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**Gaming Mobile Selection with Decision Support System using
Simple Additive Weighting**

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Abstract

Daily work makes someone feel bored. Sometimes boredom must be interspersed with playing games so that boredom can be removed. The game can be done in a physical or non-physical way. The game can also be played on a computer or handphone. In this day and age, mobile phones that are based on the Android operating system can give someone the satisfaction of playing games. But not all cellphones can play games smoothly. Some game specifications require mobile phones with good quality. Decision support systems can be used to choose mobile phones that are suitable for playing games. The SAW method is one method that can be used to provide recommendations for choosing the best mobile phone for playing games. With this SAW method, users can easily choose a cellphone to play games.

Keywords: game, Android, SAW, DSS

1. INTRODUCTION

Game is an activity that is a hobby or sport that usually requires skills, knowledge, or opportunities. If someone plays a game, they must follow the rules that have been determined by the game [1]. Usually, in a game scenario, the player is intended to win against an opponent. Many types of games are offered, from strategy, board games, puzzles, and others. All types of games have different types and patterns of games. In this day and age, games are no longer done using physical objects, but games have included an application that can be installed on electronic devices such as mobile phones, computers, televisions, and others. Because the game requires high-quality graphics, the device used must have high specifications and match the game's standards. Mobile is one of the most widely used devices for playing games. The mobile game is a mobile phone that has a higher specification than most mobile phones that are only used for communication [2].

In general, the price for a gaming handphone is very expensive. A decision support system can shape the choice of mobile games. This system can provide recommendations according to the tastes of the game players. Many criteria are used as determinants of the feasibility of a cellphone to be used as a gaming mobile. The SAW method is fairly easy and simple in determining which mobile is suitable to be used as a gaming mobile. It is hoped that this method can provide recommendations for gaming mobile phones.

2. THEORIES

2.1 Game

The game comes from English, which means game. Game (game), in general, is a recreational activity to have fun, free time, or light exercise. The game is usually done alone or together. Games are structured or semi-structured activities that are usually intended for entertainment and can sometimes be used as educational facilities. The characteristics of the game that are fun, motivating, addictive, and collaborative make this activity favored by many people.

In each game, there are different rules for starting the game, so that makes the type of game more varied. Because one of the functions of the game is also as a stress reliever or boredom, almost everyone likes to play games, both young children, adolescents, and adults [3].

The definition of the game, according to experts, is as follows:

1. Mitchell W
Games are a good training environment for the real world in organizations that demand collaborative problem-solving.
2. Ivan C. Sibero
Games are the most widely used and enjoyed applications by electronic media users today.
3. Fauzi A.
Games are a form of entertainment that is often used as a refreshing mind from fatigue caused by our activities and routines.
4. Samuel Hendry
Games are an inseparable part of children's daily lives, while some parents accuse games of causing children's values to go down, children unable to socialize, and acts of violence committed by children.
5. John Naisbitt
Games are dynamic participatory systems because games have a level of storytelling that the film does not have.

Game is an English word that means game. The game is something that can be played with specific rules so that there are winners and there are losers, usually in the context of not being serious or with the aim of refreshing. A way of learning used in the analysis interaction between several players and individuals who show rational strategies.

2.2 Phone

A Phone is a two-way electronic telecommunications tool that can be carried anywhere and can send messages in the form of voice. Mobile is a telephone that provides personal assistant functions and internet connecting facilities that can connect users with cyberspace such as through social media and others. Through social media, humans can interact with many people at once ". Mobile is an electronic telecommunications device that has the same necessary capabilities as a conventional fixed-line telephone, but can be carried anywhere (portable, mobile) and does not need to be connected to a telephone network using a cable [4].

2.3 Simple Additive Weighting (SAW)

The SAW method is often known as the weighted sum method. The basic concept of the SAW (Simple Additive Weighting) method is to find the weighted sum of the performance ratings for each alternative on all attributes. The SAW method requires the decision matrix normalization process (X) to a scale that can be compared with all available alternative

10 ratings. This method is the most famous and most widely used method in dealing with situations of Multiple Attribute Decision Making [5]. The following can be seen the work process of SAW [6].

$$R_{ij} = \begin{cases} \frac{X_{ij}}{\text{Max } X_{ij}} & (\text{benefit}) \\ \frac{i}{\text{Min } X_{ij}} \\ \frac{i}{X_{ij}} & (\text{cost}) \end{cases}$$

3 Information:

- R_{ij} = Normalized performance rating value.
- X_{ij} = Attribute value owned by.
- Max X_{ij} = The biggest value of each criterion.
- Min X_{ij} = The smallest value of each criterion.
- Benefit = If the biggest value is the best.
- Cost = If the smallest value is the best

Where R_{ij} is a normalized performance rating of alternative A_i on the C_j attribute; $i = 1, 2, \dots, M$ and $j = 1, 2, \dots, n$. Preference values for each alternative (V_i) are given as the following equation.

$$V_i = \sum_{j=1}^n W_j r_{ij}$$

Information:

- V_i = ranking for each alternative
- W_j = the weight value of each criterion
- r_{ij} = normalized performance rating value

A greater V_i value indicates that the A_i alternative is preferred. The steps for completing the SAW are:

1. Determine the criteria that will be used as a reference in making decisions, namely C_i .
2. Determine the compatibility of each alternative in each criterion.
3. Make a decision matrix based on criteria (C_i), then normalize the matrix based on an equation that is adjusted to the type of attribute to obtain a normalized matrix R .
4. The final day of acquisition of the ranking process is the sum of the multiplication of normalized matrix R with the weight vector so that the highest value is chosen as the best alternative (A_i) as the solution.

3. METHODOLOGY

3.1 Criteria Design

Criteria design is a design that is used in determining the best mobile gaming. The criteria used are five criteria, such as Price, RAM, ROM, Screen, and Weight. The value of the criteria weight ranges from 1 to 5. The following tables will explain the selection of the criteria used to choosing a gaming handphone. To classify weights based on the criteria already explained.

Table 1. Price

Price (IDR)	Score
0 - 2.000.000	1
2.000.000 - 4.000.000	2
4.000.000 - 6.000.000	3
6.000.000 - 8.000.000	4
> 8.000.000	5

Table 1 is the Weighting of price criteria. Prices given range above 8 million and below 8 million rupiah.

Table 1. RAM

RAM	Score
2	1
4	2
6	3
8	4
10	5

Table 2 is the weighting of the RAM criteria on gaming mobile phones. Mobile gaming has different size. There are five categories to be tested.

Table 2. ROM

ROM	Score
16	1
32	2
64	3
128	4
256	5

Table 3 shows the weighting criteria in ROM. This weighting serves to store data or applications on mobile gaming.

Table 3. Screen

Screen	Score
LCD	1
IPS	2
Retina Display	3
AMOLED	4
Super AMOLED	5

Table 4 is a weighting of screen type criteria. Types of screens on gaming mobile phones are made with different types that will be tested.

Table 4. Weight

Weight	Score
150g	1
160g	2
170g	3
180g	4
190g	5

Table 5 explains the scores for the weight of mobile gaming to be tested. Give the score of the weight criteria of a gaming handphone is based on value. Weight is the size of a cellphone using grams. In the weighting above are five criteria that support the determination of the best gaming mobile choice. Ratings are given with a score of 1 to 5 where a value of 1 is for the worst rating and 5 is for the best rating.

3.2 Weighting Preferences

In determining the value of this calculation, we must first know the weight of preferences so that we can calculate the results of calculations in the weight of preferences. The preference weight values that have been determined include 5,3,4,4,3. How to calculate the value of the number preference weights on a predetermined preference weighting then add up the total value to the preference weight, and then the value is divided by the value of the preference weight.

4. RESULT AND DISCUSSION

4.1 Alternative

Alternative A_i with $i = 1$ to 10 is a different object and has the same opportunity in the selection of decision making. The data used is the gaming handphone selection data submitted in determining the best gaming handphone as follows:

Table 6. Gaming Mobile Alternatives

Alternative	Alternative Name
A1	Xiaomi Black Shark
A2	Huawei Honor Play
A3	Realmi C2
A4	Vivo Y17
A5	Razer Phone 2
A6	Oppo A7
A7	Redmi Note 7
A8	Vivo Y93
A9	Samsung Galaxy A10
A10	Xiaomi Redmi 7

4.2 Preferred Weight

The data relating to alternative data and criteria can be seen in table 7. This value is a predetermined value for the proposal in the selection of gaming mobile phones submitted by alternative data.

Table 7. Preferred Weight

Criteria	Name	Score
C1	Price	2
C2	RAM	4
C3	ROM	5
C4	Screen	5
C5	Weight	4

Table 8 shows the criteria that already have decimal values. This value is determined based on the existing score table in the previous tables.

Table 8. Criteria Value

Alternative	C1	C2	C3	C4	C5
Xiaomi Black Shark	3	3	2	4	3
Huawei Honor Play	2	2	2	3	2
Realmi C2	4	4	4	4	4
Vivo Y17	2	2	2	4	2
Razer Phone 2	3	4	5	5	4
Oppo A7	4	4	4	4	4
Redmi Note 7	3	3	3	4	3
Vivo Y93	3	4	3	3	3
Samsung Galaxy A10	3	4	3	4	4
Xiaomi Redmi 7	5	4	4	4	4

4.3 Calculation

After determining the criteria and determining compatibility branches on alternative data, we can complete the calculations using the SAW formula in selecting the best gaming phone. The first thing to do is to enter the criteria value rounded off the decision matrix based on the existing score table in the previous tables.

$$C_{ij} = \begin{pmatrix} 3 & 3 & 2 & 4 & 3 \\ 2 & 2 & 2 & 3 & 2 \\ 4 & 4 & 4 & 4 & 4 \\ 2 & 2 & 2 & 4 & 2 \\ 3 & 4 & 5 & 5 & 4 \\ 4 & 4 & 4 & 4 & 4 \\ 3 & 3 & 3 & 4 & 3 \\ 3 & 4 & 3 & 3 & 3 \\ 3 & 4 & 3 & 4 & 4 \\ 5 & 4 & 4 & 4 & 4 \end{pmatrix}$$

$$R = \begin{pmatrix} 0,6667 & 0,75 & 0,4 & 0,8 & 0,75 \\ 1 & 0,5 & 0,4 & 0,6 & 0,5 \\ 0,5 & 1 & 0,8 & 0,8 & 1 \\ 1 & 0,5 & 0,4 & 0,8 & 0,5 \\ 0,6667 & 1 & 1 & 1 & 1 \\ 0,5 & 1 & 0,8 & 0,8 & 1 \\ 0,6667 & 0,75 & 0,6 & 0,8 & 0,75 \\ 0,6667 & 1 & 0,6 & 0,6 & 0,75 \\ 0,6667 & 1 & 0,6 & 0,8 & 1 \\ 0,4 & 1 & 0,8 & 0,8 & 1 \end{pmatrix}$$

After the calculation phase is completed, the SAW value can be determined in table 9. The calculation results show the initial value or the irregular value based on the highest value to the lowest value.

Table 9. Recommendation

Alternative	C1	C2	C3	C4	C5	Result
A5	3	4	5	5	4	0,9123
A9	3	4	3	4	4	0,786
A3	4	4	4	4	4	0,7842
A6	4	4	4	4	4	0,7842
A10	5	4	4	4	4	0,7579
A7	3	3	3	4	3	0,707
A8	3	4	3	3	3	0,7044
A4	2	2	2	4	2	0,6737
A1	3	3	2	4	3	0,6649
A2	2	2	2	3	2	0,6316

Based on the calculation above, the value of A7 shows the lowest value is the worst choice. The A5 value indicates the most significant value so that in other words, A5 is the best choice that deserves to be used as the selection of the best gaming handphone by the weight given by decision making.

5. CONCLUSION

The decision support system in determining the best gaming handphone by using the SAW method can be used as a solution in solving the problem of choosing a gaming handphone following what is used by online game users expect. Decision making in the selection of the best gaming handphone is more detailed and detailed, of the best quality, and deserves to be the expected choice. Weighting preferences can give flexibility to online game users by giving a balance to the criteria to get the best SAW score. The SAW method can solve problems in choosing the best quality gaming handphone.

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