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Selection of the Best Educational Application Based on Android with SMART Method (Simple Multi Attribute Rating Technique)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: Android system is widely chosen by smartphone users in Indonesia. One of the reasons for its popularity is the large number of free applications supported by Google Play Store. The large number of applications on the Google Play Store provide many choices for the needs of the community. But sometimes, this actually makes people have difficulty in choosing an application they need. This research will create a decision support system (DSS) in choosing the best application, so that it can help the community in choosing the application they need.
Methodology: The factors used in choosing include rating, file size, compatibility and others. The method used to determine the best application in this research is the SMART (Simple Multi Attribute Rating Technique) method. This method can be used to support decisions in choosing between several alternatives. The implementation is made web-based with the PHP language to make it easier for the public to access this system.
Results: The result of this research is the ranking of educational applications based on the criteria of rating, reviews, size and installs that can be taken into consideration by users in choosing applications.
Conclusion: SMART method can be used easily to generate application rankings. The results of data processing may change if the priority or weight of a criterion changes.

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Keywords: Smart; application; android; playstore; decision support system.

1. INTRODUCTION

The large number of applications on the Google Play Store provide many choices for people's needs. But sometimes, this actually makes people have difficulty in choosing an application they need. This study implements a decision support system in choosing the best educational category Android application, so that it can help the community in choosing the applications they need. The factors used in choosing include rating, file size (size), user reviews and the number of installations of the application (install).

The method used to determine the best application in this research is SMART (Simple Multi Attribute Rating Technique). This method can be used to support decisions in choosing between several alternatives. This method has also been used in several Decision Support System Research, including the decision making of prospective blood donors [1], acceptance of Competency Based Training participants [2], determination of final disposal sites [3], recipients of aid funds [4], recruitment of computer laboratory assistants [5], selection of exemplary employees [6], and determining business viability [7]. Whereas decision support systems for application selection cases have been carried out to select browsers [8], social media applications [9] and Android games for early childhood [10].

2. METHODOLOGY

Data collection in this study was carried out by means of observation and literature study. In this study, data were obtained from Google Play Store. The data accommodates application data on the Google Play Store in 2021. In that data, there are 9660 applications with various types of categories.

In this study, the methods used for system design include:

a) Analysis: At this stage, the most appropriate problem-solving alternatives are sought to overcome the existing problems. Make an alternative selection according to system requirements.
b) Design: Designing a troubleshooting system to determine operating steps, procedures, as well as making a comprehensive system design that includes databases and system interfaces.
c) Implementation: Implementation of the system that has been made, in accordance with the specifications specified in the system design.
d) Testing: After the program is completed, the next step is to test the application.

3. RESULTS AND DISCUSSION

Simple Multi Attribute Rating (SMART) is more widely used because of its simplicity in responding to the needs of decision makers and the way it analyzes responses. The analysis involved is transparent so that this method provides a high understanding of the problem and is acceptable to decision makers [11]. The SMART method has several stages as follows:

1. Determine the alternatives and criteria to be used.
2. Give weight to each criterion with a scale of 1-100, then normalize by comparing the weight value with the total weight value.
3. Conduct alternative assessments for each criterion.
4. Calculate the utility value as in the formula 1

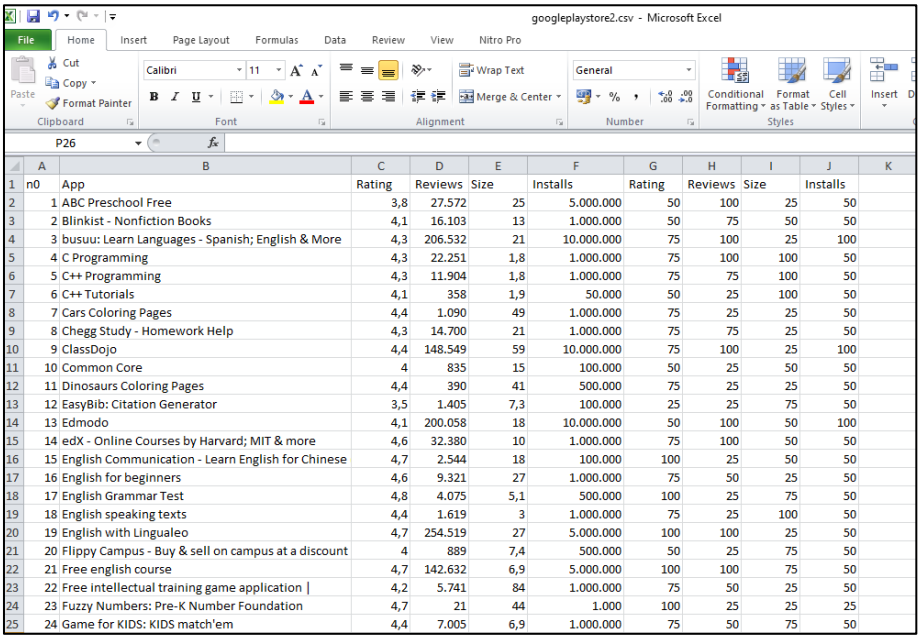
$$U_i\ (a_i) = 100\ \frac{(\ C_{max} - C_{out}\ )}{(\ C_{max} - C_{min}\ )}\ x\ 100\% \qquad (1)$$

5. Calculate the final value by multiplying the number of normalization results with the results of the normalization of the criteria weights and then adding them up.

3.1 Application Data

In this study, application data contains information like App, Category, Rating, Reviews, Size, Installs, Type, Price, Content Rating, Genres, Last Updated, Current Version, and Android Ver. The data contains various categories of applications, but this study will only examine applications that have an educational category. The attributes used are application name, rating, reviews, size and installs. The number of application data that has the education category is 81 data. Example data can be shown in Fig. 1.

Based on the application data, it can be analyzed the distribution of data groups based on ratings, reviews, sizes and installs.The grouping analysis can be shown in Table 1 - 4 and the diagram in Fig. 2.



googleplaystore2.csv - Microsoft Excel

n0	App	Rating	Reviews	Size	Installs	Rating	Reviews	Size	Installs
1	ABC Preschool Free	3,8	27.572	25	5.000.000	50	100	25	50
2	Blinkist - Nonfiction Books	4,1	16.103	13	1.000.000	50	75	50	50
3	busuu: Learn Languages - Spanish; English & More	4,3	206.532	21	10.000.000	75	100	25	100
4	C Programming	4,3	22.251	1,8	1.000.000	75	100	100	50
5	C++ Programming	4,3	11.904	1,8	1.000.000	75	75	100	50
6	C++ Tutorials	4,1	358	1,9	50.000	50	25	100	50
7	Cars Coloring Pages	4,4	1.090	49	1.000.000	75	25	25	50
8	Chegg Study - Homework Help	4,3	14.700	21	1.000.000	75	75	25	50
9	ClassDojo	4,4	148.549	59	10.000.000	75	100	25	100
10	Common Core	4	835	15	100.000	50	25	50	50
11	Dinosaurs Coloring Pages	4,4	390	41	500.000	75	25	25	50
12	EasyBib: Citation Generator	3,5	1.405	7,3	100.000	25	25	75	50
13	Edmodo	4,1	200.058	18	10.000.000	50	100	50	100
14	edX - Online Courses by Harvard; MIT & more	4,6	32.380	10	1.000.000	75	100	50	50
15	English Communication - Learn English for Chinese	4,7	2.544	18	100.000	100	25	50	50
16	English for beginners	4,6	9.321	27	1.000.000	75	50	25	50
17	English Grammar Test	4,8	4.075	5,1	500.000	100	25	75	50
18	English speaking texts	4,4	1.619	3	1.000.000	75	25	100	50
19	English with Lingualeo	4,7	254.519	27	5.000.000	100	100	25	50
20	Flippy Campus - Buy & sell on campus at a discount	4	889	7,4	500.000	50	25	75	50
21	Free english course	4,7	142.632	6,9	5.000.000	100	100	75	50
22	Free intellectual training game application |	4,2	5.741	84	1.000.000	75	50	25	50
23	Fuzzy Numbers: Pre-K Number Foundation	4,7	21	44	1.000	100	25	25	25
24	Game for KIDS: KIDS match'em	4,4	7.005	6,9	1.000.000	75	50	75	50

Fig. 1. Google play store data education category

Table 1. Rating distribution

Group	Rating interval	Amount
1	Over 4.6	1
2	4.2 - 4.6	16
3	3.6 - 4.1	49
4	Less than 3.6	15

Table 2. Install distribution

Group	Install interval	Amount
1	Over 9,000,000	33
2	1001 – 5,000,000	7
3	500 – 1000	10
4	Less than 500	31

For the purposes of processing data on a decision support system using the SMART method, criteria are needed to be used in calculating rankings. Then give weight to each criterion with a scale of 1-100 and normalize by comparing the weight value with the total weight value.

The weight indicates the priority proposed by the researcher for this educational application case. Researchers give first priority to the rating attribute because this value is obtained from application users who have downloaded and used the application are shown in Table 6. The second priority is install which shows the number of application users are shown in Table 7. For the size attribute, researchers assumes that the smaller the file size will affect the memory owned by the user's device are shown in Table 8. Last priority is given to reviews atrribute, because this is only the opinion of the user, although it shows the user's enthusiasm for the application, which is shown in Table 9. The criteria and weights used in this study are as shown in Table 5.

Table 3. Size distribution

Group	Size interval	Amount
1	Under 5 MB	26
2	5 – 10 MB	22
3	11 – 20 MB	19
4	Above 20 MB	14

Table 4. Reviews distribution

Group	Reviews interval	Amount
1	More than 20,000	2
2	10,000 – 20,000	73
3	1,000 – 10,000	0
4	Less than 1000	6

Table 5. Criteria

No	Criteria	Weight
1	Rating	40
2	Install	30
3	Size	20
4	Reviews	10

To group the value of each criterion, in this study using intervals as in Table 2, Table 3, Table 4 and Table 5. The grouping of values is intended to make it easier for users to input the criteria values for each application.

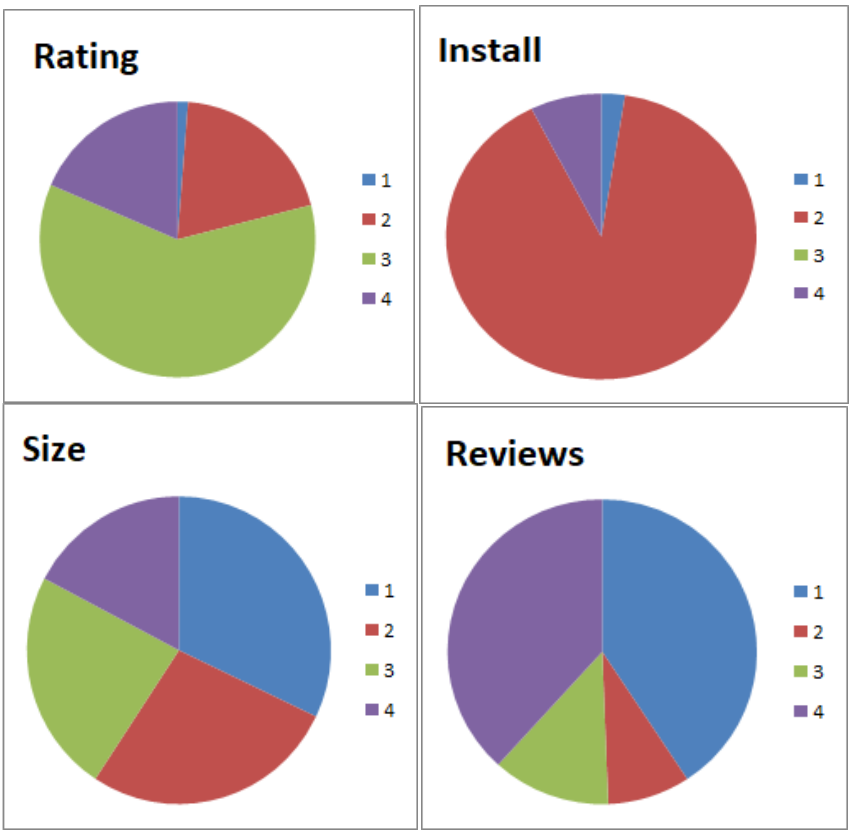


Fig. 2. Distribution chart

Table 6. Rating sub criteria

No	Sub criteria	Value
1	Over 4.6	100
2	4.2 - 4.6	75
3	3.6 - 4.1	50
4	Less than 3.6	25

Table 7. Install sub criteria

No	Sub criteria	Value
1	Over 9,000,000	100
2	1001 – 5,000,000	75
3	500 – 1000	50
4	Less than 500	25

Normalization of criteria is done by comparing the weight value with the total weight value. The results of the normalization of criteria are as in Table 10.

3.2 Implementation of Web-Based Applications

In this study, the ranking calculation process using the SMART method was made web-based using the Hypertext Preprocessor (PHP) language. The need for data processing requires a program to input alternative data, criteria and sub-criteria data and input alternative values based on existing criteria. All input processes are carried out by the admin. Users are only given processing results in the form of a ranking list of applications.

Table 8. Size sub criteria

No	Sub criteria	Value
1	Under 5 MB	100
2	5 – 10 MB	75
3	11 – 20 MB	50
4	Above 20 MB	25

Table 9. Reviews sub criteria

No	Sub criteria	Value
1	More than 20,000	100
2	10,000 – 20,000	75
3	1,000 – 10,000	50
4	Less than 1000	25

To store and process data, several tables are made to accommodate alternative data, criteria, sub-criteria and alternative assessments. The relation between tables can be shown in Fig. 3.

Table 10. Normalization criteria

No	Sub criteria	Value
1	Rating	0.4
2	Install	0.3
3	Size	0.2
4	Reviews	0.1

The web-based application page consists of the main page, alternative data management page, alternative values, criteria normalization, criteria data management, and sub criteria. On the alternative data management page, criteria and sub-criteria are equipped with functions to edit and delete data.

The main page is the page that appears the first time the user accesses the application. This page basically contains menus that can be accessed by the user. The main page display looks like in Fig. 4.

The alternative data page is used to add, edit and delete alternative data for educational applications. To add alternative data, an add button is provided on the alternative data page. If the button is pressed, it will go to the alternative data input form. The main view of this page can be shown as in Fig. 5.

The alternative value page is used to assess alternatives based on the criteria that have been determined in this study. The initial view of the alternative value page can be shown in Fig. 8. To add or start giving an assessment, it is done by selecting the plus button and filling in the alternative name and values given to each category as shown in Fig. 6.

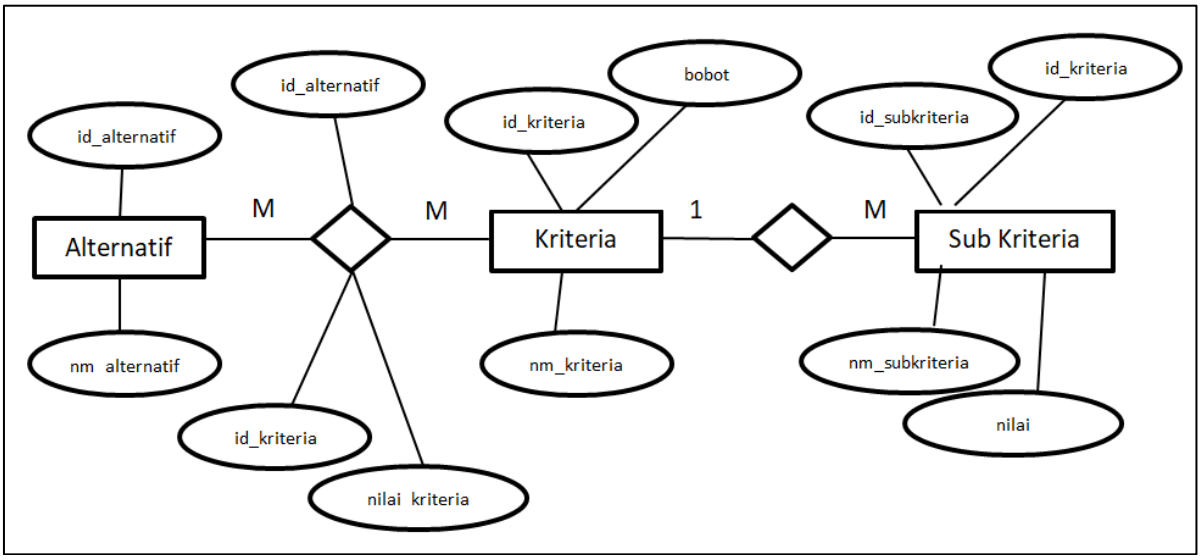


Fig. 3. Entitiy relationship diagram

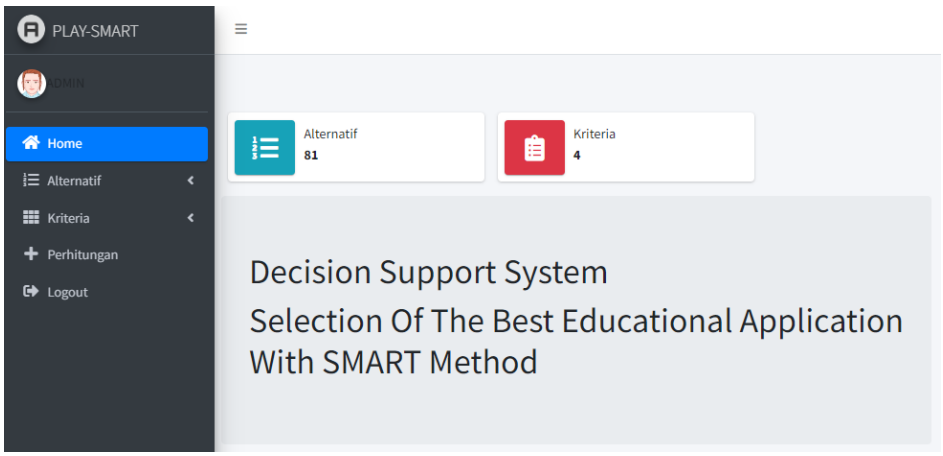


Fig. 4. Main page

The criteria data page is used to add criteria, edit and delete criteria. This page can be adjusted by the user when the priority criteria want to be replaced by giving a different weight to the existing value. The total percentage of all criteria actually does not have to be 100% because the application will calculate the normalization of the weights given by the user. The criteria data page can be shown in Fig. 7 while an example of the normalization process can be seen in Fig. 8.

The sub-criteria data page is used to make it easier for users to group criteria values. Based on the grouping of values, each criterion can be grouped to make it easier to classify the value of the criteria. Basically, this page is a detailed value of the existing criteria data. In this Android application selection Decision Support System, each category will be assigned a value between 0-100. The first interval will be given a value of 100, the second interval will be given a value of 75, the third interval will be given a value of 50, and the last interval will be given a value of 25. The assessment is applied to positive criteria, while for negative criteria, the opposite is applied. The sub-criteria page can be shown in Fig. 9. Just like the other pages, the sub-criteria page is also equipped with edit and delete facilities.

The calculation page is used to show the calculation results from SMART. In the last column, a ranking of alternative applications will be displayed. It can help users find out the best application sequence according to the SMART method. The calculation page can be shown in Fig. 10.

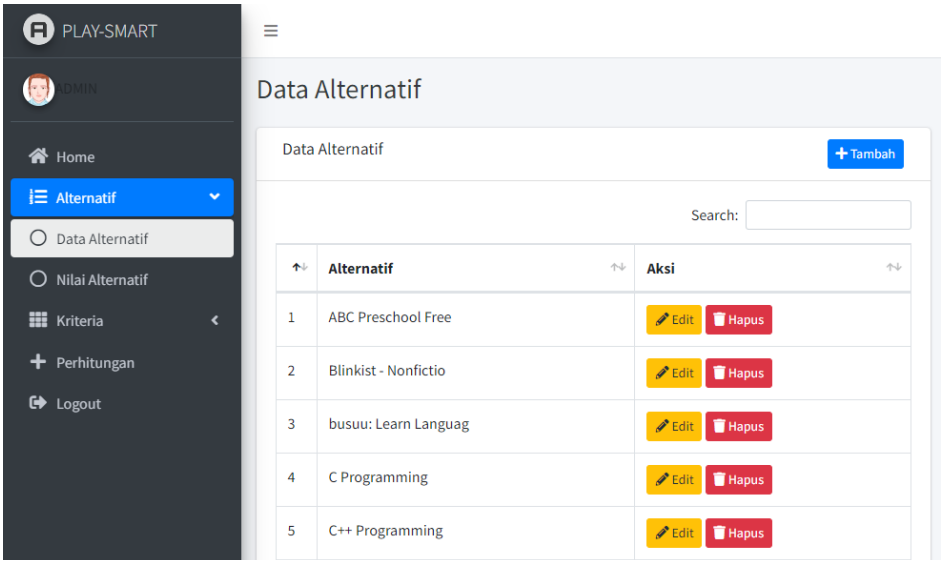


Fig. 5. Alternative data page

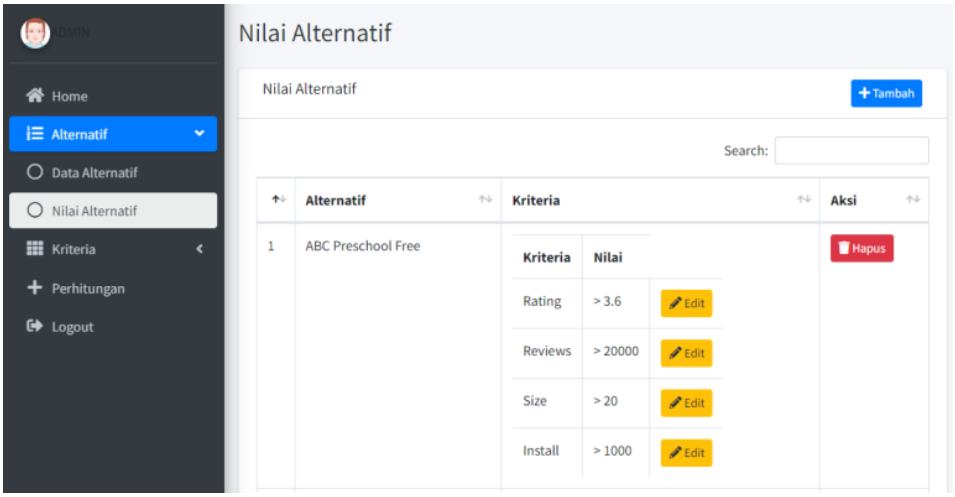


Fig. 6. Alternative values page

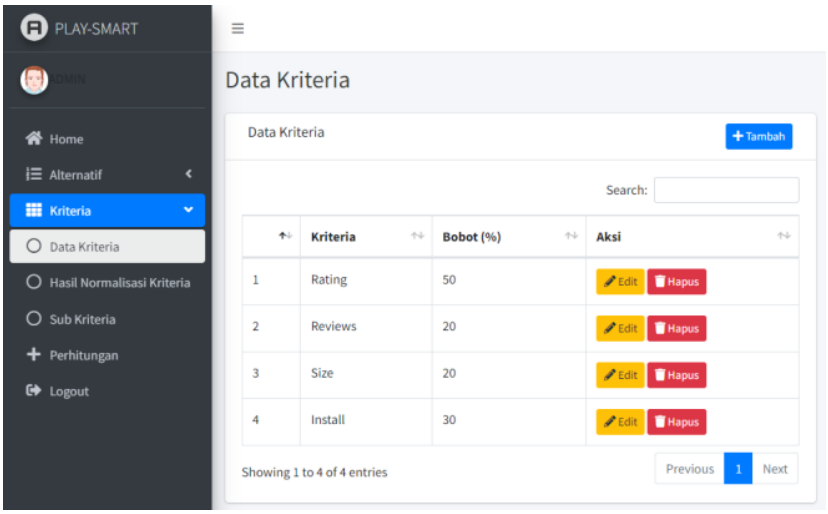


Fig. 7. Criteria data page

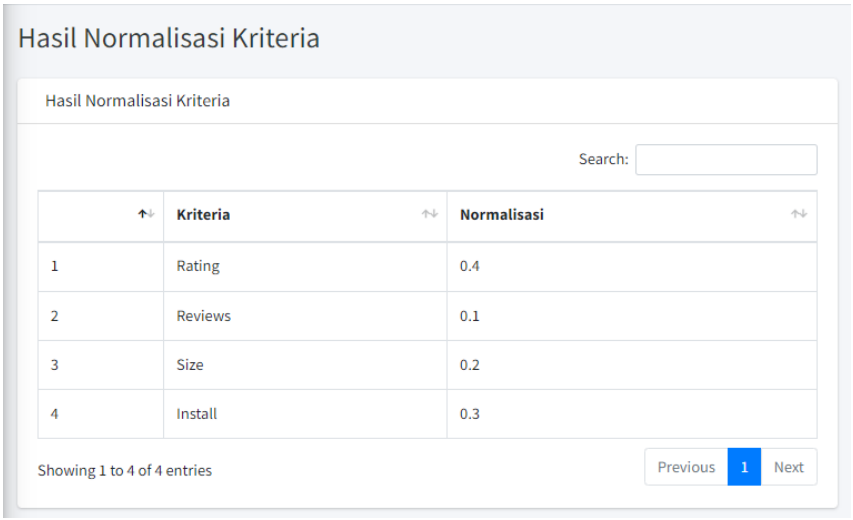


Fig. 8. Normalization criteria

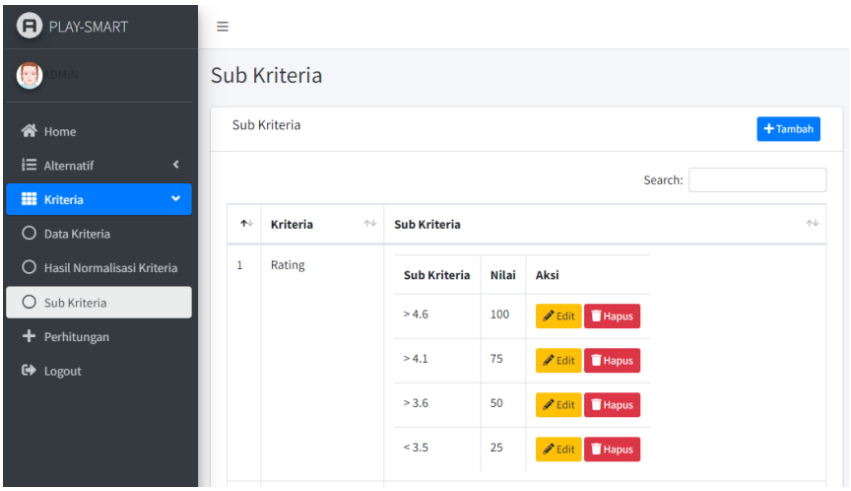


Fig. 9. Sub criteria page

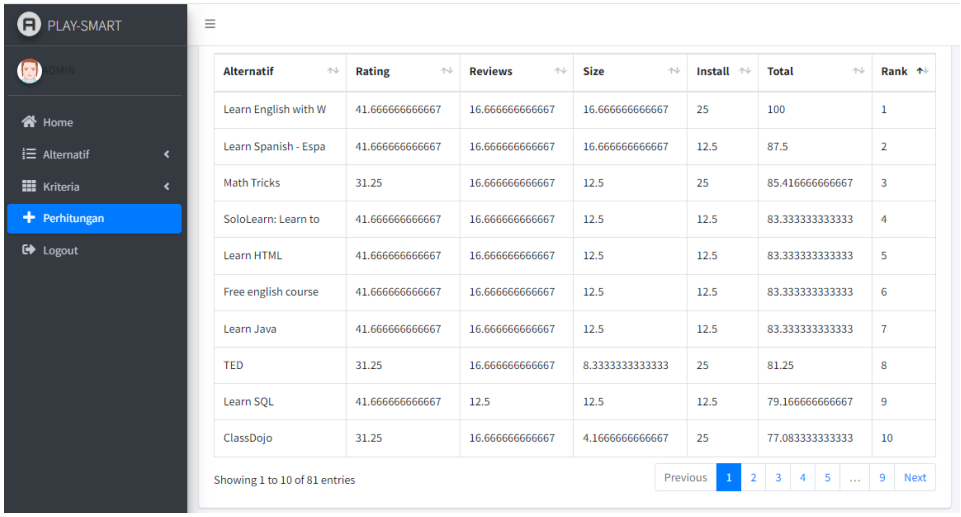


Fig. 10. SMART calculation page

Based on calculations using the SMART method, the best application is the application that has the greatest value. This application has also been given a ranking to make it easier for users to understand this application.

4. CONCLUSION

From the research results, the authors conclude that the SMART method can be used easily to generate application rankings. The results of data processing may change if the priority or weight of a criterion changes. In this study, the results of calculations using the SMART method give a score of 100 with a rating value of 41.6, a review value of 16.6, a size value of 16.6 and an install value of 25.

The input that can be given to improve this research is to adjust the value grouping method for each criterion. This can be done by further researchers to produce good groupings. Alternative data can be upgraded according to the latest conditions so that the number of alternative data is more.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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