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Implementation of the EDAS Method in Selecting the Best Foundation Based on Consumers

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Abstract−Choosing an appropriate foundation product is a challenge for consumers due to differences in skin type, skin tone, and product characteristics. Inappropriate foundation selection may result in discomfort, unnatural makeup appearance, and potential side effects on the skin. This study aims to apply the Evaluation based on Distance from Average Solution (EDAS) method to determine the best foundation product based on consumer preferences. The evaluation is conducted using seven criteria: effectiveness, ingredient content, durability, packaging, price, availability, and side effects. Data were collected from 60 respondents through questionnaires, with six foundation products used as alternatives. The results indicate that the EDAS method is capable of providing objective and systematic rankings of foundation products, where Viva achieved the highest ranking. This study proves that the EDAS method is effective as a decision support system to assist consumers in selecting foundation products that best meet their needs.

Keywords: Foundation; EDAS Method; Consumer Decisions; Product Criteria; Decision Support Systems

1. INTRODUCTION

Having a beautiful and attractive face is something every woman desires(Sriariyanun, 2025) . One of the facial beauty products is foundation, which can cover skin imperfections such as wrinkles and fine lines on the face(Batwara, 2025). Choosing the right foundation is very important as a base for makeup. However, problems arise in choosing foundation due to the diversity of skin types that each individual has(Vimala, 2025). Not all consumers have a deep understanding of the ingredients in foundation, how to choose foundation based on skin type, or skin color(Sanyal, 2025)(Srikant, 2025). Diverse skin types, such as oily, dry, and sensitive skin, must have a foundation formula that suits the skin type so as not to cause a contrast between skin and face color(Maden, 2025)(Hadjira, 2025). Inappropriate foundation choices can make one's appearance look unnatural, causing women to feel insecure(He, 2025)(Wątróbski, 2025). As the cosmetics industry grows, the number and variety of foundation products available on the market continues to increase. This situation provides consumers with more choices, but on the other hand, it also makes it difficult to determine which product best suits their needs and skin characteristics. The process of selecting a foundation can no longer be done subjectively, as it involves various interrelated criteria that must be considered simultaneously. In addition, consumer decisions in choosing foundation are often influenced by non-technical factors such as personal recommendations, advertisements, or trends, without being supported by systematic analysis. This has the potential to cause product incompatibility with the user's skin condition. Therefore, a Decision Support System (DSS) approach is needed that is capable of accommodating many criteria and alternatives objectively and providing rational and measurable recommendations. In previous studies, various methods have been applied in selecting the best foundation. For example, the MOORA (Multi-Objective Optimization by Ratio Analysis) method utilizes five assessment criteria, including pore concealment, packaging, ability to absorb excess oil, light feel, and durability(Behera, 2025). The MOORA method has the ability to address multi-criteria problems by comparing the performance ratio of each alternative for decision-making, but this method has sensitivity in weighting and its criteria are independent(Boujelben, 2025) . Furthermore, another method used is MFEP (Multifactor Evaluation Process). This study utilizes seven criteria, including effectiveness, ingredient content, durability, packaging, price, availability, and side effects(Zhao, 2025). The MEFP method is simple to apply and effective for quick decisions, but it lacks precision in complex problems and has weight limitations(L. Li, 2025).

In this situation, a Decision Support System (DSS) can provide a solution by providing a method capable of collecting, managing, and analyzing relevant data to determine more accurate decision making(Singer, 2025). The DSS method that will be used in this study is the EDAS method. The Evaluation based on Distance from Average Solution (EDAS) method is a method that can analyze and solve a problem using a calculation function by testing the positive ideal distance and negative ideal distance, then averaging them to provide an accurate and precise final result(Dhumras, 2025). This method is very useful when different criteria must be considered. The EDAS method is balanced when various weight criteria are used, and this method is consistent with other methods(Jaleel, 2025).

Based on the previous problem, this study aims to help consumers choose the right foundation product for their needs, using alternatives such as effectiveness, ingredient content, durability, packaging, price, availability, and side effects. The results of this study are expected to serve as a reference for consumers in choosing foundation products based on the alternatives and criteria that have been set.

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2. RESEARCH METHODOLOGY

2.1 Data Set

This study was conducted on consumers who use foundation, and the data was collected using a questionnaire. A total of 60 data points were obtained from respondents. The questionnaire was distributed to consumers via social media and contained 7 questions used as assessment criteria and 6 alternative choices.

Table 1. Criteria

Criteria	Description	Type	Weight
C1	Effectiveness	Benefit	4
C2	Ingredients	Benefit	5
C3	Durability	Benefit	4
C4	Packaging	Benefit	3
C5	Price	Cost	2
C6	Availability	Benefit	4
C7	Side Effects	Cost	2

Based on Table 1, it can be seen that there are 7 criteria used to select the best foundation, including (C1) Effectiveness, referring to the desired results according to user needs. Criterion (C2) Ingredients, providing product safety and benefits according to the consumer's skin type. Criterion (C3) Durability, a long-lasting foundation will be more practical and support the user's appearance throughout the day. Criterion (C4) Packaging, packaging design attracts consumers and influences consumer practicality. Criterion (C5) Price, the more affordable the foundation, the greater the consumer's attraction to buy it. Criterion (C6) Availability, providing ease of access for consumers who wish to purchase. Criterion (C6) Side Effects, refers to the consequences or symptoms after using the foundation. From the seven criteria above, the alternatives that can be used in this study are shown in Table 2:

Table 2. Alternatives

Alternatif	Description
A1	Wardah
A2	Pixy
A3	Maybelline
A4	Make Over
A5	Implora
A6	Viva

2.2 Research Stages

The research methodology consists of several stages of research, from the initial stage to the final stage, as shown in Figure 1 below:

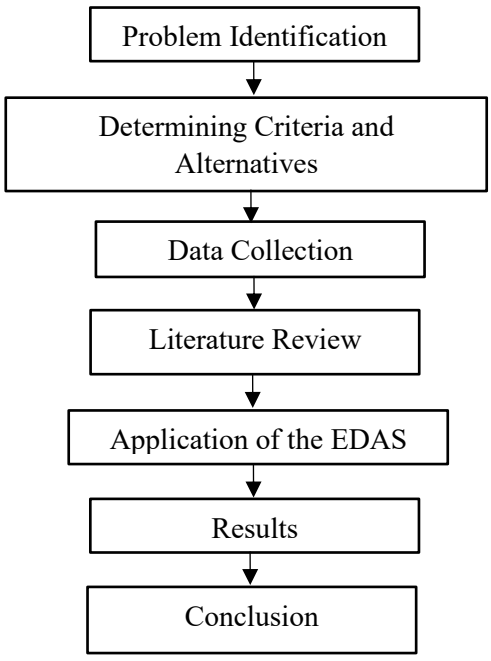

Figure 1. Research Stages

Based on the figure above, the following is an explanation of the research stages that will be carried out:

a. Problem Identification
   This stage determines the problems and issues in selecting the best foundation according to consumers(Wang, 2025).
b. Determining Criteria and Alternatives
   This process is carried out before data collection begins so that the relevant criteria are clear(Mobasshir, 2025).
c. Data Collection
   Data is collected by distributing questionnaires through social media platforms to consumers who use foundation(R. Li, 2025).
d. Literature Review
   This stage analyzes relevant literature or sources in line with the research conducted, namely regarding Decision Support Systems, the EDAS Method, and Foundations from various journals, previous studies, and books(Ubod, 2025)
e. Application of the EDAS Method
   To address errors in foundation selection, this study applies the EDAS method, which will help consumers make quick and accurate decisions(Yadav, 2025).
f. Results
   This stage will provide the results of the EDAS method calculations in determining the best foundation recommendations according to consumers(Zhu, 2025).
g. Conclusion
   The final stage is to draw conclusions based on the results calculated using the EDAS method(Garg, 2024).

2.3 Decision Support System

A Decision Support System is a computer-based system that excels at solving problems and can interact with both systematic and unsystematic problems(Nguyen, 2024). Decision Support Systems are designed to support decision making by providing relevant information, analysis, and assistance in the decision-making process(Banik, 2024).

2.4 EDAS Method

The Evaluation based on Distance from Average Solution method is one of the methods in the Multi-Criteria Decision Support System used to assess alternatives based on their distance from the average solution or the median value of all existing alternatives(Xu, 2024). The EDAS method is able to solve a problem by using a calculation method that scans the positive ideal distance and the negative ideal distance and then averages them to produce an accurate and precise result(J. J. Li, 2024).

Steps in the EDAS calculation process:

a. Creating a Decision Matrix
   The first step in the EDAS method is to compile a decision matrix$x$ that reflects the performance of each alternative against all the criteria applied. Inx , the rows show the available alternatives, while$x$ the columns show the criteria used.

$$x=x11 \quad ...x12 \quad ...x1nx21 \quad ...x22 \quad ...x2nxm1 \quad ...xm2 \quad ...xmn$$

b. Determining the Average Solution

$$AVj = in= i Xijn$$

c. Determining the positive and negative distances from the average
   Benefits:

$$PDAij=\max(0,Xij-Avj)Avj$$

$$NDAij=\max(0,Avj-Xij)Avj$$

   Cost:

$$PDAij=\max(0,Avj-Xij)Avj$$

$$NDAij=\max(0,Xij-Avj)Avj$$

d. Determining the weighted value of PDA and NDA (SP & SN)

$$SPi= jm=1 \ Wj\times PDAij$$

$$SNi= jm=1 \ Wj\times NDAij$$

e. Normalizing SP and SN Values (NSP & NSN)

$$NSPi= SPimax(SPi)$$

$$NSNi= 1-SNimax(SNi)$$

f. Calculating assessment scores (AS)

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$$ASi=12(NSPi+NSNi)$$

g. Ranking
The final step is to compile the ranking based on the final AS scores, with AS scores sorted from highest to lowest. The highest final AS score indicates the best alternative from all available alternatives.

3. RESULT AND DISCUSSION.

3.1 Respondent Data

Table 3 shows the data from the respondents assessment of each foundation alternative based on seven assessment criteria.

Table 3. Responden Results

No	Respondent	Alternatives	Criteria						
			C1	C2	C3	C4	C5	C6	C7
1	Respondent 1	Implora	4	5	4	4	5	5	2
2	Respondent 2	Maybelline	4	4	5	4	5	4	4
3	Respondent 3	Wardah	4	4	5	4	4	3	4
4	Respondent 4	Pixy	4	4	4	5	4	4	2
5	Respondent 5	Maybelline	2	2	3	4	3	5	3
…	…	…	…	…	…	…	…	…	…
60	Respondent 60		3	3	4	3	4	4	2

The data in Table 3 was obtained from 60 respondents who provided numerical ratings of the foundation they used based on their individual experiences.

3.2 Alternatives and Weight

Table 4 presents the initial decision matrix containing alternative values for each criterion and the criterion weights used in the EDAS method calculation.

Table 4. Weights, Criteria, and Alternatives

Alternatives	Criteria						
	C1	C2	C3	C4	C5	C6	C7
Wardah	4	4	3	4	3	4	4
Pixy	4	4	4	5	4	5	5
Maybelline	4	4	5	4	5	5	2
Make Over	4	3	5	5	3	4	5
Implora	3	4	4	3	4	5	2
Viva	3	3	4	3	4	5	2
BOBOT	4	5	4	3	2	4	2

This matrix is used as a basis for determining the average value and calculating positive and negative distances in the next stage.

3.3 Determining the EDAS Method

The following are the steps to solve the problem using the EDAS method to select the best foundation:

a. Create a decision-making matrix
$$X=Xij=443434444454554454552435534534434523343452$$

b. Determine the average value
$$AV1=(4+4+4+4+3+3)6=226=3,666667$$
$$AV2=(4+4+4+3+4+3)6=226=3,666667$$
$$AV3=(3+4+5+5+4+4)6=256=4,166667$$
$$AV4=(4+5+4+5+3+3)6=246=4$$
$$AV5=(3+4+5+3+4+4)6=236=3,833333$$
$$AV6=(4+5+5+4+5+5)6=286=4,666667$$
$$AV7=(4+5+2+5+2+2)6=206=3,333333$$
Table 5 presents the average values for each criterion obtained from all foundation alternatives.

Table 5. Average Values

Alternatives	Criteria					
	C1	C2	C3	C4C5	C6	C7

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Wardah	4	4	3	4	3	4	4
Pixy	4	4	4	5	4	5	5
Maybelline	4	4	5	4	5	5	2
Make Over	4	3	5	5	3	4	5
Implora	3	4	4	3	4	5	2
Viva	3	3	4	3	4	5	2
WEIGHT	4	5	4	3	2	4	2
Average	3,666667	3,666667	4,166667	4	3,833333	4,666667	3,333333

This average value is used as a reference in calculating positive and negative distances in the EDAS method.

c. Determining the Positive and Negative Deviations from the Mean (PDA and NDA)

Average positive distance

Alternative 1(Benefit)

PDAij=max (0,Xij-Avj)Avj

PDA11=max (0,4-3,666667)3,666667=0, 0,09090=0

PDA21=max (0,4-3,666667)3,666667=0, 0,09090=0

PDA31=max (0,4-3,666667)3,666667=0, 0,09090=0

PDA41=max (0,4-3,666667)3,666667=0, 0,09090=0

PDA51=max (0,3-3,666667)3,666667=0, -0,181818=0,181818

PDA61=max (0,3-3,666667)3,666667=0, -0,181818=0,181818

Etc

Average Alternative 7 (Cost)

PDA17=max (0,3,333333-4)3,333333=0,- 0,20=0

PDA27=max (0,3,333333-5)3,333333=0,- 0,50=0

PDA37=max (0,3,333333-2)3,333333=0, 0,4=0,4

PDA47=max (0,3,333333-5)3,333333=0,- 0,50=0

PDA57=max (0,3,333333-2)3,333333=0, 0,4=0,4

PDA67=max (0,3,333333-2)3,333333=0, 0,4=0,4

Table 6 presents the results of the Positive Distance from Average (PDA) calculation for each alternative against each criterion.

Table 6. PDA Value Data

Alternative	C1	C2	C3	C4	C5	C6	C7
A1	0	0	0,28	0	0,217391	0,142857	0
A2	0	0	0,04	0	0	0	0
A3	0	0	0	0	0	0	0,4
A4	0	0,181818	0	0	0,217391	0,142857	0
A5	0,181818	0	0,04	0,25	0	0	0,4
Weight	4	5	4	3	2	4	2

The PDA value indicates the extent to which an alternative has a better value than the average value.

Average Negative Distance (NDA)

Alternative 1

NDAij=max (0,Avj-Xij)Avj

NDA11=max (0,3,666667-4)3,666667=0, -0,090909=0,090909

NDA21=max (0,3,666667-4)3,666667=0, -0,090909=0,090909

NDA31=max (0,3,666667-4)3,666667=0, -0,090909=0,090909

NDA41=max (0,3,666667-4)3,666667=0, -0,090909=0,090909

NDA51=max (0,3,666667-3)3,666667=0, 0,181818=0

NDA61=max (0,3,666667-3)3,666667=0, 0,181818=0

Etc

Alternative 7 (Cost)

NDA17=max0,4-3,3333333,333333=0, 0,2=0,2

NDA27=max0,5-3,3333333,333333=0, 0,5=0,5

NDA37=max0,2-3,3333333,333333=0, -0,4=0

NDA47=max0,5-3,3333333,333333=0, 0,5=0,5

NDA57=max0,2-3,3333333,333333=0, -0,4=0

NDA67=max0,2-3,3333333,333333=0, -0,4=0

Table 7 shows the results of the Negative Distance from Average (NDA) calculation for each alternative against all criteria.

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Table 7. NDA Value Data

Alternative	C1	C2	C3	C4	C5	C6	C7
A1	0,090909	0,090909	0	0	0	0	0,2
A2	0,090909	0,090909	0	0,25	0,043478	0,071429	0,5
A3	0,090909	0,090909	0,2	0	0,304348	0,071429	0
A4	0,090909	0	0,2	0,25	0	0	0,5
A5	0	0,090909	0	0	0,043478	0,071429	0
Weight	0	0	0	0	0,043478	0,071429	0

The NDA value indicates the degree of negative deviation of an alternative from a predetermined average value.

d. Determining the weighted values of PDA and NDA (SP & SN)

Determining SP

SP1=w1×PDA11+w2×PDA12+w3×PDA13+w4×PDA14+w5×PDA15+w6×PDA16+w7×PDA17
SP1=4×0+5×0+4×0,28+3×0+2×0,217391+4×0,142857+2×0
SP1=0+0+1,12+0+0,434782+0,571428+0=2,126211
Etc
SP6=w1×PDA61+w2×PDA62+w3×PDA63+w4×PDA64+w5×PDA65+w6×PDA66+w7×PDA67
SP6=4×0,181818+5×0,181818+4×0,04+3×0,25+2×0+4×0+2×0,4
SP6=0,727272+0,90909+0,16+0,75+0+0+0,8= 3,346364

Determining SN

SN1=w1×NDA11+w2×NDA12+w3×NDA13+w4×NDA14+w5×NDA15+w6×NDA16+w7×NDA17
SN1=4×0,090909+5×0,090909+4×0+3×0+2×0+4×0+2×0,2
SN1=0,363636+0,454545+0+0+0+0+0,4=1,218182
Etc
SN6=w1×NDA61+w2×NDA62+w3×NDA63+w4×NDA64+w5×NDA65+w6×NDA66+w7×NDA67
SN6=4×0+5×0+4×0+3×0+2×0,043478+4×0,071429+2×0
SN6=0+0+0+0+0,086956 + 0,285716+0 = 0,372671

Table 8 shows the results of calculating the SP (Sum of Weighted PDA) and SN (Sum of Weighted NDA) values for each alternative.

Tabel 8. SP and SN Values

Alternative	NSP	NSN
A1	0,63538	0,585773
A2	0,047813	0
A3	0,239065	0,145625
A4	0,572353	0,009255
A5	0,728335	0,718716
A6	1	0,873278

SP and SN values are used for normalization to obtain the final preference values.

e. Normalizing SP and SN values

NSPi= SPimax(SPi)
NSP1= 2,1262113,346364= 0,63538
NSP2= 0,163,346364=0,047813
NSP3= 0,83,346364= 0,239065
NSP4= 1,9153023,346364= 0,572353
NSP5= 2,4372733,346364= 0,728335
NSP6= 3,3463643,346364= 1
NSNi=1- SNimax(SNi)
NSN1=1-1,2181822,940853=0,585773
NSN2=1- 2,9408532,940853=0
NSN3=1-2,5125922,940853=0,145625
NSN4=1- 2,9136362,940853=0,009255
NSN5=1- 0,8272162,940853=0,718715
NSN6=1- 0,3726712,940853=0,873278

Table 9 presents the results of normalizing SP and SN values, which produce NSP and NSN values.

Table 9. Normalization SP dan SN

Alternative	NSP	NSN
A1	0,63538	0,585773
A2	0,047813	0

Alternative	NSP	NSN
A3	0,239065	0,145625
A4	0,572353	0,009255
A5	0,728335	0,718716
A6	1	0,873278

The purpose of this normalization is to standardize the scale of values so that they can be used in calculating the final assessment score.

f. Calculating the AS Value

$ASi = 12(NSPi + NSNi)$

$AS1 = 120{,}63538 + 0{,}585773 = 0{,}610576$

$AS2 = 120{,}047813 + 0 = 0{,}023907$

$AS3 = 120{,}239065 + 0{,}145625 = 0{,}192345$

$AS4 = 120{,}572353 + 0{,}009255 = 0{,}290804$

$AS5 = 120{,}728335 + 0{,}718716 = 0{,}723525$

$AS6 = 121 + 0{,}873278 = 0{,}936639$

Table 10 shows the Assessment Score (AS) values for each foundation alternative.

Tabel 10. AS Values

Alternative	AS
A1	0,610576
A2	0,023907
A3	0,192345
A4	0,290804
A5	0,723525
A6	0,936639

The AS score is obtained from the average of the NSP and NSN scores, which form the basis for the ranking process.

g. Ranking

The final step is to rank the foundations based on the AS scores obtained. The AS scores are sorted from highest to lowest. The results of the ranking of the best foundations according to consumers can be seen in Table

Table 11 shows the final results of the foundation ranking based on the Assessment Score (AS).

Table 11. Ranking

Alternative	AS Score	Ranking
Viva (A6)	0,936639	1
Implora (A5)	0,723525	2
Wardah (A1)	0,610576	3
Make Over (A4)	0,290804	4
Maybelline (A3)	0,192345	5
Pixy (A2)	0,023907	6

4. CONCLUSION

Based on the above discussion, it can be concluded that Decision Support Systems play an important role in the process of ranking alternatives to determine more systematic and objective decisions. This study utilizes the EDAS method to assist consumers in choosing the best foundation based on predetermined criteria. The results of the EDAS method calculations show that Viva (A6) ranks first as the best foundation, followed by Implora (A5), Wardah (A1), Make Over (A4), Maybelline (A3), and Pixy (A2). These results prove that the EDAS method is effective in providing foundation product recommendations that suit consumer needs based on predetermined criteria.

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