



## Decision Support System for KIP-K Scholarship Selection Using SAW

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**Abstrak:** *Decision Support System (SPK) is a computer-based system designed to assist the decision-making process by considering certain data and criteria. In this study, an SPK was developed to help determine KIP-K scholarship recipients at Politeknik Negeri Bengkalis by utilizing the Simple Additive Weighting (SAW) method. The KIP-K scholarship itself is intended for outstanding students who face economic limitations. Previously, the selection process was carried out manually through file management and re-recording, which was time consuming and prone to errors. The SAW method was chosen because it is able to arrange rankings based on the weights of each predetermined criterion. This system is designed web-based to be easily accessed by students and student affairs. The results of the research show that this system is able to increase efficiency and accuracy in the selection process, as well as making the assessment more objective, transparent, and systematic.*

**Keywords:** *DSS, SAW, KIP-K Scholarship, Bengkalis State Polytechnic, Website*

### 1. Introduction

Education is a fundamental necessity for every individual and serves as a crucial foundation for building civilization and national development. Ensuring equitable access to education is essential to promote inclusive growth across all segments of society [1]. The Indonesian government, through the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek), has introduced the Indonesia Smart Card–Higher Education (KIP-K) program, which is intended to support high-achieving students from economically disadvantaged backgrounds in continuing their higher education. This program is regulated under the Secretary General Circular Letter No. 13 of 2023, which defines four main selection criteria: possession of a KIP card, registration in the Integrated Social Welfare Data (DTKS), participation in the Family Hope Program (PKH), and ownership of a Certificate of Economic Disadvantage (SKTM) [2].

Bengkalis State Polytechnic, as a vocational higher education institution with national and international standards, actively participates in the implementation of the KIP-K scholarship program as part of its commitment to expanding access to higher education [3]. However, the scholarship selection process at the institution is still conducted manually, starting from document submission by applicants to verification and data compilation by the student affairs office [4]. Such manual procedures are not only time-consuming but also prone to decision-making errors and inaccuracies in eligibility assessment [5].

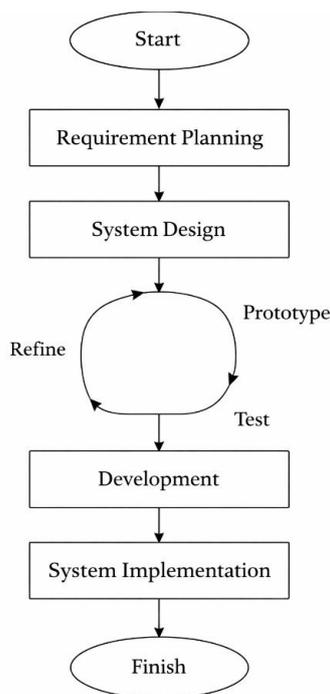
To improve the efficiency and accuracy of the selection process, it is necessary to develop a technology-based system that can support objective decision-making. One relevant solution is the implementation of a Decision Support System (DSS) using the Simple Additive Weighting

(SAW) method. The SAW method is suitable for situations in which criterion weights are predefined, enabling the system to rank alternatives based on the total weighted scores of their attributes [6]. This method is considered capable of producing fast, accurate, and easily interpretable results [7].

This study aims to develop a web-based decision support system to assist in evaluating the eligibility of KIP-K scholarship recipients at Bengkalis State Polytechnic [8]. The system evaluates candidates based on nine sub-criteria derived from four main criteria, namely KIP, DTKS, PKH, and SKTM [9]. Through this system, the assessment and scoring processes can be conducted automatically and systematically, thereby supporting the institution in determining eligible scholarship recipients in a more precise and efficient manner [10]. The expected contributions of this study include simplifying the selection and data processing of scholarship applicants, improving operational efficiency within the institution, and promoting transparent and accountable decision-making.

## 2. Research Methods

To develop a Decision Support System (DSS) for selecting KIP-K scholarship recipients at Bengkalis State Polytechnic using the Simple Additive Weighting (SAW) algorithm, this study adopts the Rapid Application Development (RAD) software development methodology [11]. The research workflow applied in developing the KIP-K scholarship DSS is illustrated in Figure 1.



**Figure 1.** Research Flow

In this study, weighted criteria and sub-criteria values are required to determine eligibility for the KIP-K scholarship. The following steps describe the application of the SAW method [12].

### 2.1 Attribute Scoring

Each criterion attribute is assigned a score ranging from 1 to 5, while the weights cover all attributes with a total weight of 1. This approach aims to facilitate the transformation of textual data into numerical values for scoring and weighting purposes.

**Table 1. DTKS Status**

No.	Attribute	Category	Score	Weight
1	Registered	Benefit	5	0.7
2	Not Registered	Benefit	1	0.3

**Table 2. P3KE Status**

No.	Attribute	Category	Score	Weight
1	Decile 1	Benefit	5	0.4
2	Decile 2	Benefit	4	0.3
3	Decile 3	Benefit	3	0.2
4	Decile 4	Benefit	2	0.1

**Table 3. KIP Number**

No.	Attribute	Category	Score	Weight
1	Registered	Benefit	5	0.7
2	Not Registered	Benefit	1	0.3

**Table 4. KKS Number**

No.	Attribute	Category	Score	Weight
1	Registered	Benefit	5	0.7
2	Not Registered	Benefit	1	0.3

**Table 5. Father's Status**

No.	Attribute	Category	Score	Weight
1	Deceased	Benefit	5	0.6
2	Alive	Benefit	3	0.4

**Table 6. Father's Occupation**

No.	Attribute	Category	Score	Weight
1	Unemployed	Benefit	5	0.4
2	Fisherman	Benefit	4	0.3
3	Farmer	Benefit	3	0.1
4	Entrepreneur	Benefit	2	0.1
5	Others	Benefit	1	0.1

**Table 7. Mother's Status**

No.	Attribute	Category	Score	Weight
1	Deceased	Benefit	5	0.6
2	Alive	Benefit	3	0.4

**Table 8. Mother's Occupation**

No.	Attribute	Category	Score	Weight
1	Unemployed	Benefit	5	0.4
2	Fisherman	Benefit	4	0.3
3	Farmer	Benefit	3	0.1
4	Entrepreneur	Benefit	2	0.1
5	Others	Benefit	1	0.1

**Table 9.** Number of Dependents

No.	Attribute	Category	Score	Weight
1	> 5 persons	Benefit	5	0.5
2	3–5 persons	Benefit	4	0.3
3	< 3 persons	Benefit	3	0.2

**2.2 SAW Calculation**

The SAW method processes registration data collected from all applicants for the KIP-K scholarship. The normalization formula is defined as follows:

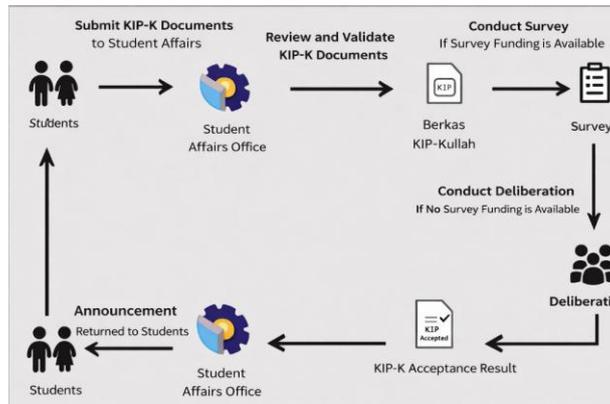
$$R_{ij} = \frac{x_{ij}}{\max(x_{ij})} \tag{1}$$

if  $j$  is a benefit attribute To obtain the final decision from the normalized matrix, the following formula is applied:

$$V_i = \sum_{j=1}^n W_j \cdot R_{ij} \tag{2}$$

**2.3 Existing System Flow**

The process begins when students submit KIP-K scholarship documents to the student affairs office. The documents are verified according to predefined criteria. Applicants may then be surveyed if survey funding is available; otherwise, deliberation is conducted. The final decision determines KIP-K scholarship acceptance can be seen in the figure 2.



**Figure 2.** Existing System Flow

**2.4 Proposed System Flow**

In the proposed system, students log in through [spk.kip-kuliah.polbeng.go.id](http://spk.kip-kuliah.polbeng.go.id) and input data for the nine criteria. The student affairs office reviews and validates the submitted data. After validation, eligible data are processed using the Simple Additive Weighting (SAW) algorithm based on the nine criteria. The final selection is determined according to the allocated scholarship quota. can be seen in the figure 3.

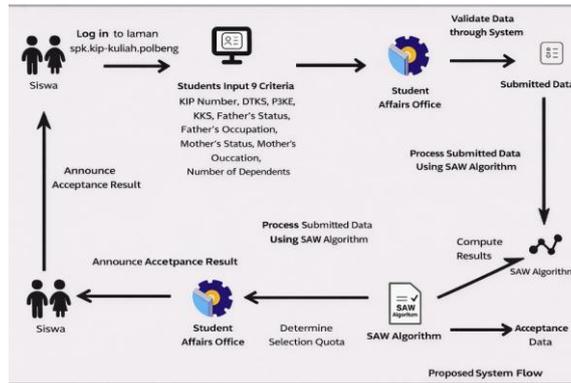


Figure 3. Proposed System Flow

### 2.5 System Analysis and Design

The system analysis and design are represented through Use Case Diagrams and Activity Diagrams. The Use Case Diagram of the KIP-K scholarship DSS involves two actors, as illustrated in Figure 4.

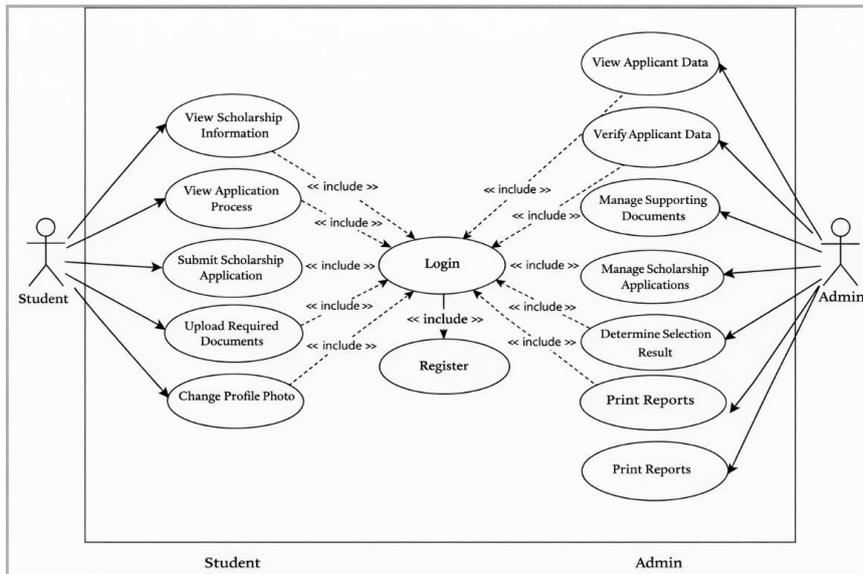


Figure 4. Use Case Diagram

### 3. Results and Discussion

This section presents the results of the previously designed system, illustrated through system screenshots.

#### 3.1 Login Page

The initial page of the system displays a login form accessible to both students and the student affairs staff. The form consists of username and password fields can be seen in the figure 5.

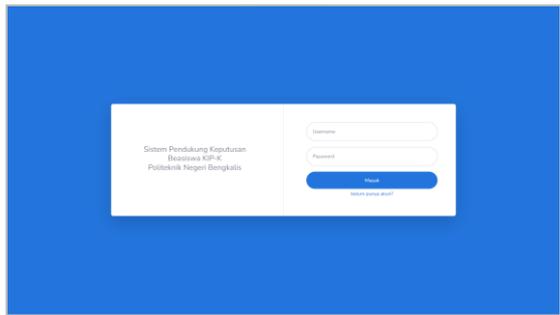


Figure 5. Login Page

### 3.2 Scholarship Application Input Page

After clicking the *Apply for Scholarship* button, this form is displayed. Students can input the required information according to their respective data can be seen in the figure 6.

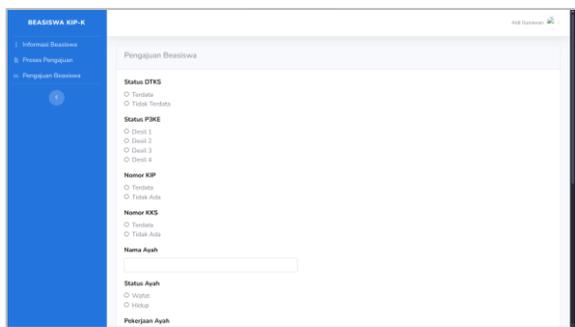


Figure 6. Scholarship Application Page

### 3.3 Application Data Page

This page displays the application data submitted by students applying for the KIP-K scholarship. Administrators can verify and delete applications, as well as determine scholarship acceptance can be seen in the figure 7.

Nama	Status CPNS	Status PKKE	Nomor KIP	Nomor KKIS	Nama Ayah	Status Ayah	Pekerjaan Ayah	Nama Ibu	Status Ibu	Pekerjaan Ibu	Jumlah Tanggungan	Aksi
Denny Setiawan	Terdapat	Dakil 2	Terdapat	Tidak Ada	P	Wafat	Tidak bekerja	P	Wafat	Tidak bekerja	> 5 Orang	[Status]
Rafiq Abdillah	Terdapat	Dakil 2	Terdapat	Terdapat	Ibu	Hidup	Tidak bekerja	SI	Hidup	Tidak bekerja	> 5 Orang	[Status]
Pran Saputra Canggih	Terdapat	Dakil 2	Terdapat	Terdapat	Alli Andia Carliaga	Hidup	Manajemen	Bayan Tanjung	Hidup	Tidak bekerja	3 - 5 Orang	[Status]
Ardi Rian Hartanto	Terdapat	Dakil 1	Terdapat	Terdapat	Arif	Hidup	Kewirausahaan	Petani	Hidup	Tidak bekerja	3 - 5 Orang	[Status]
Angga Rizka	Terdapat	Dakil 1	Terdapat	Terdapat	Arif	Hidup	Petani	Arif	Hidup	Tidak bekerja	< 3 Orang	[Status]
Fah Fauzlyandika	Terdapat	Dakil 2	Terdapat	Terdapat	Fauzan	Hidup	Kewirausahaan	Fanny	Hidup	Tidak bekerja	3 - 5 Orang	[Status]
M. Syahid	Terdapat	Dakil 3	Terdapat	Terdapat	Sarmidi	Hidup	Petani	Rahma	Hidup	Tidak	3 - 5 Orang	[Status]

Figure 7. Scholarship Application Data Page

### 3.4 Application Verification Page

This page allows administrators to review the data submitted by students in their scholarship applications. Administrators can select each data entry to approve or reject after reviewing it. Once one option is selected, the alternative option will no longer be available can be seen in the figure 8.



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