



# Application of the Simple Additive Weighting (SAW) Method in a Decision Support System for Prioritizing Public Complaint Handling at the Bandung Cipta Bintar Agency

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## ABSTRACT

*The increasing number of services at the Office of Public Works, Building Construction, and Spatial Planning (Cipta Bintar) of Bandung City has encouraged the agency to develop a web-based platform to simplify and accelerate service processes. One of the features provided on this platform is the public complaint service. However, the existing complaint feature still has several shortcomings, including the absence of a report status tracking function, the lack of complaint category classification to ensure reports are directed to the appropriate department, and the absence of a priority determination mechanism for complaint handling. So far, complaints have only been processed based on the order of submission, without considering the level of urgency or potential impact. This study proposes a solution by developing a web-based public complaint system using a descriptive analysis approach with qualitative data types and a system development method using object-oriented analysis and design (OOAD) which integrates the Simple Additive Weighting (SAW) method as the core of the priority determination process. SAW is chosen because it enables objective and systematic calculations based on five main criteria: Level of Urgency, Potential Impact, Type of Complaint, Complexity of the Problem, and Report Duration. Through the implementation of SAW, the system is not only able to provide report status information and category classification but also deliver measurable recommendations for handling priorities. The results of this study indicate that the application of the SAW method is the key to improving the effectiveness, efficiency, and responsiveness of public complaint services at Cipta Bintar Bandung City, as it successfully addresses the limitations of the previous system that relied solely on submission order.*

*Keywords: Public Complaint System; Cipta Bintar Office; Simple Additive Weighting (SAW); Priority Determination; Service Effectiveness.*

## ABSTRAK

Meningkatnya jumlah pelayanan di Dinas Cipta Karya, Bina Konstruksi, dan Tata Ruang (Cipta Bintar) Kota Bandung mendorong dinas untuk mengembangkan sebuah platform berbasis web guna mempermudah dan mempercepat proses pelayanan. Salah satu fitur yang disediakan dalam platform tersebut adalah layanan pengaduan masyarakat. Namun, pada fitur pengaduan yang telah berjalan masih terdapat beberapa kekurangan, antara lain belum adanya fitur pelacakan status laporan, belum tersedia klasifikasi kategori pengaduan agar masyarakat dapat menyampaikan laporan sesuai dengan kewenangan Dinas Cipta Bintar, serta belum adanya mekanisme penentuan prioritas penanganan pengaduan. Selama ini, pengaduan masih diproses berdasarkan urutan waktu masuk tanpa mempertimbangkan tingkat urgensi dan potensi dampak. Penelitian ini menawarkan solusi dengan mengembangkan sistem pengaduan masyarakat berbasis web yang mengintegrasikan metode Simple Additive Weighting (SAW) sebagai inti dalam proses penentuan prioritas. Metode SAW dipilih karena mampu memberikan perhitungan yang objektif dan sistematis berdasarkan lima kriteria utama, yaitu Tingkat Urgensi, Potensi Dampak, Jenis Pengaduan, Tingkat Kompleksitas Permasalahan, dan Lama Laporan. Dengan penerapan metode SAW, sistem tidak hanya mampu menyajikan informasi status dan kategori laporan, tetapi juga memberikan rekomendasi prioritas penanganan secara terukur. Hasil penelitian ini menunjukkan bahwa penerapan metode SAW menjadi kunci dalam meningkatkan efektivitas, efisiensi, serta responsivitas pelayanan pengaduan masyarakat di Dinas Cipta Bintar Kota Bandung, karena mampu mengatasi kelemahan sistem sebelumnya yang hanya mengandalkan urutan waktu masuk laporan.

**Kata Kunci:** Sistem Pengaduan Masyarakat; Dinas Cipta Bintar; Simple Additive Weighting (SAW); Penentuan Prioritas; Efektivitas Pelayanan.

## INTRODUCTION

In recent years, the Bandung City Public Works, Construction, and Spatial Planning Agency (Dinas Cipta Bintar) has experienced an increase in the number of public services, particularly those related to infrastructure and spatial planning issues. In response to this situation, Dinas Cipta Bintar developed a web-based service platform named SIPETRUK, aiming to facilitate the submission and handling of public reports more rapidly and effectively.

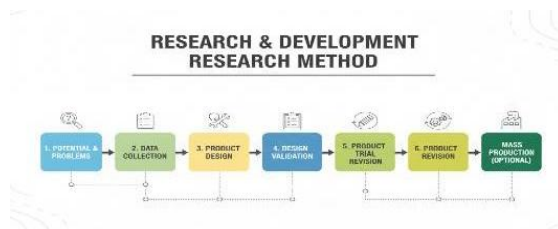
However, in its implementation, the complaint system within SIPETRUK still has several weaknesses. These include limitations in tracking the status of public reports, the absence of complaint category options, and most crucially, the lack of a mechanism for prioritizing complaints. As a result, all reports are handled based solely on their order of submission without considering the level of urgency and impact on the community.

As a solution, the application of a Decision Support System (DSS) using the Simple Additive Weighting (SAW) Method is proposed. This system is intended to help prioritize complaint reports based on several measurable criteria such as urgency level, location, and potential impact. With this system, the handling of complaints is expected to become more efficient, better targeted, and capable of increasing public trust.

## METHODOLOGY

### 1. Research and Development (R&D) Research Method

The research method used by the researcher is the Research and Development (R&D) method with qualitative research. This method is a scientific approach used to obtain data, with the goal of designing, creating, and testing a product that is effective, efficient, and practical (Sugiyono, 2021). The researcher recognizes that the objective of this study is not only to analyze the problems faced by the Dinas Cipta Bintar but also to address these problems with a concrete solution. One such solution can be realized through the application of an information technology tool that the researcher intends to implement.



**Figure 1.**  
Steps of the R&D Method

### 2. Simple Additive Weighting (SAW) Method

The basic concept of the SAW method is to find the weighted summation of the performance ratings for every alternative across all attributes. The SAW method requires the process of normalizing the decision matrix ( $X$ ) to a scale that can be compared with all existing alternative ratings (Sukaryati et al., 2022).

Steps of the Simple Additive Weighting (SAW) Method

- Determine the criteria to be used as a reference in decision-making, namely  $C_i$ .
- Determine the suitability rating for each alternative for each criterion.
- Create a decision matrix based on the criteria ( $C_i$ ), then normalize the matrix based on equations adjusted for attribute type (benefit or cost) to obtain a normalized matrix  $R$ .
- The final result is obtained from the ranking process, which is the sum of the multiplication of the normalized matrix  $R$  by the weight vector to obtain the highest value, which is selected as the best alternative ( $A_i$ ) as the solution.

The formula for normalizing the SAW method is:

$$r_{ij} = \begin{cases} \frac{x_{ij}}{\max_i x_{ij}} & \text{Jika } J \text{ adalah atribut keuntungan (benefit)} \\ \frac{\min_i x_{ij}}{x_{ij}} & \text{Jika } J \text{ adalah atribut biaya (Cost)} \end{cases}$$

$r_{ij}$  = Normalized performance rating.

$x_{ij}$  = Maximum value of each row and column.

$\min_{ij}$  = Minimum value of each row and column.

$x_{ij}$  = Row and column of the matrix.

While the preference value formula for each alternative SAW method :

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

$V_i$  = Final value of the alternative.

$W_j$  = Predetermined weight.

$r_{ij}$  = Normalized matrix.

A larger  $V_i$  value indicates that alternative  $A_i$  is more preferred.

### 3. System Development Method: Object-Oriented Analysis and Design (OOAD)

The system development technique used by the researcher is Object-Oriented Analysis and Design (OOAD). This is a systematic approach to software development that focuses on the concept of objects as the fundamental elements of the system. OOAD consists of two main stages: Object-Oriented Analysis and Object-Oriented Design.

Object-Oriented Analysis aims to identify user requirements and represent the elements within the system as objects. Object-Oriented Design, on the other hand, converts the analysis results into a model that can be implemented in program code (Rachmatika, 2025).

The researcher uses the Object-Oriented Analysis and Design (OOAD) approach because this technique makes it easier to design a system based on real-world objects present in the complaint process, such as the public (complainants), the complaint reports, and the agency administration. With OOAD, the system can be made more structured, easier to develop, and the logic of the process can be arranged more clearly. This approach is also suitable for integrating priority assessment methods like SAW, allowing the system to more effectively determine which complaints should be addressed first



**Figure 2.**  
Steps of the OOAD Method

## RESULT AND DISCUSSION

### 1. Research and Development (R&D) Research Method

#### a. Potentials and Problems

The primary problem identified is the issue arising in the handling of public complaints, specifically the lack of a system for prioritizing or ranking complaints.

#### b. Data Collection

This stage involved several methods

1. Field study at the Cipta Bintar Agency.
2. Interviews with relevant personnel.
3. Observation of the existing complaint flow.
4. Documentation review.
5. Literature study related to report handling processes.

#### c. Product Design

Designing a web-based public complaint system featuring a priority function based on the SAW method.

#### d. Design Validation

Seeking input from the Agency to assess the feasibility of the system design and the logic used for the Simple Additive Weighting (SAW) method.

#### e. Design Revision

Refining the system design based on the validation results (including the user interface, the SAW criteria, and the overall process flow).

#### f. Product Trial

Implementing the initial version of the system and conducting limited testing with several administrators using simulated complaint data.

#### g. Product Revision

Finalizing the system based on the results and feedback obtained during the limited product trial.

#### h. Mass Production (Optional)

If the Agency fully adopts the system, this stage would involve full implementation and subsequent staff training.

**2. Simple Additive Weighting (SAW) Method**

The Simple Additive Weighting (SAW) method involves the steps and implementation process to achieve decision-making results through ranking based on predetermined criteria and preference weights. This process yields the largest value, which will be identified as the best alternativ.

1. Determining Criteria and Weights

The first step of this method is to determine the criteria and weights. After the researcher obtained the results of interviews with the IT Administrator (Pranata Komputer) of the Cipta Bintar Agency, the following weights were established.

**Table 1.**  
Criteria dan Weights

Criteria Code	Criteria Name	Weight
C1	Urgency Level	30%
C2	Potential Impact	25%
C3	Complaint Type	20%
C4	Problem Complexity Level	15%
C5	Report Duration	10%

2. Determining Criteria Values, Conversion Values, and Attributes

The next step is to determine the criteria values, conversion values, and attributes for each criterion. In terms of attributes, there are Benefit and Cost. If a criterion's attribute is Benefit, a larger value is better. Conversely, if the attribute is Cost, a smaller value is better.

**Table 2.**  
Criteria Values, Conversion Values, and Attributes

No	Criterion	Criterion Code	Criterion Value	Conversion Value	Attribute
1	Urgency Level	(C1)	Very Urgent	5	<i>Benefit</i>
			Urgent	4	
			Moderate	3	
			Not Urgent	2	
			Regular	1	
2	Potential Impact	(C2)	Widespread Impact (General Public)	5	<i>Benefit</i>
			Several Community Units (RTs)	4	
			One Community Unit (RT)	3	
			Private Road	2	
			Individual Only	1	
3	Complaint Type	(C3)	Severely Damaged Infrastructure	5	<i>Benefit</i>
			Lightly Damaged Infrastructure	4	
			Administrative Service	3	
			Non-priority	2	
			Irrelevant	1	
	Problem		Complex and involves multiple parties (cross-sectoral)	5	
			Complex and requires additional verification	4	

No	Criterion	Criterion Code	Criterion Value	Conversion Value	Attribute
4	Complexity Level	(C4)	Moderate, clear enough and can be processed directly	3	<i>Cost</i>
			Simple with minor technical solution	2	
			Very simple, trivial or administrative complaint	1	
5	Report Duration (Timesince submission)	(C5)	7 -8 days	5	<i>Benefit</i>
			5-6 days	4	
			3-4 days	3	
			1-2 days	2	
			<1 days	1	

3. Determining Alternatives for Each Criterion

The next stage is to determine the alternatives. These alternatives are the complaint data from the Bandung City Cipta Binar Agency that serve as the comparative objects. Each complaint is assessed based on the five criteria that will differentiate and compare every alternative. The list of alternatives and their descriptive values are presented in the following table.

**Table 3.**  
 Alternatives for each criterion

Alternative	Criteria				
	Urgency Level (C1)	Potential Impact (C2)	Complaint Type (C3)	Problem Complexity Level (C4)	Report Duration (C5)
Landslide in Cemetery Area (A1)	Very Urgent	Several Community Units (RTs)	Severely Damaged Infrastructure	Complex and involves multiple parties (cross-sectoral)	7-8 Days
Severely Damaged Access Road to Cemetery (A2)	Urgent	One Community Unit (RT)	Severely Damaged Infrastructure	Moderate, clear enough and can be processed directly	5-6 Days
Complaint Regarding Unlicensed Building in Densely Populated Area (A3)	Moderate	Several Community Units (RTs)	Lightly Damaged Infrastructure	Complex and requires additional verification	3-4 Days
Illegal Trash Piles in Cemetery Land (A4)	Not Urgent	Private Road	Non-priority	Simple with minor technical solution	1-2 Days
Complaint on IRK, PBG, KRK, IKTR Regarding Administrative Filing (A5)	Moderate	Individual Only	Administrative Service	Very simple, trivial or administrative complaint	<1 Days

The next step is to normalize the alternative conversion values. The alternatives are converted into numerical

values ranging from a minimum of 1 to a maximum of 5, according to the established criterion values (as defined in Table 2).

**Tabel 4.**  
 Alternative Conversion Values (Decision Matrix)

No	Alternatif	Kriteria				
		C1	C2	C3	C4	C5
1	Landslide in Cemetery Area (A1)	5	4	5	5	5
2	Severely Damaged Access Road to Cemetery (A2)	4	3	5	3	4
3	Complaint Regarding Unlicensed Building in Densely Populated Area (A3)	3	4	4	4	3
4	Illegal Trash Piles in Cemetery Land (A4)	2	2	2	2	2
5	Complaint on IRK, PBG, KRK, IKTR Regarding Administrative Filing (A5)	3	1	3	1	1

4. Normalizing the Matrix

In the Simple Additive Weighting (SAW) method, two types of normalization formulas are used:

a. Benefit Criteria Type

Used if a larger value indicates a better alternative. The formula is :

$$r_{ij} = \frac{x_{ij}}{\max x_{ij}}$$

Meaning: The alternative value ( $x_{ij}$ ) is divided by the maximum value ( $\max(x_{ij})$ ) in that criterion column.

b. Cost Criteria Type

Used if a smaller value indicates a better alternative. The formula is:

$$r_{ij} = \frac{\min x_{ij}}{x_{ij}}$$

Meaning: The minimum value ( $\min(x_{ij})$ ) in the criterion column is divided by the alternative value ( $x_{ij}$ )

The following formulas are applied to the previously converted alternative values:

**C1 : Benefit = Alternative Criterion Value / Maximum Value**

$$r_{11} = \frac{5}{\max(5; 4; 3; 2; 3)} = \frac{5}{5} = 1$$

$$r_{21} = \frac{4}{\max(5; 4; 3; 2; 3)} = \frac{4}{5} = 0,8$$

$$r_{31} = \frac{3}{\max(5; 4; 3; 2; 3)} = \frac{3}{5} = 0,6$$

$$r_{41} = \frac{2}{\max(5; 4; 3; 2; 3)} = \frac{2}{5} = 0,4$$

$$r_{51} = \frac{3}{\max(5; 4; 3; 2; 3)} = \frac{3}{5} = 0,6$$

**C2 : Benefit = Alternative Criterion Value / Maximum Value**

$$r_{12} = \frac{4}{\max(4; 3; 4; 2; 1)} = \frac{4}{4} = 1$$

$$r_{22} = \frac{3}{\max(4; 3; 4; 2; 1)} = \frac{3}{4} = 0,75$$

$$r_{32} = \frac{4}{\max(4; 3; 4; 2; 1)} = \frac{4}{4} = 1$$

$$r_{42} = \frac{2}{\max(4; 3; 4; 2; 1)} = \frac{2}{4} = 0,5$$

$$r_{52} = \frac{1}{\max(4; 3; 4; 2; 1)} = \frac{1}{4} = 0,25$$

**C3 : Benefit = Alternative Criterion Value / Maximum Value**

$$r_{13} = \frac{5}{\max(5; 5; 4; 2; 3)} = \frac{5}{5} = 1$$

$$r_{23} = \frac{4}{\max(5; 5; 4; 2; 3)} = \frac{4}{5} = 0,8$$

$$r_{33} = \frac{3}{\max(5; 5; 4; 2; 3)} = \frac{3}{5} = 0,6$$

$$r_{43} = \frac{2}{\max(5; 5; 4; 2; 3)} = \frac{2}{5} = 0,4$$

$$r_{53} = \frac{3}{\max(5; 5; 4; 2; 3)} = \frac{3}{5} = 0,6$$

**C4 : Cost = Minimum Value / Alternative Criterion Value**

$$r_{14} = \frac{\min(5; 3; 4; 2; 1)}{5} = \frac{1}{5} = 0,2$$

$$r_{24} = \frac{\min(5; 3; 4; 2; 1)}{3} = \frac{1}{3} = 0,33$$

$$r_{34} = \frac{\min(5; 3; 4; 2; 1)}{4} = \frac{1}{4} = 0,25$$

$$r_{44} = \frac{\min(5; 3; 4; 2; 1)}{2} = \frac{1}{2} = 0,5$$

$$r_{54} = \frac{\min(5; 3; 4; 2; 1)}{1} = \frac{1}{1} = 1$$

**C5 : Benefit = Alternative Criterion Value / Maximum Value**

$$r_{15} = \frac{5}{\max(5; 4; 3; 2; 1)} = \frac{5}{5} = 1$$

$$r_{25} = \frac{4}{\max(5; 4; 3; 2; 1)} = \frac{4}{5} = 0,8$$

$$r_{35} = \frac{3}{\max(5; 4; 3; 2; 1)} = \frac{3}{5} = 0,6$$

$$r_{45} = \frac{2}{\max(5; 4; 3; 2; 1)} = \frac{2}{5} = 0,4$$

$$r_{55} = \frac{1}{\max(5; 4; 3; 2; 1)} = \frac{1}{5} = 0,2$$

**Normalized Results (Matrix R)**

The following is an attachment of the calculation results presented in matrix form for each criteria value of the alternative.

$$R = \begin{bmatrix} 1 & 1 & 1 & 0,2 & 1 \\ 0,8 & 0,75 & 0,8 & 0,33 & 0,8 \\ 0,6 & 1 & 0,6 & 0,25 & 0,6 \\ 0,4 & 0,5 & 0,4 & 0,5 & 0,4 \\ 0,6 & 0,25 & 0,6 & 1 & 0,2 \end{bmatrix}$$

**Calculation Process for Finding Preference Value (Vi)**

In the next stage, namely the calculation process to determine the preference value attached below.

$$V_1 = (1 \times 0,3) + (1 \times 0,25) + (1 \times 0,2) + (0,2 \times 0,15) + (1 \times 0,1) = \mathbf{0,88}$$

$$V_2 = (0,8 \times 0,3) + (0,75 \times 0,25) + (0,8 \times 0,2) + (0,33 \times 0,15) + (0,8 \times 0,1) = \mathbf{0,717}$$

$$V_3 = (0,6 \times 0,3) + (1 \times 0,25) + (0,6 \times 0,2) + (0,25 \times 0,15) + (0,6 \times 0,1) = \mathbf{0,6475}$$

$$V_4 = (0,4 \times 0,3) + (0,5 \times 0,25) + (0,4 \times 0,2) + (0,5 \times 0,15) + (0,4 \times 0,1) = \mathbf{0,44}$$

$$V_5 = (0,6 \times 0,3) + (0,25 \times 0,25) + (0,6 \times 0,2) + (1 \times 0,15) + (0,2 \times 0,1) = \mathbf{0,5325}$$

**Process of Calculating the Preference Value (Vi)**

The final stage of the simple additive weighting (SAW) calculation process after determining the preference value (Vi) calculation process is ranking, which is used to determine the best alternative with the highest score, as attached below.

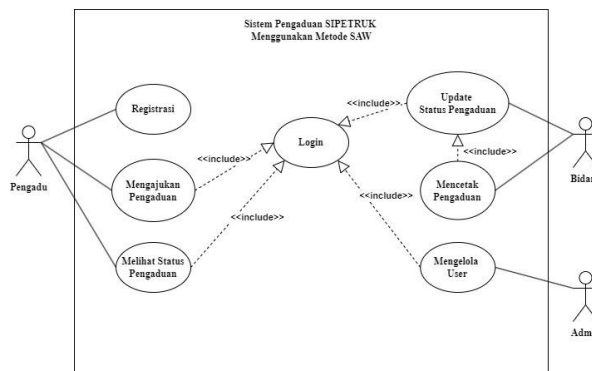
**Table 5.**  
Preference value results

Alternative Code	Alternative	result Vi	Ranking
A1	Landslide in Cemetery Area	0,88	1
A2	Severely Damaged Access Road to Cemetery	0,717	2
A3	Complaint Regarding Unlicensed Building in Densely Populated Area	0,6475	3
A4	Complaint on IRK, PBG, KRK, IKTR Regarding Administrative Filing	0,44	5
A5	Illegal Trash Piles in Cemetery Land	0,5325	4

**3. System Development Method: Object-Oriented Analysis and Design (OOAD)**

**a. Usecase Diagram**

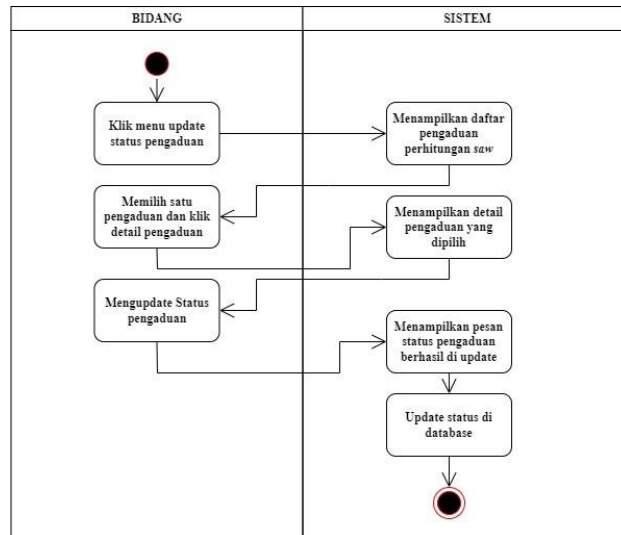
This diagram illustrates the main functionalities of the system and the interactions between the actors (Admin, Complainant, and Department) with the available use cases. This diagram displays what each actor can do.



**Figure 3.**  
Usecase Diagram

**b. Activity Diagram**

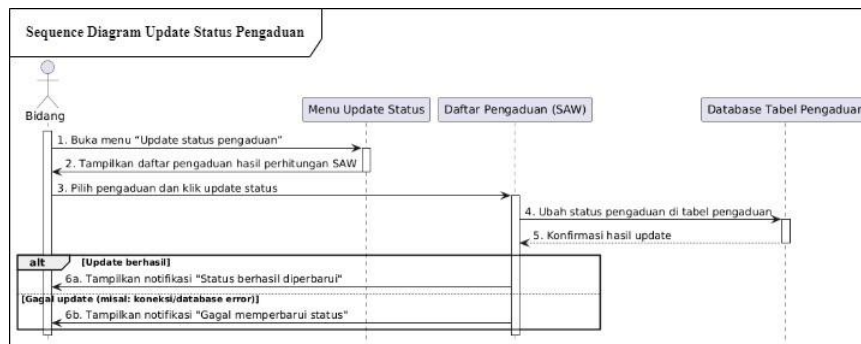
There is an Activity Diagram for the status update of a complaint by the Department, as this is where the Simple Additive Weighting method is implemented.



**Figure 4.**  
Activity diagram update status complaint

**c. Sequence Diagram**

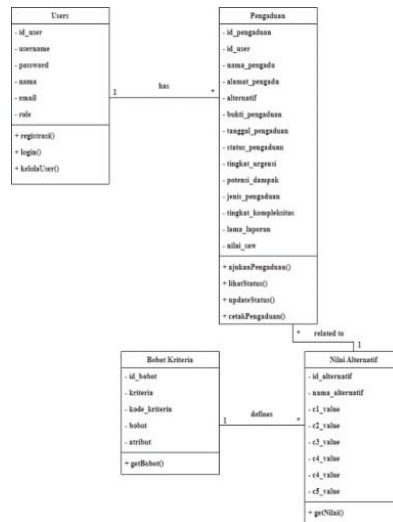
This diagram details the interactions between objects within the system during the ranking process. It shows how the Department interacts with the ranking page to view the ranking data, which appears after the Complainant submits a new complaint.



**Figure 5.**  
Sequence diagram update status complaint

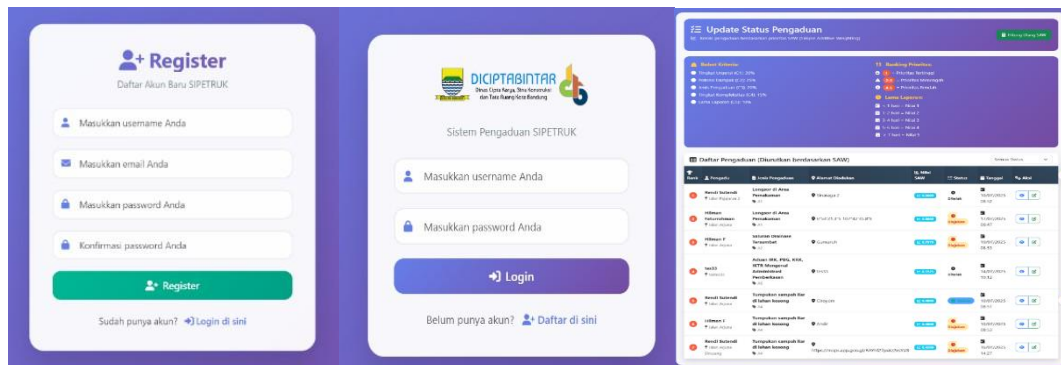
**d. Class Diagram**

This diagram represents the static structure of the system, showing the relationships between objects such as the User, Complaint, Alternative Value, and Criteria Weight. This structure serves as the basis for designing the database schema.



**Figure 6.**  
Class Diagram

In the implementation phase, the interface is created based on the design completed in the previous phase to facilitate user understanding of the system. The following is an example of a page accessible to Department users. This page also displays the Simple Additive Weighting ranking results, calculated using the steps described in the SAW methodology section. Departments can update the complaint status on this page.



**Figure 7.**  
Complaint status update, login, register page

**CONCLUSIONS AND SUGGESTIONS**

This research successfully designed and implemented a web-based public complaint service system that is equipped with the Simple Additive Weighting (SAW) method to determine the priority of complaint handling. The system was developed to address various identified problems, such as the absence of complaint status tracking, the lack of complaint type classification, and the absence of a priority determination system based on urgency, impact, and complexity of the reports. Through the implementation of the SAW method, the system is capable of calculating the preference value for each complaint based on five main criteria: Urgency Level, Potential Impact, Complaint Type, Problem Complexity Level, and Report Duration. This ensures that more critical and high-impact complaints can be prioritized for follow-up. Thus, the developed system has successfully addressed the background and main problems of the research, providing a concrete solution to improve the quality of public complaint services at the Bandung Cipta Bintang Agency.

**Continuous Development** The system can be further developed by adding features for automatic notifications (via email or SMS) so that the public receives the latest information regarding the progress of their complaints. **Integration with Other Systems** The system can be integrated with other applications or systems owned by the city government, allowing cross-agency complaint flows to be managed centrally. **Adding Alternatives or Complaint Types** It is suggested that the system provide more types or categories

of complaints as alternatives for assessment. This will allow public reports to be better classified and aligned with the authority of each respective department.

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