

Decision Support System for Selecting the Best Chat Application using the TOPSIS Method

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Abstract—Chat applications are features that allow users to send and exchange messages with others using an internet connection as a means of communication. However, with the increasing number of chat application features available today, smartphone users often complain and feel confused when choosing the best chat application feature. Considerations need to be made in determining the best chat application feature to help smartphone users find solutions to handle incompatible chat application features. With chat application features, individuals can communicate over long distances without worry, as chat applications not only support text-based communication but also enable image sharing, text messaging, voice messages, and video calls. This research involves five criteria: storage, security, user interface, application features, and network usage. The Decision Support System (DSS) aims to facilitate and solve problems by selecting the best chat application through the TOPSIS method. The result of the highest ranking is WhatsApp with a score of 0,9113. The use of the TOPSIS method in this research helps generate the best alternative with accurate and high-quality values.

Keywords: Chat Applications; TOPSIS Method; Decision Support System

1. INTRODUCTION

In the development of technology in the millennial era, which is increasingly practical and modern, communication is no longer a difficult task for everyone. In this era, technology plays a significant role, especially in communication. Communication is the exchange of messages or information between two or more people, where the intended message can be understood. With the increasing technological advancements, particularly in communication technology, which simplifies various aspects, especially communication, it has become much easier and more helpful for individuals to communicate over long distances[1].

Chat applications are features that enable users to send and exchange messages with others using an internet connection as a means of communication[2]. Various chat applications, such as WhatsApp, Telegram, Line, WeChat, KakaoTalk, and Skype, are available. However, with the increasing number of chat applications, smartphone users often struggle and become confused when choosing the best chat application[3]. To address this, careful consideration is needed to determine the best chat application to help users handle unsuitable chat features. These chat applications not only facilitate communication over long distances but also allow users to send images, texts, voice messages, and even make video calls. The rapid development of chat application features demonstrates the broad and global expansion of current technology[4]. In selecting the best chat application, certain criteria are established, including storage media, security, user interface, application features, and network usage. The chosen chat application must meet these criteria, as previously explained. The objective is to ensure that smartphone users make wiser choices when selecting chat application features and identify factors that may influence users when choosing chat application features in social media.

A Decision Support System (DSS) is a system applied in decision-making processes to obtain accurate and appropriate decisions based on the rankings of the best alternatives according to predetermined criteria[5]–[9]. The DSS aims to facilitate problem-solving and decision-making processes by selecting the best chat application alternative.

Previous research studies by Iin Mutmainah and Yunita, in 2021, on the implementation of the TOPSIS method for choosing shipping services involved six criteria: price, service, delivery time, coverage, fleet type, and company experience. They found that Central Cargo had the highest preference score of 0.8887[10]. In a previous study by Titin Kristiana in 2018, a DSS using the TOPSIS method was applied to select the location for establishing a wholesale cell phone credit business. The five criteria included strategic location, population density at each location, local income, proximity to public facilities, and the level of supporting security. The study resulted in the highest score for Kutabumi, with a value of 0.666, higher than other alternatives[11]. According to Ayunda Prima Dewi and Rudy Aryanto, who conducted research titled "Development of a Decision Support System for Determining Raskin Assistance Recipients Using the TOPSIS Method," in 2015, the study involved 14 criteria related to recipient households. The analysis indicated that 19 out of 21 cases achieved a success rate of 99.99% [11]. In another previous research study by Fitria Rizqi Nurdiana, Rena Cahya Viollita, and Adhika Pramita in 2015, a DSS for scholarship granting was developed using the TOPSIS method. The research involved six criteria, such as parents' income, the number of dependents, report card grades, in-school achievements, completeness of application documents, and interview results. The highest score of 0.8886 was obtained for student 1[12].

Building upon the findings of these previous studies, the author's research serves as a foundation for addressing and solving problems related to the selection of chat applications. This research study, titled "Decision

Support System for Selecting the Best Chat Application Using the TOPSIS Method," utilizes the TOPSIS method to generate high-quality alternative scores, ensuring precise and quality values.

2. RESEARCH METHODOLOGY

2.1 Chat Applications

Chat applications involve a communication activity used by two or more individuals to send images, messages, and conduct video calls while requiring an internet connection. Chat applications are software or digital platforms that provide users with the ability to engage in direct communication through text messages, voice, and other media. Through the use of chat applications, users can engage in real-time interactions, send instant messages, and exchange information quickly without being bound by geographical limitations. Thus, chat applications have transformed the human communication paradigm, providing the opportunity to connect with friends, family, colleagues, and even larger communities[13]–[15].

2.2 TOPSIS Method

The TOPSIS method is an effective and optimal decision-making approach for solving problems and reaching decisions by determining alternatives that are very close to the positive and negative ranges. The TOPSIS method involves various criteria[16]–[20]. Here are the steps of the TOPSIS method[21]–[25].

- a. Determine the alternatives and criteria considered using the TOPSIS method.
- b. Establish the decision matrix in the TOPSIS method by calculating the performance of each alternative, using the equation with alternative values:

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

- c. Calculate the weighted normalization:

$$y_{ij} = w_i r_{ij} \quad (2)$$

- d. Determine the positive and negative ideal solutions on the matrix:

1. Lowest criteria values

$$A^- = (y_1^-, y_2^- \dots y_n^-) \quad (3)$$

2. Highest criteria values

$$A^+ = (y_1^+, y_2^+ \dots y_n^+) \quad (4)$$

- e. Calculate the alternative distances:

1. If the ideal solution is positive

$$D_i^+ = \sqrt{\sum_{j=1}^n (y_1^+ - y_{ij})^2} \quad (5)$$

2. If the ideal solution is negative

$$D_i^+ = \sqrt{\sum_{j=1}^n (y_{ij} - y_1^-)^2} \quad (6)$$

- f. Calculate the preference value for each alternative:

$$v_1 = \frac{D_i^-}{D_i^- - D_i^+} \quad (7)$$

2.3 Research Stages

In this research, there are several stages as follows:

- a. Problem Analysis
In the problem analysis phase, the aim is to address the issues mentioned in the preceding paragraphs.
- b. Data Collection
Data collection is essential in this research to evaluate the selection of the best chat application.
- c. Literature Review
The literature review phase is crucial as it aids the author in resolving the research-related issues.
- d. Analysis and Application
During this phase, the research problem of selecting the best chat application is analyzed, and criteria values are determined, followed by an analysis using the TOPSIS method.
- e. Research Report Implementation

In this phase, the outcomes of the selection of the best chat application are determined by selecting alternatives and values using the TOPSIS method.

This research involves several phases, as illustrated in the following figure 1:

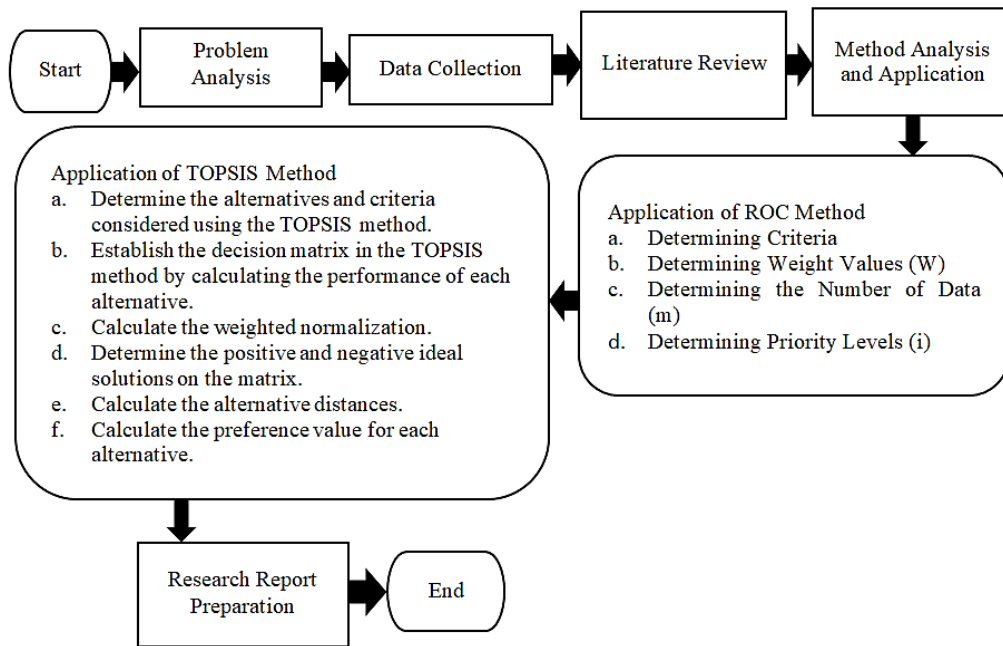


Figure 1. Research Framework

3. RESULT AND DISCUSSION

3.1 Determination of Alternatives

In the selection of the best chat application, several alternative data, weights, and criteria are required. There are 6 alternatives as follows in table 6:

Table 1. Alternative application data

Code	alternative
A1	Whatsapp
A2	Telegram
A3	Line
A4	Wechat
A5	kakaotalk
A6	skype

3.2 Data Criteria and Weights

In determining the chat application, several criteria are needed to consider in problem-solving can be seen in table 2.

Table 2. Criteria data

Criteria	Description	Weight	Type
C1	Storage Media	0,456	Benefit
C2	Security	0,256	Benefit
C3	Appearance/Interface	0,156	Benefit
C4	Application Features	0,09	Benefit
C5	Network Usage	0,04	Cost

Description

Storage Media

: a tool to store data or files

Security

: to safeguard and protect the application from data theft

Appearance/Interface

: the initial appearance of the application

Application Features

: the design of the application

Network Usage

: the extent of network usage in the application used

Table 3 is a sample of application data and the completeness value for selecting the best chat application.

Table 3. Alternatives and Criteria

Alternative	C1	C2	C3	C4	C5
A1	Good	Good	Excellent	Good	Excellent
A2	Excellent	Excellent	Good	Excellent	Good
A3	Fair	Good	Excellent	Good	Fair
A4	Excellent	Good	Fair	Good	Fair
A5	Good	Good	Excellent	Good	Excellent
A6	Excellent	Fair	Good	Fair	Good

Each criterion has a weight value, which is as follows.

Table 4. Criteria Weight Value Data

Value	Description
8	Excellent
7	Good
6	Cukup Baik

The sample data is matched with the criteria weight value table, resulting in the following compatibility rating data.

Table 9. Compatibility Rating Data

Alternative	C1	C2	C3	C4	C5
Whatsapp	7	7	8	7	8
Telegram	8	8	7	8	7
Line	6	7	8	7	6
Wechat	8	7	6	7	6
Kakaotalk	7	7	8	7	8
skype	8	6	7	6	7

3.3 Application of TOPSIS Method

After performing the compatibility rating data, the next step is to calculate using the TOPSIS method in selecting the best chat application:

a. Determining the normalization decision matrix

$$|X1| = \sqrt{7^2 + 8^2 + 6^2 + 8^2 + 7^2 + 8^2} = 18,055$$

$$X_{11} = \frac{7}{18,055} = 0,387$$

$$X_{12} = \frac{8}{18,055} = 0,443$$

$$X_{13} = \frac{6}{18,055} = 0,332$$

$$X_{14} = \frac{8}{18,055} = 0,443$$

$$X_{15} = \frac{7}{18,055} = 0,387$$

$$X_{16} = \frac{8}{18,055} = 0,443$$

$$|X2| = \sqrt{7^2 + 8^2 + 7^2 + 7^2 + 7^2 + 6^2} = 17,204$$

$$X_{21} = \frac{7}{17,204} = 0,406$$

$$X_{22} = \frac{8}{17,204} = 0,465$$

$$X_{23} = \frac{7}{17,204} = 0,406$$

$$X_{24} = \frac{7}{17,204} = 0,406$$

$$X_{25} = \frac{7}{17,204} = 0,406$$

$$X_{26} = \frac{6}{17,204} = 0,348$$

$$|X3| = \sqrt{8^2 + 7^2 + 8^2 + 6^2 + 8^2 + 7^2} = 18,055$$

$$X_{31} = \frac{8}{18,055} = 0,443$$

$$X_{32} = \frac{7}{18,055} = 0,387$$

$$X_{33} = \frac{8}{18,055} = 0,443$$

$$X_{34} = \frac{6}{18,055} = 0,332$$

$$X_{35} = \frac{8}{18,055} = 0,443$$

$$X_{36} = \frac{7}{18,055} = 0,387$$

$$|X4| = \sqrt{7^2 + 8^2 + 7^2 + 7^2 + 7^2 + 6^2} = 17,204$$

$$X_{41} = \frac{7}{17,204} = 0,406$$

$$X_{42} = \frac{8}{17,204} = 0,465$$

$$X_{43} = \frac{7}{17,204} = 0,406$$

$$X_{44} = \frac{7}{17,204} = 0,406$$

$$X_{45} = \frac{7}{17,204} = 0,406$$

$$X_{46} = \frac{6}{17,204} = 0,348$$

$$|X5| = \sqrt{8^2 + 7^2 + 6^2 + 6^2 + 8^2 + 7^2} = 17,262$$

$$X_{51} = \frac{8}{17,262} = 0,463$$

$$X_{52} = \frac{7}{17,262} = 0,405$$

$$X_{53} = \frac{6}{17,262} = 0,347$$

$$X_{54} = \frac{6}{17,262} = 0,347$$

$$X_{55} = \frac{8}{17,262} = 0,463$$

$$X_{56} = \frac{7}{17,262} = 0,405$$

Below is the matrix resulting from the normalization calculation:

$$R = \begin{bmatrix} 0,387 & 0,406 & 0,443 & 0,406 & 0,463 \\ 0,443 & 0,465 & 0,387 & 0,465 & 0,405 \\ 0,332 & 0,406 & 0,443 & 0,406 & 0,347 \\ 0,443 & 0,406 & 0,332 & 0,406 & 0,347 \\ 0,387 & 0,406 & 0,443 & 0,406 & 0,463 \\ 0,443 & 0,348 & 0,387 & 0,348 & 0,405 \end{bmatrix}$$

b. Next, in the following steps, multiplication is performed with the R and weight values:

$$Y = \begin{bmatrix} 0,425 * 0,387 & 0,256 * 0,406 & 0,156 * 0,443 & 0,09 * 0,406 & 0,04 * 0,463 \\ 0,425 * 0,443 & 0,256 * 0,465 & 0,156 * 0,387 & 0,09 * 0,465 & 0,04 * 0,405 \\ 0,425 * 0,332 & 0,256 * 0,406 & 0,156 * 0,443 & 0,09 * 0,406 & 0,04 * 0,347 \\ 0,425 * 0,443 & 0,256 * 0,406 & 0,156 * 0,332 & 0,09 * 0,406 & 0,04 * 0,347 \\ 0,425 * 0,387 & 0,256 * 0,406 & 0,156 * 0,443 & 0,09 * 0,406 & 0,04 * 0,463 \\ 0,425 * 0,443 & 0,256 * 0,348 & 0,156 * 0,387 & 0,09 * 0,348 & 0,04 * 0,405 \end{bmatrix}$$

$$Y = \begin{bmatrix} 0,164 & 0,103 & 0,069 & 0,036 & 0,018 \\ 0,188 & 0,119 & 0,060 & 0,041 & 0,016 \\ 0,141 & 0,103 & 0,069 & 0,036 & 0,013 \\ 0,188 & 0,103 & 0,051 & 0,036 & 0,013 \\ 0,164 & 0,103 & 0,069 & 0,036 & 0,018 \\ 0,188 & 0,089 & 0,060 & 0,031 & 0,016 \end{bmatrix}$$

c. Afterward, the values of the positive ideal and negative ideal are determined as follows in table 10:

Table 10. Positive Ideal and Negative Ideal Values

Alternative	C1	C2	C3	C4	C5
A1	0,164	0,103	0,069	0,036	0,018
A2	0,188	0,119	0,060	0,041	0,016
A3	0,141	0,103	0,069	0,036	0,013
A4	0,188	0,103	0,051	0,036	0,013
A5	0,164	0,103	0,069	0,036	0,018
A6	0,188	0,089	0,060	0,031	0,016
y^+	0,188	0,119	0,069	0,041	0,018
y^-	0,141	0,103	0,051	0,031	0,013

d. Then, the values of D+ and D- are calculated as follows:

$$D_1^+ = \sqrt{(0,164 - 0,188)^2 + (0,103 - 0,119)^2 + (0,069 - 0,069)^2 + (0,036 - 0,041)^2 + (0,018 - 0,018)^2} = 0,0292$$

$$D_2^+ = \sqrt{(0,188 - 0,188)^2 + (0,119 - 0,119)^2 + (0,060 - 0,069)^2 + (0,041 - 0,041)^2 + (0,016 - 0,018)^2} = 0,0092$$

$$D_3^+ = \sqrt{(0,141 - 0,188)^2 + (0,103 - 0,119)^2 + (0,069 - 0,069)^2 + (0,036 - 0,041)^2 + (0,013 - 0,018)^2} = 0,0501$$

$$D_4^+ = \sqrt{(0,188 - 0,188)^2 + (0,103 - 0,119)^2 + (0,051 - 0,069)^2 + (0,036 - 0,041)^2 + (0,013 - 0,018)^2} = 0,0250$$

$$D_5^+ = \sqrt{(0,164 - 0,188)^2 + (0,103 - 0,199)^2 + (0,069 - 0,069)^2 + (0,036 - 0,041)^2 + (0,018 - 0,018)^2} = 0,02992$$

$$D_6^+ = \sqrt{(0,118 - 0,118)^2 + (0,089 - 0,119)^2 + (0,060 - 0,069)^2 + (0,031 - 0,041)^2 + (0,016 - 0,018)^2} = 0,0773$$

Then, the D- values are obtained as follows:

$$D_1^- = \sqrt{(0,164 - 0,141)^2 + (0,103 - 0,103)^2 + (0,069 - 0,051)^2 + (0,036 - 0,031)^2 + (0,018 - 0,013)^2} = 0,0300$$

$$D_2^- = \sqrt{(0,188 - 0,141)^2 + (0,119 - 0,103)^2 + (0,060 - 0,051)^2 + (0,041 - 0,031)^2 + (0,016 - 0,013)^2} = 0,0515$$

$$D_3^- = \sqrt{(0,141 - 0,141)^2 + (0,103 - 0,103)^2 + (0,069 - 0,051)^2 + (0,036 - 0,031)^2 + (0,013 - 0,013)^2} = 0,0186$$

$$D_4^- = \sqrt{(0,188 - 0,141)^2 + (0,103 - 0,103)^2 + (0,051 - 0,051)^2 + (0,036 - 0,031)^2 + (0,013 - 0,013)^2} = 0,0472$$

$$D_5^- = \sqrt{(0,164 - 0,141)^2 + (0,103 - 0,103)^2 + (0,069 - 0,051)^2 + (0,036 - 0,031)^2 + (0,018 - 0,013)^2} = 0,0300$$

$$D_6^- = \sqrt{(0,188 - 0,141)^2 + (0,089 - 0,103)^2 + (0,060 - 0,051)^2 + (0,031 - 0,031)^2 + (0,016 - 0,013)^2} = 0,0499$$

e. The final step is to calculate the reference values to obtain the best value:

$$v_1 = \frac{0,0300}{0,0300+0,00292} = 0,9113$$

$$v_2 = \frac{0,0515}{0,0515+0,0092} = 0,3064$$

$$v_3 = \frac{0,0186}{0,0186+0,0501} = 0,2707$$

$$v_4 = \frac{0,0472}{0,0472+0,0250} = 0,6537$$

$$v_5 = \frac{0,0300}{0,0300+0,02992} = 0,5006$$

$$v_6 = \frac{0,0499}{0,0499+0,0773} = 0,3922$$

In the calculations in the final step above, the results in the final table 11 are as follows:

Table 11. Final Results

Alternative	Description	Value	Rangking
A1	Whatsapp	0,9113	1
A2	Telegram	0,3064	5
A3	Line	0,2707	6
A4	Wechat	0,6537	2
A5	Kakaotalk	0,5006	3
A6	skype	0,3922	4

The highest final result is obtained by applying the TOPSIS method in alternative A1 with the Whatsapp application, with a total score of 0.9113.

4. CONCLUSION

The conclusion of this research is that the application of the TOPSIS method can be used in selecting the best chat media and can serve as a tool for choosing the best chat media. Therefore, the process and results of implementing a decision support system become a recommendation in the best chat media selection process based on the actual calculated values determined by the author, resulting in more accurate and precise findings. The highest final result is obtained by applying the TOPSIS method, which is in alternative A1 with the WhatsApp application, with a total score of 0.9113.

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