroom, parking space, bed, wardrobe, and other facilities. The more complete the available facilities, the better, thus it is included in the criteria of benefits.
4. Security (C4)
   Security is the level of comfort and safety in a boarding house environment, such as the presence of fences, CCTV, boarding house guards, or a safe environment. The higher the level of security, the better, so it is included as a benefit criterion.

Weight

The weight of the criteria is the value of the level of importance of each criterion used in the decision-making process. In this study, weights are given to indicate how much influence each criterion has on choosing the best boarding house for students. The greater the weight value of a criterion, the greater its influence in the calculation process of the Copras method.

Weight determination is carried out based on the needs and general considerations of students in choosing a boarding place.

Explanation of Criteria Weights:

1. Rental Price (0,35)
   Rental prices have the highest weight because cost is the main consideration for students when choosing a boarding house. Students tend to choose a boarding house with a price that matches their financial capability.
2. Distance to Campus (0,30)
   The distance to the campus has a fairly significant impact because it relates to the efficiency of time and transportation costs for students going to campus.
3. Facilities (0,20)
   Facilities are an important factor in supporting the comfort of students while staying in a boarding house. The more complete the available facilities, the better the quality of the boarding house.
4. Security (0,15)
   Security has considerable importance because it is related to the comfort and safety of students while staying in the boarding house environment.

The weights will later be used in the COPRAS method calculation process by multiplying the weight with each value of the normalized decision matrix. The following are the criteria data obtained in solving problems related to feasibility determination (Ningrum et al., 2022).

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Tabel 2. Weight Value (W) Criteria

Weight	Value	Type
W1	0,35	Cost
W2	0,30	Cost
W3	0,20	Benefit
W4	0,15	Benefit

Copras Method

Copras (Complex Proportional Assessment) is one of the methods in decision making that assumes a direct and proportional dependence on the level of significance and the usefulness of alternatives. This method chooses the best decision by considering the best and worst ideal solutions.

Zavadskas and Kaklauskas (1996) introduced the Copras method. The Copras method is one of the famous MCDM methods that can determine the best solution for a ratio with the worst ideal solution. A feature that makes the Copras method superior to other methods is that it can be used to calculate the utility level of alternatives, which indicates the goodness or badness of an alternative chosen for comparison. The Copras method has been successfully applied to several problems in the field of building construction and property management. The application of the Copras method is used to determine the best materials for making clothing at the Hatta batik boutique. In this method, there are several stages that must be followed.

The stages in the completion of the Copras method are as follows:

Step 1: Prepare the evaluation attributes that will be identified

$$D = \begin{array}{c|ccccc} A1 & X11 & X12 & X13 & . & X1n \\ A2 & X21 & X22 & X23 & . & X2n \\ A3 & X31 & X32 & X33 & . & X3n \\ . & . & . & . & . & . \\ Am & Xm1 & Xm2 & Xm3 & . & Xmn \end{array}$$

Step 2: Normalization of the matrix in decision making. To normalize the matrix, use the following formula:

$$Xij = \frac{Xij}{\sum_{1=}^{m} 1\, Xij}$$

Step 3: Determining the weighted normalization matrix, to determine the weighted normalization use the following formula:

$$D' = dij = Xij * wj$$

Stage 4: Calculation of the highest and lowest values on the index for each alternative. Here is the formula to calculate the highest and lowest values for each alternative:

$$S_{\{i+\}} = \sum_{\{j=1\}}^{\{k\}} d_{\{ij\}\, j=1,2,\ldots,\ldots,k}$$

$$S_{\{i-\}} = \sum_{\{j=1\}}^{\{k\}} d_{\{ij\}}\, J = k+1, K+2, \ldots, n$$

Step 5: Calculating the relative weight of each existing alternative using the following formula:

$$Q\_i = S\_\{+i\} + \frac{min\, S\_\{-i\}\, \backslash sum\_\{i=1\}\^\{m\}\, S\_\{-i\}}{min\, S\_\{-i\}\, \backslash sum\_\{i=1\}\^\{m\}\, S\_\{-i\}}$$

Stage 6: Determine the order of positions according to the priority of alternatives. The alternative that has the highest priority weight and the highest relative weight is the selected alternative. Here is the formula to determine the order of priority or ranking:

$$A* = \{Ai|\ \max Qi\}$$

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Step 7: Determine the performance index value (pi) of each alternative, here is the formula to determine (pi):

$$Pi = \frac{Qi}{Qmax} \; x \; 100\%$$

RESULT

Copras Method Calculation

The manual calculation of the COPRAS method to determine the Best Boarding House Selection for Students is by determining alternatives and criteria. There are 4 alternatives used, namely:

- A1 = Boarding house M & U
- A2 = Boarding house Aditya
- A3 = Boarding house Rudi
- A4 = Boarding house Two Princesses

There are 4 criteria used in this calculation, including:

- C1 = Monthly Rental Price (Cost)
- C2 = Distance to campus (Cost)
- C3 = Room Facilities (Benefit)
- C4 = Environmental Security (Benefit)

Next is to fill in the values from the existing alternatives. The filling of values based on the obtained data is shown in Table 3.

Criteria Weight:

- Monthly rental price = 35%
- Distance to the campus = 30%
- Room facilities = 20%
- Environmental security = 15%.

Table 3. Data Before Conversion

Alternative	C1	C2	C3	C4
A1	500.000	150 m	5	5
A2	500.000	38 m	3	3
A3	350.000	32 m	3	4
A4	400.000	4 km	4	5

The process of changing the value of price and also distance is carried out through fuzzification/codification, here are the codification results for price and distance.

Price Fuzzification

- 500rb – 1.000.000 = 1 (not good)
- 350rb - 400rb = 2 (quite good)
- 200rb-300rb = 3 (good)

Distance Fuzzification

- 2 – 4 KM = 2 (far)
- 50 – 170M = 3 (close enough)
- 25 – 40M = 5 (very close)

The range of values is determined based on observations of several boarding houses around the research location and adjusted to the characteristics of price and distance of the available boarding houses.

Table 4. Data Normalization Or Fuzzification

Alternative	C1	C2	C3	C4
A1	1	3	5	5
A2	1	5	3	3
A3	2	5	3	4
A4	2	2	4	5

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Determination of the best boarding house alternative for students using the COPRAS method is carried out with the following calculations:

- Determining the decision matrix

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

- Then calculate the normalized matrix

C1 = (1 + 1 + 2 + 2) = 6
A_{11} = 1 : 6 = 0,1667
A_{21} = 1 : 6 = 0,1667
A_{31} = 2 : 6 = 0,3333
A_{41} = 2 : 6 = 0,3333

C2 = (3 + 5 + 5 + 2) = 15
A_{12} = 3 : 15 = 0,2000
A_{22} = 5 : 15 = 0,3333
A_{32} = 5 : 15 = 0,3333
A_{42} = 2 : 15 = 0,1333

C3 = (5 + 3 + 3 + 4) = 15
A_{13} = 5 : 15 = 0,3333
A_{23} = 3 : 15 = 0,2000
A_{33} = 3 : 15 = 0,2000
A_{43} = 4 : 15 = 0,2667

C4 = (5 + 3 + 4 + 5) = 17
A_{14} = 5 : 17 = 0,2941
A_{24} = 3 : 17 = 0,1765
A_{34} = 4 : 17 = 0,2353
A_{44} = 5 : 17 = 0,2941

- After performing the calculation, the matrix is obtained Xij

$$X = \begin{bmatrix} 0,1667 & 0,2000 & 0,3333 & 0,2941 \\ 0,1667 & 0,3333 & 0,2000 & 0,1765 \\ 0,3333 & 0,3333 & 0,2000 & 0,2353 \\ 0,3333 & 0,1333 & 0,2667 & 0,2941 \end{bmatrix}$$

- The next step is to determine the weighted decision matrix. At this stage, the matrix (Xij) is multiplied by the predetermined weights:

A_{11} = 0,1667 * 0,35 = 0,0583
A_{21} = 0,1667 * 0,35 = 0,0583
A_{31} = 0,3333 * 0,35 = 0,1167
A_{41} = 0.3333 * 0,35 = 0,1167
A_{12} = 0,2000 * 0,30 = 0,0600
A_{22} = 0,3333 * 0,30 = 0,1000
A_{32} = 0,3333 * 0,30 = 0,1000
A_{42} = 0,1333 * 0,30 = 0,0400

A_{13} = 0,3333 * 0,20 = 0,0667
A_{23} = 0,2000 * 0,20 = 0,0400
A_{33} = 0,2000 * 0,20 = 0,0400
A_{43} = 0,2667 * 0,20 = 0,0533

A_{14} = 0,2941 * 0,15 = 0,0441

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A_{24} = 0,1765 * 0,15 = 0,0265
A_{34} = 0,2353 * 0,15 = 0,0353
A_{44}= 0,2941 * 0,15 = 0,0441

- After performing the calculations, the matrix is obtained Xij

$$X = \begin{bmatrix} \mathbf{0,0583} & \mathbf{0,0600} & \mathbf{0,0667} & \mathbf{0,0441} \\ \mathbf{0,0583} & \mathbf{0,1000} & \mathbf{0,0400} & \mathbf{0,0265} \\ \mathbf{0,1167} & \mathbf{0,1000} & \mathbf{0,0400} & \mathbf{0,0353} \\ \mathbf{0,1167} & \mathbf{0,0400} & \mathbf{0,0533} & \mathbf{0,0441} \end{bmatrix}$$

- The next stage is to calculate the benefit and cost values, sum the alternative benefits with the alternative benefits and sum the alternative costs with the alternative costs

Sum the benefit attributes
A_1 = 0,0667 + 0,0441 = 0,1108
A_2 = 0,0400 + 0,0265 = 0,0665
A_3 = 0,0400 + 0,0353 = 0,0753
A_4 = 0,0533 + 0,0441 = 0,0974

Sum the cost attribute (S-)
A_1 = 0,0583 + 0,0600 = 0,1183
A_2 = 0,0583 + 0,1000 = 0,1583
A_3 = 0,1167 + 0,1000 = 0,2167
A_4 = 0,1167 + 0,0400 = 0,1567
The total number of cost attributes is : 0,6500

Table.5 Relative Weight Calculation

1/S-i	S-*(1/S-i)
8,4531	0,1183 * 25,7665 = 3,0482
6,3171	0,1583 * 25,7665 = 4,0798
4,6147	0,2167 * 25,7665 = 5,5846
6,3816	0,1567 * 25,7665 = 4,0376
25,7665	

- Determining the order of priorities

Q1 = 0,1108 + (0,6500/3,0482) = 0,3240
Q2 = 0,0665 + (0,6500/4,0798) = 0,2258
Q3 = 0,0753 + (0,6500/5,5846) = 0,1917
Q4 = 0,0974 + (0,6500/4,0376) = 0,2584

The Highest Score is (Q1) = 0,3240

Next, calculate the performance index (Pi) value; in this process, the total (Q) is divided by the highest value (Q1) and then multiplied by 100.

P1 = 0,3240/ 0,3240 * 100 = 100%
P2 = 0,2258/ 0,3240 * 100 = 69,69%
P3 = 0,1917/ 0,3240 * 100 = 59,17%
P4 = 0,2584/ 0,3240 * 100 = 79,75%

The following is the final result table taken from the calculation of priority order, performance index, and made into a ranking as shown in Table 6.

Table.6 COPRAS Calculation Results

Alternative	Priority Order (Qi)	Pi (%)	Ranking
A_1	0,3240	100%	1
A_2	0,2258	69,69%	3
A_3	0,1917	59,17%	4
A_4	0,2584	79,75%	2

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CONCLUSION

Based on the data processing results using the COPRAS method, it was found that alternative A1 (Kost M & U) has the highest priority order value (Qi) of 0.3240 with a utility value (Pi) of 100.00%, making it rank first as the best boarding house alternative. Next, alternative A4 (Kost Dua Putri) has a priority order value of 0.2584 with a utility value of 79.75%, placing it in second position. Alternative A2 (Kost Aditya) ranks third with a priority order value of 0.2258 and a utility value of 69.69%. Meanwhile, alternative A3 (Kost Rudi) ranks fourth with a priority order value of 0.1917 and a utility value of 59.17%.

Based on the ranking results, it can be concluded that Kost M & U (A1) is the most recommended alternative because it has the highest priority score and utility level compared to other alternatives. Thus, the Copras method can be used as a decision-making tool in selecting the best boarding house for students objectively based on criteria such as rental price, distance to campus, room facilities, and neighborhood security.

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