

# Implementation of Decision Support System Method to Evaluate Posyandu Program in Tangerang Selatan

Jason Maximus<sup>1</sup>, Ririn Ikana Desanti<sup>2</sup>, Budi Berlinton Sitorus<sup>3</sup>

<sup>1,2,3</sup> Information System Study Program, Universitas Multimedia Nusantara, Tangerang, Indonesia

<sup>2</sup>ririn.desanti@umn.ac.id

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**Abstract**— The objective of the research is to develop a decision support system (DSS) of Posyandu in the South Tangerang area using the Technique for Order Preference by Similarity to Solution (TOPSIS) and Simple Multi-Attribute Rating Technique (SMART) approaches. The issue at hand is the selection of posyandu programs that are considered to have the most impact on mothers and children. The DSS system development utilizes the TOPSIS method's ranking feature to select the best alternative based on agreed-upon criteria with the local posyandu. This method will measure the distance between each alternative with a positive ideal solution and a negative ideal solution, then calculate the relative preference value, which can ultimately determine the ranking. Furthermore, the SMART method gives weights to each criterion. These weights contribute to calculating the final value for the alternatives. The system development methodology is prototyping, and the system modeling process utilizes UML diagrams. The final result of this research is a DSS system using TOPSIS and SMART methods, which helps in the decision-making process so that Posyandu can always improve the quality of services for mothers and children.

**Keywords**— decision-making; decision support system; TOPSIS; SMART

## I. INTRODUCTION

Health is a crucial aspect of people's lives and serves as a key foundation for supporting other areas such as the economy and social environment. This statement is supported by study findings indicating that central government investment in the health sector is in the APBN and regional government expenditure, which has a substantial effect on growth in the economic and human development index [1]. To achieve this, communities need accessible healthcare services. According to the Minister of Health's press statement, both the central and regional governments are facing

challenges in providing healthcare services, exacerbated by the fact that the number of primary healthcare centers (Posyandu) is insufficient to reach the wider population. Posyandu (Integrated Health Service Post) is a service unit provided by the Indonesian government. Its main objective is to deliver integrated and comprehensive healthcare services, covering various aspects such as maternal and child health, nutrition, immunization, posyandu programs, and environmental health. The primary goal of Posyandu is to improve community health, particularly for mothers and children. Through Posyandu, communities can access basic healthcare services easily, thus enhancing disease prevention efforts. Posyandu serves as a place where the community can monitor the health of mothers and children within their environment. However, Posyandu often faces challenges in managing health data and information in practice. Therefore, the management of data and health information in Posyandu can be aided using information technology, such as a Decision Support System (DSS). DSS can assist in more effective and organized management of health data and information, as well as enable more accurate decision-making for monitoring the health of mothers and children. The implementation of an information system like the DSS is expected to make Posyandu operate more effectively and efficiently in monitoring the health of mothers and children in the surrounding community, utilizing tools such as a DSS (Decision Support System) [2]. A DSS system can also be utilized by Posyandu cadres for the decision-making process to improve Posyandu's service quality. Based on data from Posyandu in the South Tangerang area, the initial problem that occurred was the need to evaluate some Posyandu programs, such as Bina Keluarga Balita (Child Family Care),

Tanaman Obat Keluarga (Family Medicinal Plants), Bina Keluarga Lansia (Elderly Family Care), Early Childhood Education (PAUD), and Bina Keluarga Remaja (Youth Family Care). One issue faced by Posyandu is the confusion among the community in selecting the appropriate programs. This research utilized two DSS methods namely Technique for Order Preference by Similarity to Solution (TOPSIS) and Simple Multi-Attribute Rating Technique (SMART). Five criteria for evaluating the programs were determined as a result of discussions with Posyandu cadres: cost, maximum program utilization, supporting capability for the Posyandu program, program availability or convenience, and cadre services.

## II. METHODOLOGY

### A. Decision Support System

The Decision Support System (DSS) is defined as a computer-based system consisting of several components. DSS is not a decision-making tool itself, but rather a system that assists in making decisions by providing us with relevant information derived from processed data, thereby facilitating accurate decision-making.

### B. Black Box Testing

Black box testing is a software testing approach that allows for the evaluation of a system or application without knowledge of its internal implementation. It focuses on examining the input and output of the system or application being tested, disregarding its internal workings [3]. The objective of black box testing is to ensure that the system or application functions by user requirements. This testing method can encompass various techniques, including functional testing, non-functional testing, regression testing, and security testing. An advantage of utilizing black box testing is that it can be conducted by individuals without extensive technical knowledge, leading to varied testing outcomes based on the tester's level of technical expertise.

### C. SMART Method

The SMART method is a decision-making technique used in DSS to evaluate and rank alternatives based on multiple criteria. It simplifies the decision-making process by assigning scores to each alternative and considering their relative importance, allowing for informed decision-making based on priorities [4].

### D. TOPSIS Method

The TOPSIS approach is used in Decision Support Systems (DSS) to analyze and rank alternatives based on multiple criteria. It provides a systematic process for decision-making by considering factors such as cost, fuel efficiency, safety ratings, and style in selecting the

best alternative. The TOPSIS method allows for a clear and objective evaluation of alternatives, providing valuable information for informed decision-making [5].

### E. Previous Research

Several previous research are used as references. The first research resulted in a system that referred to developing a web-based dog adoption system. The research findings were positive. The findings of research number one serve as guidelines for applying the black box testing approach [6]. The current study relates to earlier studies that used the SMART technique to create a DSS system [7]. Furthermore, the TOPSIS approach was used in the current study by referring to two previous research that used the TOPSIS method to the DSS application that was developed [8][9].

### F. Research Methods

The research flow is carried out in four stages adopting a prototyping approach where the output from each stage will become input for the next stage.

The first stage is an analysis of the problem and research needs. At this stage, interviews were conducted with cadres from Posyandu Sakura, Posyandu Mahoni, dan Posyandu Nusa Indah, all three of which are in the South Tangerang area. The interviews revealed several issues faced by the program, including the community's reluctance to engage in the program and the lack of efficiency in its implementation. The community members expressed uncertainty in selecting the programs due to limited information about the available options, while the cadres faced challenges in evaluating the program's outcomes without a dedicated evaluation team. These concerns highlight a lack of community awareness and government support for the existing programs. Addressing these issues is crucial for improving the effectiveness and acceptance of the program in the community.

The second stage is the stage of implementing DSS methods which are SMART and TOPSIS.

The third stage is system modeling using UML Diagram such as use case diagram, activity diagram and class diagram.

The fourth stage is system implementation and testing.

### G. Data Collection Methods

Data collection methods were carried out using questionnaires, interviews, and observations. The distribution of questionnaires and the interview process were carried out for 7 weeks in parallel. During this time, we conducted observation activities for a duration of 3 weeks

III. RESULT AND DISCUSSION

A. Determination of Research Criteria and weight

1) Criteria

The determination of criteria and weights is done through direct offline interviews with the cadres from each Posyandu. The criteria are obtained from Posyandu cadres who suggest several commonly used criteria in Posyandu. Table 1 details the alternatives that can be selected.

TABLE I. ALTERNATIVES

Data Code	Program Posyandu
A1	Bina Keluarga Balita (BKB)
A2	Tanaman Obat Keluarga (TOGA)
A3	Bina Keluarga Lansia (BKL)
A4	Pos Pendidikan Anak Usia Dini (PAUD)
A5	Bina Keluarga Remaja (BKR)

2) Weight

The weights for the criteria are determined from Posyandu cadres who provide estimated weights commonly used in Posyandu. Table 2 details the criteria and the weight of each criteria.

TABLE II. WEIGHT TABLE

Criteria	Value Weighting	Rating Scale	Number Scale
Price	15%	Very Bad	1
The most used program	30%	Bad	2
Support towards the program at Posyandu	20%	Enough	3

Program availability or convenience	25%	Good	4
Service from cadres	10%	Very Good	5

B. Use Case Diagram

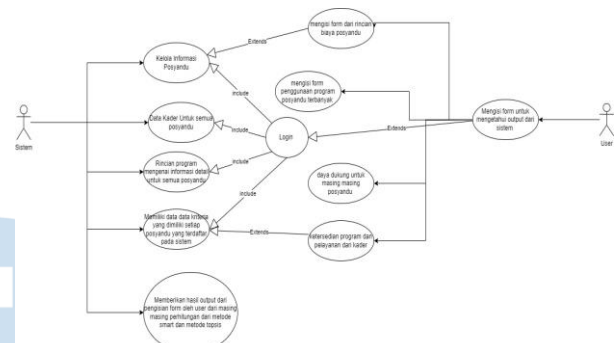


Fig. 1. Use Case Diagram of Proposed System

Use case diagram is used to describe the main functions contained in the system [10].

The use case diagram shown at figure 1 above has 1 role based on the agreed user requirements, namely the user of each posyandu, that role is the user. Starting from filling out the form to find out the output of the system. After completing the filling, proceed with filling out the form with details of posyandu costs, filling out the form for the most posyandu program users, the carrying capacity for each posyandu, and the availability of programs and services from cadres. Then you can log in by redirecting to the next page, namely the system page, which can manage posyandu information, cadre data for all posyandu, program details regarding detailed information for all posyandu, and has data - data criteria owned by each posyandu registered in the system. Finally, the system will provide output results from filling out the form by the user from each calculation from the SMART method and the TOPSIS method.

C. Activity Diagram

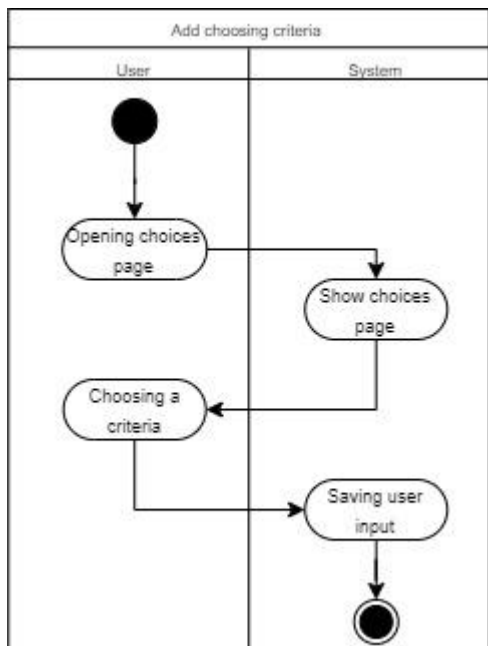


Fig. 2. Activity Diagram Add Choosing Criteria

Figure 2 shows that the cadres would go to the first page, namely selection page. The system will be displaying a criteria selection page to Cadre. After the data has been selected, it will be stored in the system database.

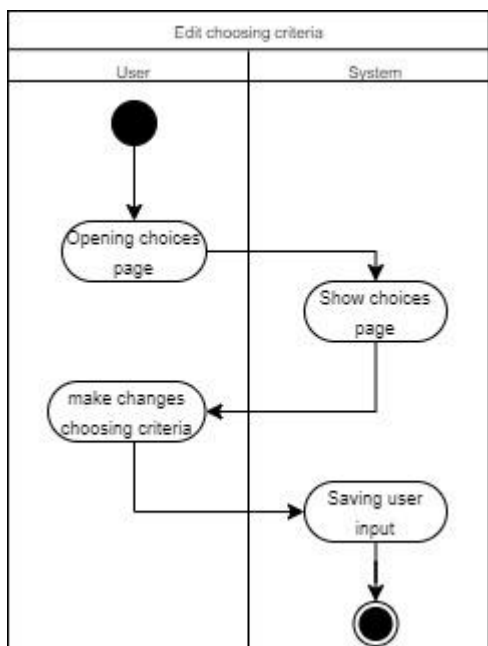


Fig. 3. Activity Diagram Edit Choosing Criteria

Figure 3 Shows the cadres will access the first page, which is the selection page. Next, the user will display

the criteria modification selection page, where the user themselves will choose the criteria, they want to access on that page. Once the data is selected, the user's selection data will be stored in the system's database.

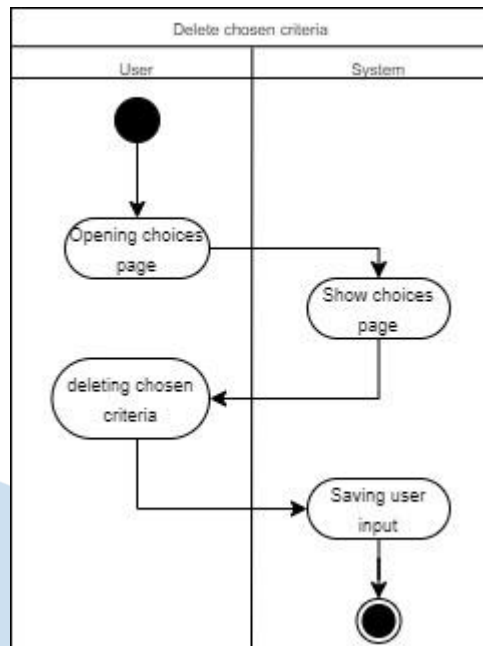


Fig. 4. Activity Diagram Delete Chosen Criteria

Figure 4 The cadre will access the first page, which is the selection page. Then, the user will display the input criteria deletion selection page, where the user themselves will choose the input criteria they want to access on that page. Once the data is selected, the user's selection data will be stored in the system's database.

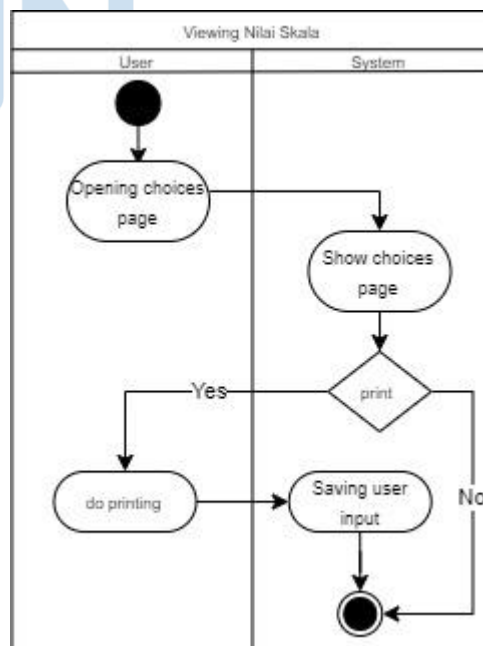


Fig. 5. Activity Diagram Viewing Nilai Skala

Figure 5 displays that the cadre will access the first page, which is the criteria selection page. Then, the user will display the criteria selection page where they can choose the criteria they want to access. The user can then select the specific page they want to print, and once the data is selected, the user's selection data will be stored in the system's database.

D. Class Diagram

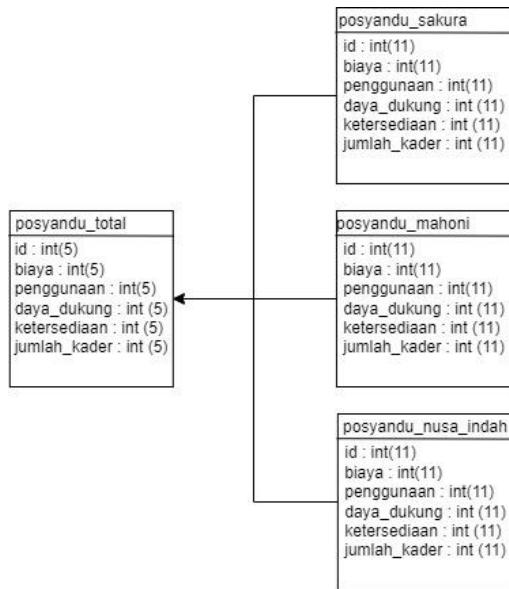


Fig. 6. Class Diagram of Proposed System

The class diagram in figure 6 shows the relationship that occurs between one class and another class. The class diagram above explains that only 1 database is used which is the result of the database, namely posyandu\_total. The descriptions of several tables from several posyandu are combined into posyandu\_total where the results of the calculations will end up in that table. Few databases are used because the system used is already integrated with the API.

E. User Interface



Fig. 7. Start Page

Figure 7 The Login Page serves as the entry point to the application and displays a welcoming message "Welcome to the Posyandu Recommendation with TOPSIS and SMART Method". It also features a "Mulai Sekarang" button that allows users to proceed to the next page, which is the Personal Data Input Page.

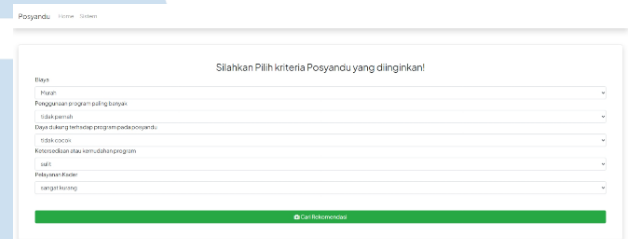


Fig. 8. Criteria Selection Page

Figure 8 is the Criteria Selection Page that allows users to choose the criteria and scales they want to use to find recommendations that align with their preferences. After selecting the desired criteria, the system calculates the recommendations based on the chosen criteria, and the results are displayed to the user.

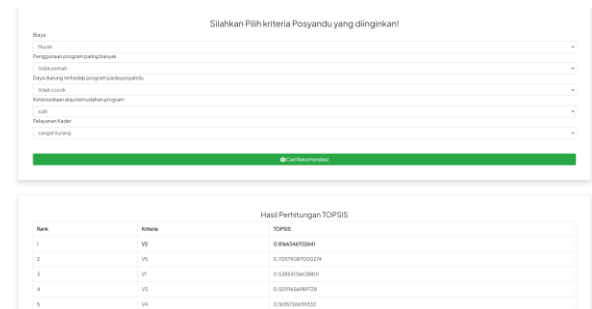


Fig. 9. Calculation Results Page TOPSIS Method



Hasil Perhitungan SMART			
Rank	nama	SMART	SMART
1	V5	0.046	
2	V1	0.044	
3	V4	0.04	
4	V3	0.038	
5	V2	0.037	

Keterangan:  
 (1) Struktur Kesehatan (SK)  
 (2) Struktur Organisasi (SO)  
 (3) Struktur Manajemen (SM)  
 (4) Struktur Pelaksanaan (SL)  
 (5) Struktur Pengawasan (SP)

Fig. 10. Calculation Results Page SMART Method

In Figure 9 and Figure 10 are pages of calculation results according to the method that has been selected, namely the TOPSIS method and the SMART method. On this page has the ranking results of each method. It can be seen that the TOPSIS method gives better results because the results are more objective than the SMART method, which has simpler calculations.

#### IV. CONCLUSION

The following conclusions are based on the outcomes of the decision support system's development. The use of TOPSIS and SMART approaches in the construction of a Decision Support System (DSS) provides benefits in decision-making for enhanced service quality. TOPSIS ranks alternatives, and SMART assigns weights to DSS to help pick optimum alternatives based on criteria. The selection of health center programs is based on familiarity, and they are administered via a web platform with the publication of comparative results. TOPSIS and SMART approaches in DSS give organized information for correct judgments, improving service quality and community well-being.

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