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Decision Support Systems in Determining the Product Marketing Strategy of PT. Universal Gloves with Multi-Objective Optimization Method On The Basic Of Ratio Analysis (MOORA)

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Article Info	ABSTRACT
	Multi-Objective Optimization based on Ratio Analysis or often referred to as the MOORA method is a method that is often used as a decision-making method that uses optimization techniques to solve complex problems that have many criteria or multi-criteria. The MOORA method can separate various factors by separating the subjective part of the factors into several decision-making attributes by forming a decision matrix. The decision matrix will be normalized and optimized for each criterion to produce a preference value that can be used as a decision making. In this study, decision making was carried out using the MOORA method on the right product marketing strategy based on various existing criteria to determine the strategy that the company will implement in marketing its products so that the company has a competitive advantage to win the market from competitors. The results of the analysis show that the differentiation strategy has a higher preference value, namely 53.243164 and the cost leadership strategy with a value of 48.123638, and the market segmentation strategies with a value of 46.540075.

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1. INTRODUCTION

Sales and purchase transactions of goods or services are economic activities that must always be responsive to changes that occur in society. Companies are faced with increasingly competitive competition with each other, and this spurs companies to compete to win the market[1]–[3].

In winning the competition, every company always implements promotion or marketing by building a competitive advantage to generate value for consumers has become a major highlight in strategic marketing[4], [5]. This competitive advantage is the value created by a company that can motivate consumers to buy the company's products or services compared to its competitors and make it difficult for competitors to imitate these values[6]. In choosing a competitive marketing strategy, research is needed from various possible factors, including internal and external factors that affect company performance[7].

The choice of marketing strategy involves many attributes that are influenced by various subjective factors and require appropriate steps so that a method that can convert subjective

judgments is needed and can provide competitive value for the company. One of the decision-making methods that can solve problems that have many attributes is Multi-Objective Optimization based on Ratio Analysis or often referred to as the MOORA method. The advantage of this method is that it can separate the subjective part of the factors into several groups of attributes used in decision making[8]–[11].

The right marketing strategy is necessary for the sustainability of the company's business. Likewise, what happened to PT. Universal Gloves, a company that manufactures and markets latex gloves and nitrile gloves. This company produces high-quality gloves by promoting customer satisfaction. To win the business competition from companies with similar products, PT. Universal Gloves requires the selection of a marketing strategy for its products to the public. In choosing the right marketing strategy, the use of the right method is expected to provide appropriate results and generate value for consumers so that PT. Universal Gloves can compete with existing competitors.

2. RESEARCH METHOD

The MOORA method is a method introduced by Brauers and Zavadkas (2006). This relatively new method was first used by Brauers (2003) in a multi-criteria take. The MOORA method has a good level of selectivity in determining an alternative[12]–[14].

According to Syaiful Rothman et al. (2017: 37) states that: "MOORA is a method that is widely applied in several fields such as management, building, contracting, road design, and economics. The approach taken by MOORA is defined as a collective process to optimize two or more contradictory ones on several constraints ". According to Dennis Pasaribu (2018: 250) defines: "Moora is a multi-objective system that optimizes two or more conflicting attributes simultaneously. This method is applied to solve problems with complex mathematical calculations. According to Dicky Nofriansyah and Sargon Deficit (2017: 85) defines: "Multi-Objective Optimization based on Ratio Analysis (MOORA) is a multi-objective system optimizing two or more conflicting attributes simultaneously". Dicky Nofriansyah and Sargon Defit also said that the following is the complete algorithm of the Moora method, which is as follows:

1. First Step: Input Criteria Values. Input the criterion value in an alternative where the value will be processed and the result will be a decision.
2. Second Step: Converting Criteria Values Into a Decision Matrix. The decision matrix serves as a performance measurement of the I th alternative on the J th attribute, M is the alternative and N is the number of attributes and then a ratio system is developed where each performance of an alternative on an attribute is compared with the denominator which is the representative for all alternatives of the attribute, The following is the change in the criteria value into a decision matrix:

$$X = \begin{bmatrix} X11 & X12 & X1n \\ X21 & X22 & X2n \\ Xm1 & Xm2 & Xmn \end{bmatrix} ....(1)$$

3. Third Step: Normalization in the MOORA method. Normalization aims to unify each matrix element so that the elements in the matrix have uniform values. Normalization on MOORA can be calculated using the following equation.

$$x_{ij}^* = \frac{x_{i.j}}{\sqrt{\left[\sum_{i=1}^{m} x_{ij}^2\right]}} \ ....(2)$$

4. Fourth Step: Decrease the maximax and min-max values. To indicate that an attribute is more important it can be multiplied by the appropriate weight (coefficient of significance). When the weight attribute is considered, the calculation uses the following equation.

$$y_i = \sum_{j=1}^{g} w_j w_{ij}^* - \sum_{j=g-1}^{n} w_j w_{ij}^* \ ....(3)$$

5. Langkah Kelima : Menentukan rangking dari hasil perhitungan MOORA.

3. RESULTS AND DISCUSSION

Alternative marketing strategies used are:
1. Cost Leadership Strategy (Alternative 1)
2. Differentiation Strategy (Alternative 2)

3. Market Segmentation Strategies (Alternative 3)

The criteria for determining the marketing strategy used in this study consist of 6 groups of criteria, namely managerial capabilities, customer linking capabilities, market innovation capabilities, human resource assets, capabilities in product distribution, and reputational assets. Each of these criteria has a set of criteria which can be seen in the following table:

Table 1. Criteria

Kode	Kriteria	Bobot
	Managerial Capabilities	
K1	Kondisi Finansial	10
K2	Manajemen SDM yang Efektif	5
K3	Manajemen Operasi yang Baik	5
	Customer Linking Capabilities	
K4	Layanan Terhadap Konsumen	10
K5	Hubungan dengan Key Target Customer	5
K6	Memahami Kebutuhan Konsumen	5
K7	Hubungan dengan Konsumen	5
K8	Pembinaan Hubungan dengan Konsumen	5
	Market Innovation Capabilities	
K9	Kemampuan Meluncurkan Produk Baru	5
K10	Proses Pengembangan Produk yang Efektif	5
	Human Resource Asset	
K11	Tingkat Kepuasan Kerja Karyawan	5
K12	Tingkat Retensi Karyawan	5
	Capabilities In Product Distribution	
K13	Hubungan Dengan Distributor	5
K14	Mempertahankan Distributor Terbaik	5
K15	Memberikan Value Terhadap Distributor	5
K16	Tingkat Dukungan Terhadap Distributor	5
	Reputational Asset	
K17	Brand dan Reputasi	5
K18	Kredibilitas	5

The weight value or set of criteria for each criterion is determined on a scale of numbers 1–3 based on the level of importance of the existing criteria. The weight values for each set of criteria from each criterion are as follows:

- Good = 3
- Enough = 2
- Less = 1

The following is a case example of determining a suitable marketing strategy in marketing products from PT. Universal Gloves by using the steps to solve the problem with the MOORA method as follows:

1. Determine the Criteria Value of the Alternative

Alternative values for each criterion can be seen in the following table. Where the value of each criterion is given the weight of each fact based on the data above.

Table 2. Alternative Values for Each Criterion

Alternatif	Kriteria									
	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
A1	3	3	2	1	2	1	3	2	1	3
A2	3	1	2	3	3	2	3	2	3	1
A3	3	2	3	1	1	3	2	3	1	2

(Connection Table of Alternative Values for Each Criterion)

Alternatif	Kriteria							
	K11	K12	K13	K14	K15	K16	K17	K18
A1	2	2	1	3	2	3	2	3
A2	1	3	1	1	3	2	3	1

| | A3 | 2 | 2 | 1 | 2 | 3 | 3 | 2 | 2 |

2. Decision Matrix

Based on the criteria value as in the table above, a decision matrix can be determined as in the following table:

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

3. Normalization Matrix

The next step is to normalize the matrix by calculating the X value of each alternative.
Then the normalized matrix for all criteria and all alternatives based on the calculation is:

Table 3. Normalized Matrix

	Kriteria					
Alt	K1	K2	K3	K4	K5	K6
A1	0,57735027	0,80178373	0,48507125	0,30151134	0,53452248	0,267261242
A2	0,57735027	0,26726124	0,48507125	0,90453403	0,80178373	0,534522484
A3	0,57735027	0,53452248	0,72760688	0,30151134	0,26726124	0,801783726

(Connection Table Normalized Matrix)

	Kriteria					
Alt	K7	K8	K9	K10	K11	K12
A1	0,63960215	0,48507125	0,30151134	0,801783726	0,66666667	0,48507125
A2	0,63960215	0,48507125	0,90453403	0,267261242	0,33333333	0,727606875
A3	0,42640143	0,72760688	0,30151134	0,534522484	0,66666667	0,48507125

(Connection Table Normalized Matrix)

	Kriteria					
Alt	K13	K14	K15	K16	K17	K18
A1	0,57735027	0,80178373	0,42640143	0,63960215	0,48507125	0,801783726
A2	0,57735027	0,26726124	0,63960215	0,42640143	0,727606875	0,267261242
A3	0,57735027	0,53452248	0,63960215	0,63960215	0,48507125	0,534522484

4. Optimization of Attributes

To optimize the normalized matrix of each alternative, multiplying the weight included with the normalized search for y. Then the value of Xij * Wj is as follows:

$y^*_{A1} = (x^*_{1,1(max)}.w_1) + (x^*_{1,2(max)}.w_2) + (x^*_{1,3(max)}.w_3) + (x^*_{1,4(max)}.w_4) + (x^*_{1,5(max)}.w_5) + (x^*_{1,6(max)}.w_6) + (x^*_{1,7(max)}.w_7) + (x^*_{1,8(max)}.w_8) + (x^*_{1,9(max)}.w_9) + (x^*_{1,10(max)}.w_{10}) - (x^*_{1,11(max)}.w_{11}) + (x^*_{1,12(max)}.w_{12}) + (x^*_{1,13(max)}.w_{13}) + (x^*_{1,14(max)}.w_{14}) + (x^*_{1,15(max)}.w_{15}) + (x^*_{1,16(max)}.w_{16}) + (x^*_{1,17(max)}.w_{17}) + (x^*_{1,18(max)}.w_{18}) =$ **48,123638**

$y^*_{A2} = (x^*_{1,1(max)}.w_1) + (x^*_{1,2(max)}.w_2) + (x^*_{1,3(max)}.w_3) + (x^*_{1,4(max)}.w_4) + (x^*_{1,5(max)}.w_5) + (x^*_{1,6(max)}.w_6) + (x^*_{1,7(max)}.w_7) + (x^*_{1,8(max)}.w_8) + (x^*_{1,9(max)}.w_9) + (x^*_{1,10(max)}.w_{10}) - (x^*_{1,11(max)}.w_{11}) + (x^*_{1,12(max)}.w_{12}) + (x^*_{1,13(max)}.w_{13}) + (x^*_{1,14(max)}.w_{14}) + (x^*_{1,15(max)}.w_{15}) + (x^*_{1,16(max)}.w_{16}) + (x^*_{1,17(max)}.w_{17}) + (x^*_{1,18(max)}.w_{18}) =$ **53,243164**

$y^*_{A3} = (x^*_{1,1(max)}.w_1) + (x^*_{1,2(max)}.w_2) + (x^*_{1,3(max)}.w_3) + (x^*_{1,4(max)}.w_4) + (x^*_{1,5(max)}.w_5) + (x^*_{1,6(max)}.w_6) + (x^*_{1,7(max)}.w_7) + (x^*_{1,8(max)}.w_8) + (x^*_{1,9(max)}.w_9) + (x^*_{1,10(max)}.w_{10}) - (x^*_{1,11(max)}.w_{11}) + (x^*_{1,12(max)}.w_{12}) + (x^*_{1,13(max)}.w_{13}) + (x^*_{1,14(max)}.w_{14}) + (x^*_{1,15(max)}.w_{15}) + (x^*_{1,16(max)}.w_{16}) + (x^*_{1,17(max)}.w_{17}) + (x^*_{1,18(max)}.w_{18}) =$ **46,540075**

5. Furthermore, a reduction is made between the criteria that have the benefit and cost attributes as in the following table:

Table 4. Preference Value

Kode	MAX (K1+K2+K3+K4+K5+K6+K7+ K8+K9+K10+K12+...+K18)	MIN (K11)	Nilai (Max-Min)
A1	51,456971	3,333333	48,123638
A2	54,909830	1,666667	53,243164
A3	49,873409	3,333333	46,540075

6. Ranking

The preference value is obtained after subtracting the total criterion value that has the benefit attribute (max) and the criterion value that has the cost attribute (min), it can produce preference values and alternative rankings that can be used by the company in implementing its product marketing.

Table 5. Ranking

Alternatif	Nilai Preferensi	Rangking
A2	53,243164	1
A1	48,123638	2
A3	46,540075	3

Based on the above calculations, the suitable marketing strategy to run is A2, namely the Differentiation Strategy with a preference value of 53.243164. Meanwhile, another alternative marketing strategy that can be done is the Cost Leadership Strategy with a preference value of 48,123638. And the Market Segmentation Strategies marketing strategy has a preference value of 46.540075.

Implementation of the decision support system in determining the product marketing strategy of PT. Universal Gloves can be seen in the screenshot (print screen) as follows.

1. Login page

Users who are allowed to use the system that has been built are administrators. If you want to enter the system, the user must enter a username and password. The system will validate the login when the user selects the LOGIN button. If the login is valid, the system will display the main page. Meanwhile, if the status is invalid, the system will display a login error message.

Figure 1. Login Page

2. Assessment Analysis page

The calculation page will display the results of calculations using the MOORA method based on the previously entered criteria and alternative weight values.
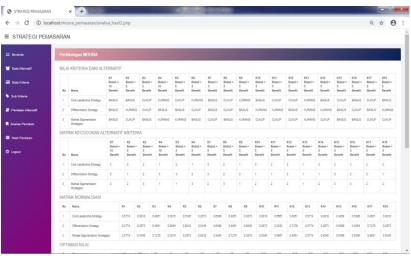
Figure 2. Assessment Analysis page

3. Assessment Results

After calculating using the MOORA method, the results of the assessment based on these alternative values can be printed in a form like the following image:
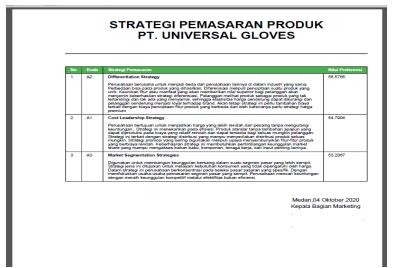

Figure 3. Assessment Results

4. CONCLUSION

The MOORA method succeeded in analyzing product marketing strategies where the differentiation strategy had the highest preference value, namely 53.243164 and the cost leadership strategy with a value of 48.123638, and market segmentation strategies with a value of 46.540075. The decision support system was successfully implemented with the MOORA method so that the system can help analyze marketing strategies that can be applied by the company. A successful decision support system was built using PHP for the company to select a marketing strategy for the company's products.

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