

Implementation of MOORA in the Decision Support System for Shopee's Best Ad Keywords using Looker Studio

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ABSTRACT

In an increasingly competitive digital era, PT Soka Cipta Niaga is required to optimize its marketing strategy through marketplace platforms such as Shopee. One of the main challenges in carrying out a marketing strategy on Shopee is the selection of the right keywords, because it can affect product visibility and the effectiveness of advertising costs. This study aims to help the process by applying the MOORA (Multi-Objective Optimization on the Basis of Ratio Analysis) method in the decision support system. The MOORA method was chosen because it is able to evaluate various alternatives by objectively considering the criteria that are beneficial (benefit) and unprofitable (cost). The development of the system is carried out through structured stages using the waterfall approach, with the stages of needs analysis, design, implementation in the form of a dashboard looker studio, to the testing process using black box testing. Data were collected through observation, interviews, questionnaires, and literature studies. The result of this research is in the form of an interactive dashboard that not only displays keyword performance, but also provides the best keyword recommendations with three advanced groupings, namely prioritize and improve by 20%, maintain, and re-evaluate/reduce, based on the results of the MOORA method ranking. By implementing this system, keyword evaluation can be carried out in a more objective and consistent manner using the MOORA method compared to manual evaluation. Thus, this system can help PT Soka Cipta Niaga's digital marketing division in making decisions related to the selection of the best keywords more optimally.

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1. INTRODUCTION

Advances in information and communication technology in the digital era have brought significant changes in the business world, especially through the use of marketplace platforms that allow businesses to reach consumers online [1] To maintain business sustainability, the right marketing strategy is needed, one of which is through the use of paid advertising. This condition opens up new opportunities for business people to increase sales through online stores [2]

PT Soka Cipta Niaga is a company engaged in the industry and distribution of halal fashion such as socks, gloves, and inner fashion. To expand its market reach, PT Soka Cipta Niaga has utilized digital technology through [3] the Shopee marketplace platform, which is currently ranked first as the most in-demand

online marketplace in Indonesia[4]. In digital marketing in marketplaces such as Shopee, a Pay Per Click-based advertising system makes keyword selection an important aspect of digital marketing, where the advertising cost will be calculated based on the number of clicks obtained. Therefore, choosing the right keywords is a strategy that must be considered to increase product visibility, optimize budgets and encourage maximum sales conversions[5] However, until now, the keyword selection process at PT. Soka Cipta Niaga is still carried out manually with subjective analysis without the support of structured data. This condition has the potential to cause inconsistency in keyword selection, which can ultimately affect the effectiveness of advertising.

These problems show the need for a decision support system (SPK) that can help in the keyword selection process in a more objective, measurable, and strategic way. SPK is a system designed to support data- and model-based decision-making processes, without replacing the role of decision-makers, but providing a more systematic alternative solution[6], [7]. In their implementation, DSS methods have various differences in concepts, calculation mechanisms, and prioritization that impact research results. SAW is simple and transparent, but less than optimal for complex multi-criteria problems, AHP excels in hierarchical assessment but has high complexity, while the MOORA method has the advantage of producing objective, consistent, and efficient quantitative assessments on multi-criteria problems [8]. Therefore, this method is considered the most relevant and appropriate for the needs of keyword selection and ranking based on measurable performance indicators.

The MOORA method is known as one of the efficient methods in supporting decision-making that involves various criteria, both benefits and costs [9]. With a simple but systematic calculation process, MOORA can produce accurate and structured recommendation results. Previous research has proven that this method is effectively used in business decision-making, such as predicting sales trends and evaluating marketing performance [10], [11]. Unlike previous research that only displayed keyword performance visualization through Business Intelligence without being equipped with a structured decision-making system[12], this study offers a more objective and accurate keyword selection process by systematically considering the weight of criteria through the MOORA method. The output of this method is visualized in the form of an interactive dashboard through the Looker Studio platform, which allows users, including non-technicals, to easily analyze keyword performance based on historical data for each period [13].

2. METHOD

This research uses a quantitative approach that is carried out systematically through data collection and processing procedures that can be calculated numerically[14]. The methodology of this research consists of three main components, namely the data collection method, the software development method using the waterfall approach, and the problemsolving method using the MOORA method:

The Waterfall method is used as a software development model applied to systematically organize the stages of system development, from requirements analysis, design, implementation, testing, and maintenance [15]. During the analysis and design stages, criteria and keyword alternatives are determined as the basis for calculating the MOORA method. Next, the MOORA method is implemented and tested to ensure functionality using black-box testing. Thus, Waterfall serves as a system development framework, while MOORA serves as the core decision-making process within the system.

2.1 Data Sources and Collection

The primary data source used in this keyword advertising system was obtained from PT. Soka Cipta Niaga's internal Shopee Seller Center system. The data used in this decision support system was solely for ihram cloth from January to April 2025. The selection of ihram cloth was deemed appropriate because this product only launched its advertising strategy in October 2024. Furthermore, the seasonal sales target, particularly during the Umrah and Hajj periods, further strengthened the rationale for selecting ihram cloth as the focus of the research.

Data collection techniques used included observation, interviews, and questionnaires to determine criteria, weight each criterion, and to understand employee perspectives on the effectiveness of Shopee keyword advertising. Furthermore, a literature review was conducted to support all research processes through a review of articles, books, and scientific sources related to the MOORA method, decision support systems, and marketing strategies to strengthen the research's theoretical foundation.

Table 1 Data Criteria, Weight, Type

Code	Criterion	Weight	Kind
C1	Number of Clicks	0,13	Benefit
C2	Conversion Rate	0,13	Benefit
C3	Products Sold	0,17	Benefit
C4	Cost per Click	0,17	Cost
C5	Cost	0,17	Cost
C6	Advertising Effectiveness	0,21	Benefit

Table 1 presents data on the criteria, weights, and types of criteria used in the MOORA method to determine the best keywords for Shopee ads. The criteria and weights were determined based on interviews and questionnaires conducted with PT Soka Cipta Niaga employees, particularly those involved in digital advertising management. The criteria used consist of six indicators, number of clicks, conversion rate, products sold, cost per click, cost, and advertising effectiveness. The weights reflect the importance of each criterion in the decision-making process, while the types of criteria are divided into benefit and cost based on their impact on advertising optimization objectives.

2.2 MOORA Method

MOORA method was chosen because it was able to evaluate various alternatives by objectively considering the criteria both beneficial (benefit) and unprofitable (cost). In addition, the calculation process is simple but capable of generating structured and accurate recommendations in determining the best alternative [16]. The following are the stages in designing a decision support system using the MOORA method: [7], [10]:

1. Determining the value of criteria, weights and alternatives

At the initial stage is the determination of relevant criteria in keyword evaluation. Furthermore, criteria are weighted by providing a level of importance for each criterion by being given a scale of 1-5 based on the priority that has been inputted, then normalized to the weights that have been inputted using the following formula:

$$w_i = \frac{w_j}{\sum w_j} \quad (1)$$

Information:

w_i = Determining the weight of the criteria

w_j = Weighted criteria

$\sum w_j$ = Total weights criteria

2. Create a decision matrix

This stage is the stage of changing the criterion value into a decision matrix, where raw data is the basic form of a matrix of responses with rows containing alternatives and columns containing objective values, attributes/criteria, or indicators. Here is the form of the decision matrix:

$$X = \begin{bmatrix} X_{11} & X_{12} & X_{13} & X_{1n} \\ X_{21} & X_{22} & X_{23} & X_{2n} \\ \dots & \dots & \dots & \dots \\ X_{m1} & X_{m2} & X_{m3} & X_{mn} \end{bmatrix}$$

Information:

n = sequence number of attributes or criteria

m = alternate sequence number

x= result matrix

3. Matrix normalization

This process is done with the aim of unifying each element of the matrix, so that the elements in the matrix have a uniform value. Normalization is carried out with the formula:

$$X^*_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^m x^2_{ij}}} \tag{2}$$

Information:

i = 1,2,3,..., n is the sequence number of the attribute or criterion

j = 1,2,3,..., m is the alternate sequence number

X_{ij}= Alternative matrix j on criterion i

X*_{ij}= Alternative normalization matrix j on criterion i

4. Calculate optimization values

This process aims to produce an advertising budget recommendation. At this stage, the value that has been normalized is added with attributes that have a maximized status (attribute-type benefit) and subtracted by attributes that have a minimized status (attribute-type cost). Here is to calculate the optimization value without considering the weight value:

$$Y^*_j = \sum_{i=1}^g X_{ij} - \sum_{j=g+1}^n X_{ij} \tag{3}$$

Information:

i = 1,2,3,..., g is an attribute or criterion with a maximized state

j = g+1, g+2, g+3, ..., n is an attribute or criterion with a minimized status

Y*_j= Alternative Max-Min Normalization Matrix j

Here's an equation for calculating the optimization value by taking into account the weight value to get more accurate data:

$$Y^*_j = \sum_{i=1}^g W_j X_{ij} - \sum_{j=g+1}^n W_j X_{ij} \tag{4}$$

Information:

i = 1,2,3,..., g is an attribute or criterion with a maximized state

j = g+1, g+2, g+3, ..., n are attributes or criteria with the status of minimizes

W_j= weight against criteria

Y *_j= the normalized value of the judgment value of the J alternative to all attributes Y*_j

5. Determining results and ranking

This process is seen based on the analysis of the MOORA method, by sorting by the highest y_1 value which is the best alternative marker, while those with low y_1 values are bad alternatives.

3. RESULT AND DISCUSSION

3.1 Calculation of the MOORA Method

1. Determination of criteria, and weights and alternatives

following are the alternatives, along with their criteria and weighted scores.

Table 2 Alternative Value Data for Each Criterion

Code	Alternative	Criterion					
		C1	C2	C3	C4	C5	C6
A1	Men's ihrom fabric	3136	33,9582	462	108.438	3.879.926	19,366
A2	Men's ihram fabric	6	0,1667	2	1.395	8.367	40,396
A3	ihrom fabric	16	2,7262	5	16.696	30.340	31,938
A4	Premium ihram fabric	1	1	1	6.510	6.510	20,768
A5	Umrah equipment	1	1	1	7.510	7.510	22,503

Table 2 displays alternative value data for each criterion obtained from previous advertising campaign data, resulting in five alternatives analyzed using the MOORA method. The data in this table forms the basis for

creating a decision matrix, which is then processed through normalization, optimization value calculation, and determination of the best keyword ranking using the MOORA method.

2. Create a decision matrix

After determining the criteria and weight, the data is converted into a decision matrix

$$X = \begin{bmatrix} 3.136 & 33,9582 & 462 & 108.438 & 3.879.926 & 19,366 \\ 6 & 0,1667 & 2 & 1.395 & 8.367 & 40,396 \\ 16 & 2,7262 & 5 & 16.696 & 30.340 & 31,938 \\ 1 & 1 & 1 & 6.510 & 6.510 & 20,768 \\ 1 & 1 & 1 & 7.510 & 7.510 & 22,503 \end{bmatrix}$$

3. Normalization

a. Normalization of the C1 matrix (Number of clicks)

$$\begin{aligned} &= \sqrt{\sum_{i=1}^m x_{ij}^2} \sqrt{3.136^2 + 6^2 + 16^2 + 1^2 + 1^2} \\ &= \sqrt{9.834.790} \\ &= 3.136.04 \end{aligned}$$

$$X_{1,1}^* = \frac{3.136}{3.136,04} = 0,99998$$

$$X_{2,1}^* = \frac{6}{3.136,04} = 0,00191$$

$$X_{3,1}^* = \frac{16}{3.136,04} = 0,0051$$

$$X_{4,1}^* = \frac{1}{3.136,04} = 0,00031$$

$$X_{5,1}^* = \frac{1}{3.136,04} = 0,00031$$

b. Normalization of the C2 matrix (Conversion rate)

$$\begin{aligned} &= \sqrt{\sum_{i=1}^m x_{ij}^2} \sqrt{33,9582^2 + 0,1667^2 + 2,7262^2 + 1^2 + 1^2} \\ &= \sqrt{1.162,61930257} \\ &= 34.097203735350 \end{aligned}$$

$$X_{1,2}^* = \frac{33,9582}{34,0972} = 0,99592$$

$$X_{2,2}^* = \frac{0,1667}{34,0972} = 0,00488$$

$$X_{3,2}^* = \frac{2,7262}{34,0972} = 0,07995$$

$$X_{4,2}^* = \frac{1}{34,0972} = 0,02932$$

$$X_{5,2}^* = \frac{1}{34,0972} = 0,02932$$

c. Normalization of C3 matrix (Products sold)

$$\begin{aligned} &= \sqrt{\sum_{i=1}^m x_{ij}^2} \sqrt{462^2 + 2^2 + 5^2 + 1^2 + 1^2} \\ &= \sqrt{213.475} \\ &= 462.03354856546 \end{aligned}$$

$$X_{1,3}^* = \frac{462}{462,0335} = 0,99992$$

$$X^*_{2,3} = \frac{2}{462,0335} = 0,00432$$

$$X^*_{3,3} = \frac{5}{462,0335} = 0,01082$$

$$X^*_{4,3} = \frac{1}{462,0335} = 0,00216$$

$$X^*_{5,3} = \frac{1}{462,0335} = 0,00216$$

d. C4 matrix normalization (Cost per click)

$$\begin{aligned} \sqrt{\sum_{i=1}^m x^2_{ij}} &= \sqrt{108.438^2 + 1.395^2 + 16.696^2 + 6.510^2 + 7.510^2} \\ &= \sqrt{12.138.282.485} \\ &= 110.173.8738 \end{aligned}$$

$$X^*_{1,4} = \frac{108.438}{110.173,8738} = 0,98424$$

$$X^*_{2,4} = \frac{1.395}{110.173,8738} = 0,01266$$

$$X^*_{3,4} = \frac{16.696}{110.173,8738} = 015154$$

$$X^*_{4,4} = \frac{6.510}{110.173,8738} = 0,05908$$

$$X^*_{5,4} = \frac{7.510}{110.173,8738} = 0,06816$$

e. C5 matrix normalization (Cost)

$$\begin{aligned} \sqrt{\sum_{i=1}^m x^2_{ij}} &= \sqrt{3.879.928^2 + 8.367^2 + 30.340 + 6.510^2 + 7.510^2} \\ &= \sqrt{15.054.934.587.673} \\ &= 3,880,068,889 \end{aligned}$$

$$X^*_{1,5} = \frac{3.879.928}{3.880.068,889} = 0,99996$$

$$X^*_{2,5} = \frac{8.367}{3.880.068,889} = 0,00215$$

$$X^*_{3,5} = \frac{30.340}{3.880.068,889} = 0,00781$$

$$X^*_{4,5} = \frac{6.510}{3.880.068,889} = 0,00167$$

$$X^*_{5,5} = \frac{7.510}{3.880.068,889} = 0,00193$$

f. Normalization of the C6 matrix (Ad effectiveness/ROAS)

$$\begin{aligned} \sqrt{\sum_{i=1}^m x^2_{ij}} &= \sqrt{19,366^2 + 40,396^2 + 31,938^2 + 20,768^2 + 22,503^2} = \sqrt{3.964,7702} \\ &= 62,96642 \end{aligned}$$

$$X^*_{1,6} = \frac{19,3669}{62,96642} = 0.3075$$

$$X^*_{2,6} = \frac{40,3967}{62,96642} = 0.6415$$

$$X^*_{3,6} = \frac{31,9386}{62,96642} = 0.5072$$

$$X^*_{4,6} = \frac{20,768}{62,96642} = 0.3298$$

$$X^*_{5,6} = \frac{22,5033}{62,96642} = 0.3573$$

4. Calculate optimization values

$$a. Y^*_1(\text{Kain ihrom pria}) = (0,99998 \times 0,13 + 0,99592 \times 0,13 + 0,99992 \times 0,17 + 0,3075 \times 0,21) - (0,98424 \times 0,17 + 0,99996 \times 0,17) = 0,1567$$

$$b. Y^*_2(\text{Kain ihram pria}) = (0,00191 \times 0,13 + 0,00488 \times 0,13 + 0,00432 \times 0,17 + 0,6415 \times 0,21) - (0,01266 \times 0,17 + 0,00215 \times 0,17) = 0,1338$$

$$c. Y^*_3(\text{Kain ihrom}) = (0,0051 \times 0,13 + 0,07995 \times 0,13 + 0,01082 \times 0,17 + 0,5072 \times 0,21) - (0,15154 \times 0,17 + 0,00781 \times 0,17) = 0,0923$$

$$d. Y^*_4(\text{Kain ihram premium}) = (0,00031 \times 0,13 + 0,02932 \times 0,13 + 0,00216 \times 0,17 + 0,3298 \times 0,21) - (0,05908 \times 0,17 + 0,00167 \times 0,17) = 0,0631$$

$$e. Y^*_5(\text{Perlengkapan umroh}) = (0,00031 \times 0,13 + 0,02932 \times 0,13 + 0,00216 \times 0,17 + 0,3573 \times 0,21) - (0,06816 \times 0,17 + 0,00193 \times 0,17) = 0,0673$$

5. Determining rankings

Here are the final results of the calculation of the MOORA method:

Table 3 MOORA Calculation Results for April

Alternative	MOORA Score	Ranking
Men's ihrom fabric	0,1567	1
Men's ihram fabric	0,1338	2
ihrom fabric	0,0923	3
Premium ihram fabric	0,0631	5
Umrah equipment	0,0673	4

Table 3 above shows the final score of the MOORA method calculation of 5 alternative *keywords* for April. Based on these results, the best search word or keyword in April was "Ihrom Male Cloth" with a score of 0.1567 which means that the keyword has an optimal output based on predetermined criteria. With the determination of the best keywords, it is hoped that it can increase the effectiveness of advertising while optimizing the costs incurred. A similar calculation process has been applied to the previous months' data, and all results are visualized through an interactive dashboard in the looker studio.

3.2 System Implementation

During the implementation phase, the system was developed by integrating Google Sheets as a database and Looker Studio as a visualization tool to display calculation results and rankings interactively. Next, the system was tested using black-box methods to ensure all functions were functioning according to the research needs and objectives. The implementation of this system resulted in two main interactive dashboard pages:

1. Keyword performance page

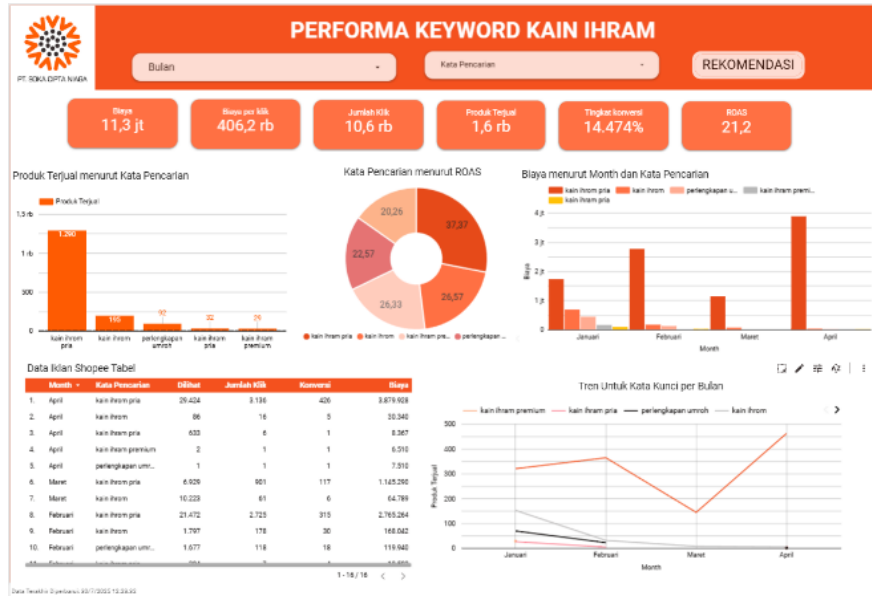


Figure 1 Display of keyword performance

The keyword performance page is designed to display information related to the performance of shopee ad keywords comprehensively through a combination of scorecards, tables, and chart visualizations. The scorecard at the top displays key metrics such as clicks, impressions, ad cost, CTR, and ROAS, which provides a quick summary of the effectiveness of your ads over a given period. Subsequently, other information is also presented in the form of bar charts, pie charts, and line charts. A bar graph to show the number of products sold and cost by search keyword, then a line chart to monitor keyword trends based on ROAS, and a pie chart to show the proportion of keyword performance based on ROAS. Next, an interactive table is provided to display the details of advertising metrics such as clicks, impressions, cost, sales, and conversions. In addition, this page is also equipped with a "Month" filter feature, a "search word" feature and a "Recommendations" button that functions to navigate to the keyword recommendation menu, so users can connect directly with the results of the MOORA method calculation. With this performance visualization, users can identify keywords that have high and low performance more quickly and systematically.

2. Keyword recommendations page

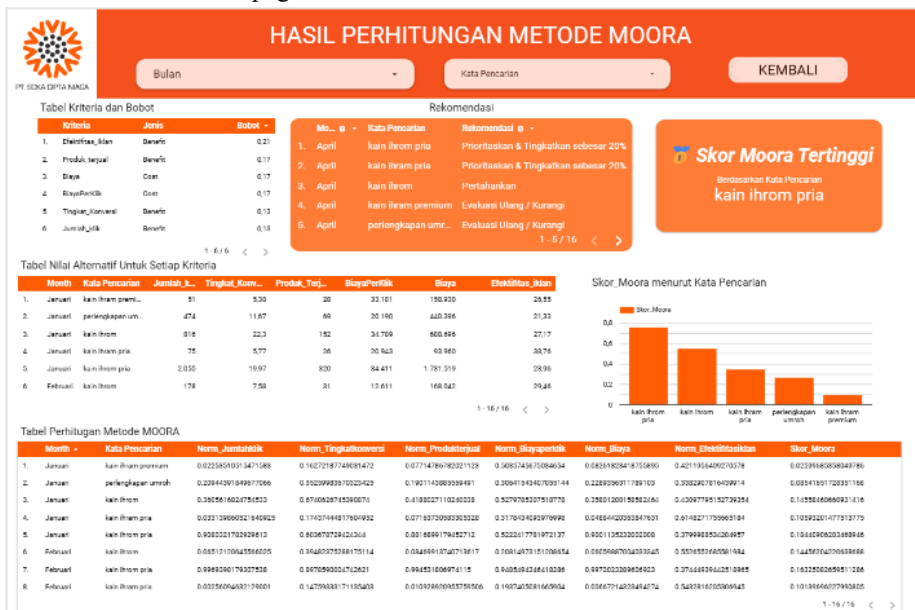


Figure 2 Keyword Recommendation Display

The Keyword Recommendations page is designed to present the results of the analysis of the MOORA method used in determining keyword rankings based on the established ad performance criteria. At the top left, a table of criteria and their weights is displayed as the basis for the calculation, followed by an alternative value table for each keyword and a table of MOORA calculation results that displays the normalization score until the final ranking. This page also displays three advanced recommendations related to keyword settings, namely prioritize and increase by 20%, maintain, and re-evaluate/reduce. The recommendation was obtained based on the results of rankings that had been carried out previously using the MOORA method. In addition, there is a visual indicator in the form of an information box that highlights the keyword with the highest MOORA score as the main recommendation. It also comes with a month and search word filter feature to customize the analysis results as needed, as well as a navigation button back to the keyword performance page. With this combination of numerical information, recommendations, and visualizations, the dashboard serves as a comprehensive decision support tool for the digital marketing division in determining a more objective keyword allocation strategy.

3.3 System Testing

After the system is successfully implemented, the process continues with the system testing stage. In this study, the test was carried out using the black box testing method which focuses on testing the functionality of the feature without looking at the internal structure of the system. Here are the results of the system testing using black box testing:

Table 4 Black box Testing Results

Yes	Tested Features	Testing Scenarios	Expected output	Result
1	Moon Filter	The user hasn't selected the month they want to show	All data in the dashboard displays the overall data for 4 months, both on the keyword performance page and on the keyword recommendations page.	Succeed
		The user selects the month of April on the month filter	All data in the dashboard displays April data according to the user's choice, both on the keyword performance page and on the keyword recommendations page.	Succeed
2	Search Word Filter	The user hasn't selected the search word they want to display	All data on the dashboard displays the overall data for the search word Kain Ihrom for 4 months, both on the keyword performance page and on the keyword recommendation page	Succeed
		Users select a search word for Ihrom Fabric products	All data on the dashboard displays data for Kain Ihrom search words according to user choices, both on the keyword performance page and on the keyword recommendation page	Succeed
3	Optional metrics on the Pie Chart search words by ROAS	The user replaces the ROAS metric into the Cost matrix.	The pie chart view will change by displaying the Cost data according to the selected matrix.	Succeed
4	Optional metrics on the Cost Chart Bar by month and search word	The user changes the Cost metric to the Cost per click, Viewed, Number of Clicks, Product Sold or ad effectiveness metrics.	The Bar Chart will change according to the selected metrics.	Succeed
5	Navigation buttons	The user clicks on the "Recommend" or "Return" button	The system will move to the "Recommendations" page or the "Back" page	Succeed

The results of the black box test in the table above have shown that the system is ready for use by the user, this is marked by all the features in the system running according to the function and with the expected purpose. Based on the test results, users stated that the system has met their needs, is easy to use and can display appropriate information for determining the best keywords. Therefore, the system is declared ready for use by users.

4. CONCLUSION

Based on the research results, it can be concluded that the integration of the MOORA method into a decision support system visualized through the Looker Studio dashboard is effective in supporting the keyword selection process for Shopee ads at PT Soka Cipta Niaga. The MOORA ranking results indicate that alternatives 1 and 2, namely "Men's ihram fabric" (0.1567) and "Men's ihram fabric" (0.1338), have good prospects if these keywords are prioritized. Meanwhile, alternatives 4 and 5, "Premium ihram fabric" (0.0631) and "Umrah equipment" (0.0673), are deemed necessary to re-evaluate these keywords due to their lowest ad performance.

This system serves not only as a tool for keyword performance analysis but also as a means to provide measurable recommendations through an objective and consistent ranking process. Furthermore, the presence of three recommended lists of keyword settings that users can apply is expected to simplify the decision-making process in advertising strategies. This study shows that the use of the MOORA method using the looker studio dashboard can provide more consistent, efficient and sustainable results compared to the manual approach, thereby significantly increasing the accuracy of the company's digital marketing strategy.

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