

Implementation of the Simple Additive Weighting Method in Determining Promotional Locations for Prospective New Student Admissions in Colleges

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Abstract

Universities are currently competing in the selection of prospective students. By attracting high school graduates and others to continue their education to a higher level of education, universities promote high schools and vocational schools in the surrounding area. Every year, universities actively conduct promotional activities to gain the capacity that has been targeted by university leaders. One of the obstacles faced by universities in achieving the promotion target is the number of high schools and vocational schools spread across all provinces in Indonesia. The promotion section in determining the target area of promotion is requested by university leaders to be right on target because the budget of each university is limited. Determining the right promotion target can help universities strategize and use the budget appropriately and efficiently. The Simple Additive Weighting (SAW) method was chosen because it has an easy-to-understand concept. The criteria used in this study are: 1) the number of private universities in the district; 2) the number of high schools and vocational schools in the district; 3) the number of students in the district; and 4) the distance of private universities from the district.

Keywords: student admissions, promotion, simple additive weighting methods

1. Introduction

Private college (PTS) are currently competing to recruit prospective students. By attracting high school graduates and others to continue their education at a higher level, PTS carries out promotions to high schools and vocational schools in the surrounding area. Every year, PTS actively carries out promotional activities to obtain the capacity that has been targeted by university leaders. Marketing is one of the company's activities that is directly related to consumers [1]. In this opinion, through marketing, we introduce the products we offer. Various kinds of promotions are carried out in order to attract prospective new students. One of the promotions carried out by PTS is promoted directly or through social media [2]. One of the obstacles faced by private universities in achieving promotion targets is the large number of high schools and vocational schools spread across all provinces in Indonesia.

The promotion section, in determining promotional target areas, is asked by higher education leaders to be right on target due to the limited budget of each private university. Decision support systems are computer-based systems designed to help decision-makers solve various unstructured problems using certain data and models [3]. Decision support system can be the basis for providing recommendations for promotional target areas for private universities. Determining the right promotional target can help PTS develop strategies and be able to use the budget appropriately and efficiently. The Simple Additive Weighting (SAW) method is a calculation method carried out by determining alternatives, where alternatives are assessed based on predetermined criteria and a weight is given to each criterion [4]. The SAW method was chosen because it has a concept that is easy to understand.

The advantage of the SAW method, according to [5], when compared to other decision support models lies in its ability to carry out assessments more precisely because it is based on predetermined criteria values and preference weights. The criteria used in this research are: 1) the number of PTS in the district; 2) the number of SMA/SMK in the district; 3) the number of students in the district; and 4) the distance of the PTS from the district. According to Sahadi, the advantage of SAW compared to other decision support models is its ability to make more accurate assessments because it is based on predetermined criteria values and priority weights [6].

According to Febryanlahanuji, he concluded that he had succeeded in creating an information system to support decisions on selecting the best employees using the Simple Additive Weighting (SAW) method at PT. Campus Data Media, and this system provides the best suggestion solutions for users according to the criteria and weights determined at the beginning [7]. Based on the problems above, researchers are interested in conducting research with the title Implementation of the Simple Additive Weighting Method for Determining Promotional Locations for Prospective New Student Admissions at College.

2. Research Methodology

2.1. Research Flow Scheme

The research stages include problem formulation, namely collecting problems that exist in determining the location for accepting new students. At the data collection stage, data collection was carried out in the form of interviews and literature studies to support this research. Then a system analysis is carried out according to research needs. After that, the system is implemented based on the needs that have been created. In the next stage, system testing is carried out, where testing is carried out by comparing system results with manual calculation results.



Fig. 1: Research Flow Scheme

2.2. Needs Analysis

From the results of literature studies and observations, in research determining the location for accepting new students, four criteria can be determined, namely:

X1: Number of High Schools / Vocational Schools in the district;

X2: Number of active students in the district;

X3: Number of universities in the district;

X4: Distance from university to district

For weight $W = [3, 4, 1.5, 1.5]$,

Table 1: Criteria

| Number | Code | Criterion Name | Type | Weight |
|--------|------|---|---------|--------|
| 1 | X1 | Number of high schools and vocational schools in the district | Benefit | 3 |
| 2 | X2 | Number of active students in the district | Benefit | 4 |
| 3 | X3 | Number of universities in the district | Cost | 1.5 |
| 4 | X4 | Distance from college to district | Cost | 1.5 |

Next, weighting is carried out for each criterion (x1, x2, x3, and x4). For each alternative, we apply the following weighting:

Table 2: X1 Weight (Number of High Schools /Vocational Schools in the district)

| X1 | Weight |
|-------|--------|
| 0-20 | 1 |
| 21-40 | 2 |
| 41-60 | 3 |
| 61-80 | 4 |
| >80 | 5 |

Table 3: X2 Weight (Number of active students in the district)

| X2 | Weight |
|-------------|--------|
| 0-5000 | 1 |
| 5001-10000 | 2 |
| 10001-20000 | 3 |
| 20001-30000 | 4 |
| >30000 | 5 |

Table 4: X3 Weight (Number of universities in the district)

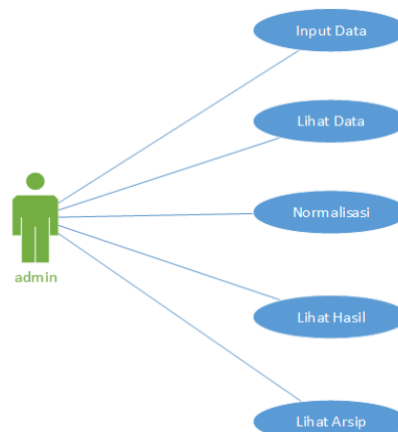
| X3 | Weight |
|-------|--------|
| 0-5 | 1 |
| 6-10 | 2 |
| 11-15 | 3 |
| 16-20 | 4 |
| >20 | 5 |

Table 5: X4 Weight (Distance from university to district)

| X4 | Weight |
|---------|--------|
| 0-200 | 1 |
| 201-400 | 2 |
| 401-600 | 3 |
| 601-800 | 4 |
| >800 | 5 |

2.3. System Planning

System design is intended to help solve problems in the running system. In designing a system, you must go through the system design stages. This system design stage uses a use-case diagram. A use case diagram is an outline depiction of the system being created and shows the roles of actors who are directly involved with the system [8]. Use case diagrams show actors, use cases and interactions that use the system [9]. The following is a use-case diagram shown in Fig. 2.

**Fig. 2:** A use Case Diagram

2.4. Database Design

Database design is a process for producing a database as a storage place [10]. In this study, one table was used with the following description:

Table 6: Database Design

| Number | Field | Type | Null | Key |
|--------|------------|-------------|------|-------------|
| 1 | Id_regency | Int(5) | No | Primary Key |
| 2 | Nm_regency | Varchar(50) | No | |
| 3 | jumsma | Int(5) | No | |
| 4 | jumstudent | Int(5) | No | |
| 5 | jumpt | Int(5) | No | |
| 6 | distance | Int(5) | No | |

3. Results and Discussion

3.1. System Implementation

System implementation is the result of the design of the system that has been created. The system implementation is adjusted to the system design so that the system created can answer the problems that occur. The following is a screenshot of the system implementation

based on the user section. The main page is the initial page that can be accessed. This page contains a form with several menu options, namely: home, input data, view data, normalization, results, and archive. The following is a screenshot of the main index page shown in Fig. 3.



Fig. 3: System Implementation

Figure 4 is the display for data input. This page is used to input data from several alternatives based on their respective criteria values. The following is a screenshot of that page.



Fig. 4: Display for Data Input

In figure 5, there is a display to show the results of normalization of calculations using the SAW method. This page will display data normalization based on the criteria for each alternative that has been input on the data input page. The following is a screenshot of that page.

| No | Nama Kabupaten | Jumlah SMA/SMK | Jumlah Siswa | Jumlah PT | Jarak |
|-----|--------------------------|----------------|--------------|-----------|---------|
| 1. | kab. Lombok timur | 1 | 1 | 1 | 1 |
| 2. | Kab. Tana Toraja Selatan | 1 | 0,8 | 1 | 0,2 |
| 3. | Kab. Lombok tengah | 1 | 1 | 1 | 1 |
| 4. | kab. Lombok barat | 1 | 0,8 | 1 | 1 |
| 5. | kab. jember | 1 | 1 | 0,23333 | 0,5 |
| 6. | kab. bojonegara | 1 | 1 | 0,5 | 0,23333 |
| 7. | Kab. Bojonegara | 1 | 1 | 0,5 | 0,23333 |
| 8. | Kab. Sukorejo | 1 | 1 | 0,5 | 0,5 |
| 9. | kab. bojonegara | 1 | 1 | 0,5 | 1 |
| 10. | kab. panyampan | 1 | 1 | 1 | 0,5 |

Fig. 5: Normalization Page

Fig. 6 is a display to show the final results and ranking of the SAW method calculations. The following is a screenshot of that page.



Fig. 6: Promotion Location Ranking Results Page

3.2. System Testing

At this stage, manual calculation tests were carried out using the Simple Additive Weighting (SAW) method. There are 4 criteria, namely the number of high schools and vocational schools in the district, the number of high school and vocational school students in the district, the number of university and the distance to the district. The case example in this research is that XYZ College has a data table like Table 7 below.

Table 7: A Case Example at XYZ College

| Number | Region | Number Of High Schools / Vocational Schools | Number of Students | Number of Universities | Distance |
|--------|-----------------------------|---|--------------------|------------------------|----------|
| 1 | South Central Timor Regency | 91 | 23754 | 1 | 1636 |
| 2 | East Lombok Regency | 179 | 42908 | 8 | 195 |
| 3 | Central Lombok Regency | 150 | 30671 | 3 | 144 |
| 4 | West Lombok Regency | 85 | 22595 | 0 | 128 |
| 5 | Jember Regency | 242 | 73112 | 12 | 248 |
| 6 | Lamongan Regency | 148 | 39624 | 6 | 478 |
| 7 | Bojonegoro Regency | 109 | 40914 | 8 | 567 |
| 8 | Sidoarjo Regency | 157 | 76323 | 8 | 399 |
| 9 | Banyuwangi Regency | 145 | 57100 | 8 | 141 |
| 10 | Pasuruan Regency | 110 | 42607 | 5 | 381 |

The data above is then matched with the value of each criterion, which can be seen in Table 8.

Table 8: Convert Values Based on Values In Criteria

| Number | Region | Number Of High Schools / Vocational Schools | Number of Students | Number of Universities | Distance |
|--------|-----------------------------|---|--------------------|------------------------|-----------|
| | | X1 (benefit) | X2 (benefit) | X3 (cost) | X4 (cost) |
| 1 | South Central Timor Regency | 5 | 4 | 1 | 5 |
| 2 | East Lombok Regency | 5 | 5 | 2 | 1 |
| 3 | Central Lombok Regency | 5 | 5 | 1 | 1 |
| 4 | West Lombok Regency | 5 | 4 | 1 | 1 |
| 5 | Jember Regency | 5 | 5 | 3 | 2 |
| 6 | Lamongan Regency | 5 | 5 | 2 | 3 |
| 7 | Bojonegoro Regency | 5 | 5 | 2 | 3 |
| 8 | Sidoarjo Regency | 5 | 5 | 2 | 2 |
| 9 | Banyuwangi Regency | 5 | 5 | 2 | 1 |
| 10 | Pasuruan Regency | 5 | 5 | 2 | 2 |

Next, create a decision matrix based on the criteria, then carry out a normalized matrix with the formula so that the results can be seen in Table 9.

Table 9: Normalization

| Number | Region | Number Of High Schools / Vocational Schools | Number of Students | Number of Universities | Distance |
|--------|-----------------------------|---|--------------------|------------------------|----------|
| | | X1 | X2 | X3 | X4 |
| 1 | South Central Timor Regency | 1 | 0.8 | 1 | 0.2 |
| 2 | East Lombok Regency | 1 | 1 | 0.5 | 1 |
| 3 | Central Lombok Regency | 1 | 1 | 1 | 1 |
| 4 | West Lombok Regency | 1 | 0.8 | 1 | 1 |
| 5 | Jember Regency | 1 | 1 | 0.33 | 0.5 |
| 6 | Lamongan Regency | 1 | 1 | 0.5 | 0.333333 |
| 7 | Bojonegoro Regency | 1 | 1 | 0.5 | 0.333333 |
| 8 | Sidoarjo Regency | 1 | 1 | 0.5 | 0.5 |

| | | | | | |
|----|--------------------|---|---|-----|-----|
| 9 | Banyuwangi Regency | 1 | 1 | 0.5 | 1 |
| 10 | Pasuruan Regency | 1 | 1 | 0.5 | 0.5 |

The final stage in this calculation is to multiply the value of each alternative by the weight of the criteria. So the results can be seen in Table 10.

Table 10: The Calculation Results

| Number | Region | V-Value |
|--------|-----------------------------|---------|
| 1 | South Central Timor Regency | 0.8 |
| 2 | East Lombok Regency | 0.925 |
| 3 | Central Lombok Regency | 1 |
| 4 | West Lombok Regency | 0.92 |
| 5 | Jember Regency | 0.825 |
| 6 | Lamongan Regency | 0.825 |
| 7 | Bojonegoro Regency | 0.825 |
| 8 | Sidoarjo Regency | 0.85 |
| 9 | Banyuwangi Regency | 0.925 |
| 10 | Pasuruan Regency | 0.85 |

From the results of the manual calculations above, when compared with the calculations in the system, the comparison results can be seen in Table 11.

Table 11: Comparison of System Results and Manual Calculations

| Number | Region | Manual Value | System Value |
|--------|-----------------------------|--------------|--------------|
| 1 | South Central Timor Regency | 0.8 | 0.8 |
| 2 | East Lombok Regency | 0.925 | 0.925 |
| 3 | Central Lombok Regency | 1 | 1 |
| 4 | West Lombok Regency | 0.92 | 0.92 |
| 5 | Jember Regency | 0.825 | 0.825 |
| 6 | Lamongan Regency | 0.825 | 0.825 |
| 7 | Bojonegoro Regency | 0.825 | 0.825 |
| 8 | Sidoarjo Regency | 0.85 | 0.85 |
| 9 | Banyuwangi Regency | 0.925 | 0.925 |
| 10 | Pasuruan Regency | 0.85 | 0.85 |

4. Conclusions and Suggestions

Based on the results of the research that has been carried out, it can be concluded that determining promotional locations for prospective new student recipients uses the Simple Additive Weighting (SAW) method, so that it can make it easier for related parties to provide more accurate recommendations for promotional locations. In the process of determining the promotional location for prospective new student recipients, several specified criteria are used, namely the number of high schools or vocational schools, the number of students, the number of universities, and the distance. This research still has many shortcomings, namely that, with a large amount of data, it will take time to fill in the data. So for further research development, it is necessary to provide additional functions to make it easier to input large amounts of data.

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