

Application of the Simple Multi Attribute Rating Technique Method in Determining Recipients of Educational Development Contributions

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Abstrak— SMK PGRI 1 Jakarta memiliki beberapa kompetensi keahlian merupakan salah satu institusi pendidikan swasta yang mewajibkan siswanya untuk membayar uang sekolah setiap bulannya. Selain itu, SMK PGRI 1 Jakarta juga memberikan keringanan biaya untuk Sumbangan Pembinaan Pendidikan. Program ini merupakan bantuan yang diberikan secara mandiri kepada siswa yang berprestasi, memiliki keterbatasan kemampuan ekonomi, dan kehilangan orang tua. Tidak semua bantuan dan siswa yang mendaftar dapat menerima program ini karena kuotanya terbatas. Dalam menentukan calon penerima bantuan, SMK PGRI 1 Jakarta akan mengeluarkan keputusan berdasarkan kriteria, subkriteria, dan alternatif yang telah ditentukan. Namun, metode apa yang dapat digunakan untuk membantu proses seleksi penerima bantuan keringanan biaya pengembangan pendidikan yang terkomputerisasi dan dapat membantu bagian kesiswaan dalam menghasilkan alternatif terbaik dengan cepat, tepat dan mudah untuk dikelola. Metode Sistem Pendukung Keputusan Simple Multi Attribute Rating Technique dapat digunakan untuk membantu proses seleksi pemilihan calon penerima bantuan ini. Kesimpulannya menyatakan bahwa Sistem Pendukung Keputusan Penerima Bantuan Biaya Pendidikan Siswa Miskin SMK PGRI 1 Jakarta, membuat proses menjadi lebih mudah dan efektif. Kriteria-kriteria yang digunakan untuk mempertimbangkan pemilihan calon penerima bantuan pada sistem pendukung keputusan ini dapat dikembangkan sesuai dengan kebutuhan penggunaan sistem, sehingga dapat meningkatkan proses evaluasi calon penerima bantuan. Calon penerima bantuan sangat terbantu dengan adanya aplikasi ini. Aplikasi ini dapat diimplementasikan oleh pihak-pihak di sekolah lain dengan fitur-fitur yang disesuaikan.

Kata Kunci— Sistem Pendukung Keputusan, Kontribusi Pengembangan Pendidikan, Pengambilan Keputusan Multi Kriteria, Teknik Pemeringkatan Multi Atribut Sederhana

Abstract— Republic of Indonesia Teachers Association Vocational School 1 Jakarta, which has several skill competencies, is one of the private educational institutions that requires students to pay tuition fees every month. Apart from that, the Republic of Indonesia Teachers Association Vocational School 1 Jakarta also provides a fee reduction for Educational Development Contributions. This program is assistance provided independently to students who excel, have limited economic capabilities, and have lost their parents. Not all aid and students who register can receive the program



because the quota is limited. In determining potential recipients of assistance, the Republic of Indonesia Teachers Association Vocational School 1 Jakarta will issue a decision based on the specified criteria, sub-criteria and alternatives. However, what methods can be used to assist the selection process for recipients of computerized educational development fee waivers and can assist the student affairs department in producing the best alternative quickly, precisely and easily to manage? The Simple Multi Attribute Rating Technique Decision Support System method can be used to assist the selection process for selecting potential recipients of this assistance. The conclusion states that the Decision Support System for Recipients of Reduced Costs of Educational Development Contributions for students of the Republic of Indonesia Teachers Association Vocational School 1 Jakarta, makes the process easier and more effective. The criteria used to consider the selection of potential aid recipients in this decision support system can be developed according to the needs of using the system, so as to improve the evaluation process of potential aid recipients. Prospective aid recipients are greatly helped by this application. This application can be implemented by parties at other schools with customized features.

Keywords— Decision Support System, Educational Development Contributions, Multi Criteria Decision Making, Simple Multi Attribute Ranking Technique

I. INTRODUCTION

Technological developments and information needs have resulted in increasingly complex data that can be processed (Argiyan & Doni Hidayat, 2020). The current growth in technology is able to carry out data processing easily and can produce the required data accurately, so that it is more effective in terms of time and budget spent more efficiently (Sastya Hendri Wibowo et al, 2023). One of the educational institutions that is starting to take advantage of developments in technology and internet networks is the Vocational High School (SMK) of the Indonesian Teachers' Association (PGRI) 1 Jakarta. SMK PGRI 1 Jakarta has several skill competencies. SMK PGRI 1 Jakarta is also a private educational institution that requires students to pay school fees every month. In response to this, SMK PGRI 1 Jakarta has a cost reduction program for Educational Development Contributions (Smkpgri1jkt.sch.id, 2020).

The education cost reduction program is educational cost assistance provided independently by the educational institution SMK PGRI 1 Jakarta to students who excel or have limited economic capabilities. Apart from that, a fee reduction program is also provided to students whose parents pass away. The Education Development Contribution cost reduction assistance aims to ensure that aid recipients are selected and have the potential to complete their education.

Education fee reduction assistance is provided to each class in accordance with the policies set by SMK

PGRI 1 Jakarta. Considering the various criteria in determining which students are selected and worthy of receiving assistance, as well as the limited quota for recipients of educational development contribution deductions, namely 5 students per class, not all students can receive this assistance.

The process of evaluating the eligibility of potential aid recipients still uses manual methods which cause data processing to be less effective and takes a relatively long time, it only relies on subjective assessments from decision makers who are prone to bias in assessment, there is no approach or method in decision making. So there is a need for a decision support system (DSS) as a support system that can help the assessment process of selecting potential recipients of cost reduction assistance more effectively, efficiently and can help reduce errors and bias in assessment (Noor Hasan, 2019). The complexity of decision making to improve adolescent character can be overcome by using a decision support system approach. A decision support system is used to select strategies that can be used to improve the character of the younger generation in maintaining Chinese-Indonesian cultural relations (Piliang, 2019).

Decision Support Systems (DSS) are computer-based information systems that are used to solve problems and as a tool to support the decision-making process Istam (Chaidir Ishak, Alicia A.E. Sinsuw, & Virginia Tulenan, 2017). The use of DSS aims to help provide the best alternative decisions. One method for



building DSS is to use the Simple Multi Attribute Rating Technique (SMART) method. The SMART method is a multi-attribute decision support method developed by Edward in 1977 (Ahmad Fitri Boy & Dedi Setiawan, 2019)(Freshtiya et al, 2020)(Ardi Rizkiyanto & Indra Gita Anugrah, 2019).

The data processing process for selecting potential recipients of aid still uses manual methods that utilize paper media, subjective assessments from decision makers, and there is no approach or method for decision making. This can cause damage or loss of documents, less effective data processing, and vulnerability to bias in assessment. So it is necessary to build a computerized system such as DSS which can facilitate the student affairs section as well as the supervisors of SMK PGRI 1 Jakarta to assist in the data processing process of selecting potential aid recipients in producing the best alternative recommendations for deserving students.

The problem that will be solved in this research is how the design of a Decision Support System can help the process of selecting recipients of computerized Education Development Contribution fee waivers and can help the student affairs department to produce the best alternative quickly and accurately and easy to manage? The aim is to design and develop a web-based SPK for recipients of contribution reduction assistance, making it easier to process data in selecting potential aid recipients. Help produce recommendations for the best alternatives, considering quota limitations.

A. *Simple Multi Attribute Rating Technique (SMART)*

Multi-attribute decision support techniques are used as a tool to support decision makers in choosing several alternatives, each decision maker must choose an alternative in accordance with the goals that have been formulated. Each set of attributes and each attribute has a value, this value is averaged on a certain scale. Each attribute has a weight that describes how important a particular scale is and how important an attribute is compared to other attributes. This weighting and scale is used to assess each alternative so that the best alternative is obtained. SMART applies an adaptive linear model to predict the value of each alternative (Gede Surya Mahendra et al, 2023)(Nur Azizah & Gunadi Widi Nurcahyo, 2021).

B. *Novelty*

Sukamto, Yanti Andriani, and Ayu Lestari, 2020, Decision Support System for Bidikmisi Scholarship

Recipients Using the SMART Method. Aims to build a SPK that can determine bidikmisi scholarship recipients, especially at FMIPA, Riau University, using the SMART method [12]. Hidayatus Sibyan, 2020, Application of the SMART Method in the Decision Support System for School Scholarship Recipients. The aim is to create a system that can simplify the scholarship selection process so that scholarship recipients are in the right priority order (Sukamto, Andriyani & Lestari, 2020).

Ardi and Fadhli, 2018 discussed DSS for Doctoral Scholarship Selection for Lecturer Candidates Using the SMART Method. The goal is that doctoral education scholarships can be achieved subjectively, optimally, computerized and on target (Sibyan, H.,2020). Rasia, O., Sutisna, H., Alawiyah, T., & Surahman, M., 2019 discusses the Implementation of SPK for BSPS Recipients in Ciawang Village Using the SMART Method. The purpose of making the SPK is to select which poor people should be prioritized to receive BSPS assistance (Ardi & Fadhli, 2020) (Rasia, O., Sutisna, H., Alawiyah, T., & Surahman, 2019).

II. RESEARCH METHODOLOGY

This research was carried out by directly observing the object under study and recording the necessary information regarding the recipients of the educational development cost reduction program at SMK PGRI 1 Jakarta. By conducting a direct interview with Mrs. Larasati as a student affairs officer at SMK PGRI 1 who understands the process of the program for recipients of reducing the cost of educational assistance contributions. And carry out research by collecting data by reading reference books and sources from the internet as well as journal articles that can be used as support.

The SMART method is a Multi Criteria Decision Making method. Multi-criteria decision making is one of the most widely used methods in the field of decision making. The purpose of creating multiple decision criteria is to select the best alternative from several mutually beneficial alternatives based on general performance in various criteria determined by the decision maker (Julia Purnama Sari & M. Yusa, 2020) (Malisa Huzaifa & Evi Refianti, 2021) (Sri Surati, Sri Siswanti, & Andriani Kusumaningrum, 2022).

A. *Determine Alternatives and Criteria*

The number of expert respondents was 15 potential recipients of assistance to reduce the cost of educational development donations. Criteria used to

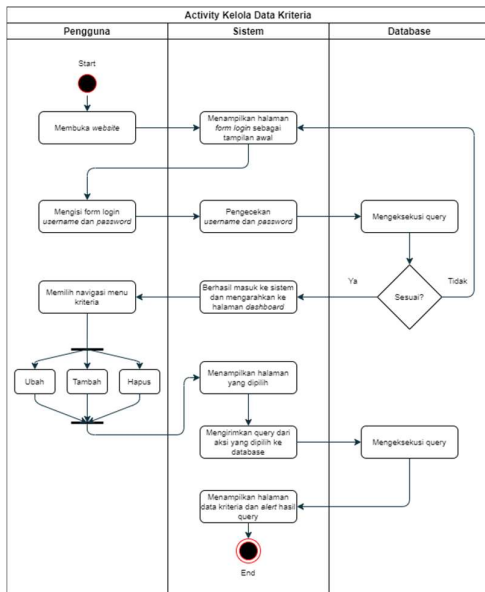


Figure 3. Recipient Activity Diagram

H. Sequence Diagram of Aid Recipients

The following is a Sequence Diagram for recipients of reduced education donation fees.

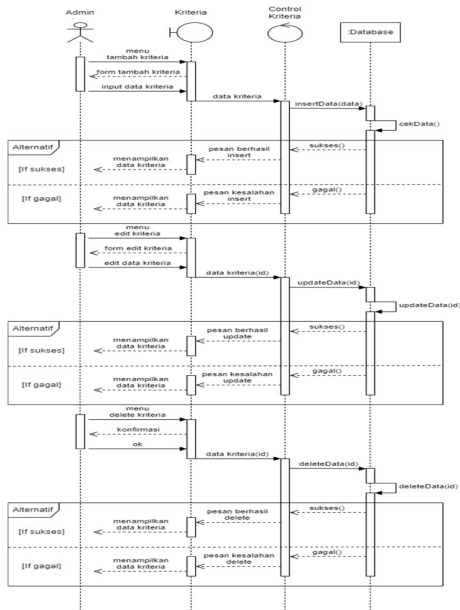


Figure 4. Receiver Sequence Diagram

III. RESULT AND DISCUSSION

The following is the design of the Decision Support System website for recipients of the SMK PGRI 1 School tuition fee waiver.

A. Home page

The following is the initial page of the Decision Support System for recipients of the SMK PGRI 1 School tuition fee waiver.

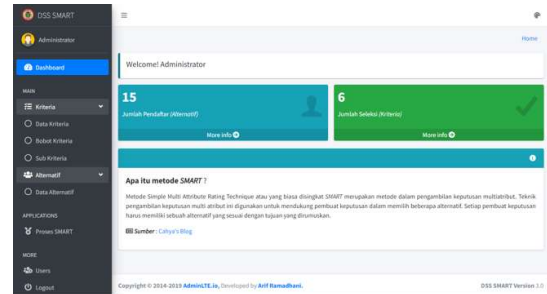


Figure 5. Home page

B. Criteria Page

The following is a page on the criteria for supporting decisions on recipients of the SMK PGRI 1 School tuition fee waiver.

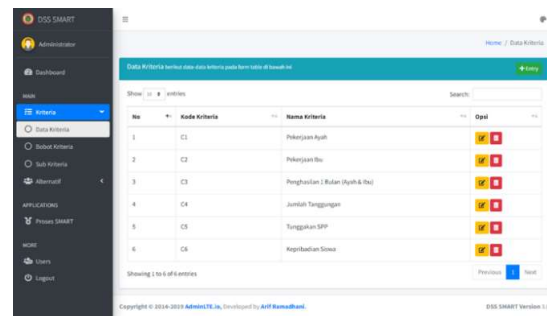


Figure 6. Home page

C. Alternative Page

The following is an alternative page to support decisions on recipients of the SMK PGRI 1 School tuition fee waiver.

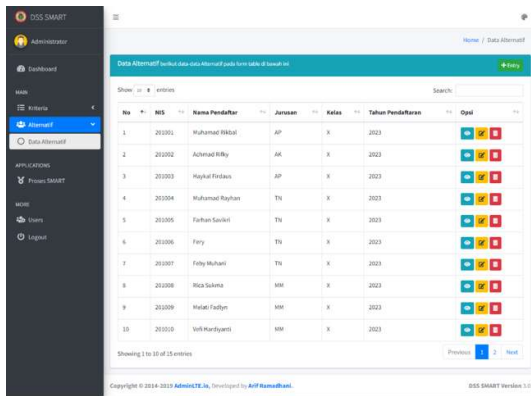


Figure 7. Alternative page

D. SMART Process Page

The following is the Smart Decision Support process page for recipients of the SMK PGRI 1 School tuition fee waiver.

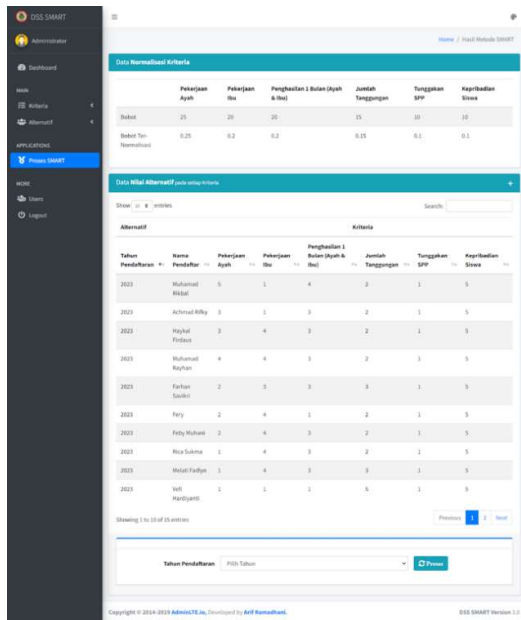


Figure 8. SMART Process Page

E. SMART Recommendation Results Page

The following is a page of SMART recommendation results for recipients of reduced education costs at SMK PGRI 1.

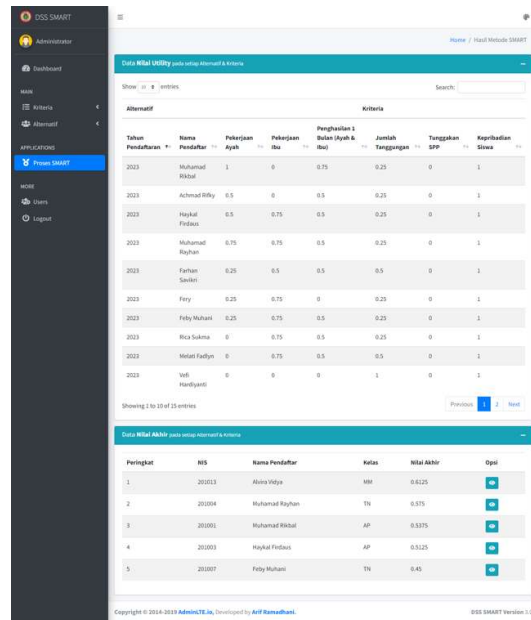


Figure 9. SMART Recommendation Results Page

F. Testing

Tests carried out on this Decision Support System used the black box testing method. At this stage, testing is carried out by running the functions and features contained in the Decision Support System and then evaluating whether the existing functions and features can run according to the expected output. This Decision Support System application is run via a web browser. The following are the results of testing the system that has been created.

Table 5. Recipient DSS Test Results

Test Case	Executed Procedure	Results Expected	Results
Login	Login enter username & password	If the login is successful the Admin goes to the dashboard, if the login fails the Admin returns to the login page	Succeeded
Criteria Data	Criteria	If successful, the system will display the criteria data along with menus that can be used to manage the criteria data.	Succeeded
Add criteria	Add criteria button	Admin fills in the criteria	Succeeded

		details on the form. If successful, the criteria will be added to the database and the Admin will return to the "Criteria Data" page.	
Add criteria edition	Add criteria edition <i>button</i>	The system displays confirmation on the screen. If the Admin selects OK then the Admin will be directed to the edit form to edit the detailed criteria on the form. If successful, the criteria data will change in the database and the Admin will return to the "Criteria Data" page.	Succeeded
Delete criteria	Delete criteria <i>button</i>	The system displays confirmation on the screen. If the Admin selects OK, the criteria data will be deleted in the database and the Admin will return to the "Criteria Data" page.	Succeeded
Giving Criteria Weight Values	Edit Criteria Weight <i>button</i>	The system displays confirmation on the screen. If the Admin selects OK then the Admin will be directed to the edit form to provide criteria weight values on the form. If successful, the criteria weight data will change in the database and the Admin returns to the "Criteria Weights" page.	Succeeded
Displaying Sub Criteria Data	Sub Criteria Data	If successful, the system will	Succeeded

		display sub-criteria data.	
Displaying Alternative Data	Alternative	If successful, the system will display alternative data with menus that can be used to manage alternative data.	Succeeded
Add Alternative Data	Alternative <i>button</i> "Entry"	If successful, the alternative will be added to the database and the Admin will return to the "Alternative Data" page.	Succeeded
Edit Alternative Data	Alternative then click <i>button icon</i> edit	The system displays confirmation on the screen. If the Admin selects ok, the Admin will be directed to the edit form to edit alternative details on the form. If successful, the alternative data in the database will change and the Admin will return to the "Alternative Data" page.	Succeeded
Delete Alternative Data	Alternative then delete <i>button</i>	The system displays confirmation on the screen. If the Admin selects OK, the alternative data will be deleted in the database and the Admin will return to the "Alternative Data" page.	Succeeded
Displaying Alternative Data Details	Alternative Data Details	If successful, the system will display detailed alternative/registrant data.	Succeeded
User data	Users	If successful, the system will display user data along with menus that can be used to manage user data.	Succeeded

Add User	Users <i>button</i> "Entry"	If successful, the system will display user data along with menus that can be used to manage user data.	Succeed
Edit User Data	User then <i>button</i> edit	The system displays confirmation on the screen. If Admin selects OK, Admin will be directed to the edit form to edit user details on the form. If successful, the user data in the database will change and the Admin will return to the "User Data" page.	Succeed
Delete User Data	User then <i>button</i> delete	The system displays confirmation on the screen. If the Admin selects OK, the user data will be deleted in the database and the Admin will return to the "User Data" page.	Succeed
Displaying SMART Recommendations	Select the "SMART Process" menu then select "Registration Year Data" which will be processed	If successful, the system will display alternative recommendations according to the specified quota, sorting the recommendations from highest to lowest final score.	Succeed
<i>Logout</i>	<i>Logout</i>	If successful, the Admin will exit the system and then the system will display the Login Successful page again	Succeed

Table 6. Receiver-Viewer SPK Test Results

Test Case	Executed Procedure	Results Expected	Results
<i>Login</i>	Login <i>username & password</i>	If the login is successful, the User goes to the dashboard, if the login is unsuccessful, the Admin returns to the login page.	Succeed
Criteria Data	Kriteria	If successful, the system will display the criteria data.	Succeed
Alternative Data	Alternatif	If successful, the system will display alternative data.	Succeed
Displaying SMART Recommendations	Pilih menu "Proses SMART" lalu pilih "Data Tahun Pendaftaran" yang akan diproses	If successful, the system will display alternative recommendations according to the specified quota, ranking the recommendations from highest to lowest final score.	Succeed
<i>Logout</i>	<i>Logout</i>	If successful, the Admin will exit the system and then the system will display the Login Successful page again	Succeed

IV. CONCLUSION

Based on the results of designing and developing a decision support system for recipients of reduced educational guidance fees for students of SMK PGRI 1 Jakarta, it can be concluded that for DSS recipients of reduced educational guidance fees, data processing is carried out in the processing of potential recipients of this assistance so that it runs more smoothly. the process. easy and effective. The decision-making process will be faster with a decision support system that is able to carry out calculations and produce recommendations for potential aid recipients.

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