Advance Sustainable Science, Engineering and Technology (ASSET)
Vol. 6, No.1, January 2024, pp. 02401013-01 ~ 02401013-010
ISSN: 2715-4211 DOI: https://doi.org/10.26877/asset.v6i1.17816

Implementation of a Decision Support System with a Simple Additive Weighting Method for the Selection of Quality Bird Breeder

Naafi Septianto*, Joko Aryanto

Faculty of Sains & Technology, Universitas Teknologi Yogyakarta, Jl. Siliwangi Jl. Ring Road Utara Daerah Istimewa Yogyakarta 55285, Yogyakarta, Indonesia

*naafiseptianto9@gmail.com

Abstract. Indonesia is a country blessed with abundant natural resources, one of which is the diverse variety of chirping birds that captivate the attention of many. The high demand for these birds has led to a decline in the population of wild chirping birds due to increased illegal capture. To address this issue, bird breeding programs have been implemented. The selection of superior quality chirping birds will determine the offspring produced. Superior quality bird brooders can also increase the selling price of the resulting chicks. Therefore, the determination of superior quality bird breeders is very crucial for decision makers who are related in this case are chirping bird breeders. If it is not done properly and accurately, the wrong selection of chirping birds often results in various problems. Some of the problems that arise include the results of tillers that have low quality to the difficulty of selling livestock produced tillers. Decision-making models can be used to help chirping bird breeders make decisions. The Simple Additive weighting (SAW) method is expected to be able to help overcome the problems encountered. The purpose of this study was to create a decision-making system for the selection of superior quality chirping birds. It is hoped that there will be no mistakes in the selection of chirping birds.

Keywords: Chirping Birds, Decision Support System, Ranch, Selection, Simple Additive Weighting, Superior Quality.

(Received 2023-12-15, Accepted 2023-12-21, Available Online by 2024-01-02)

1. Introduction

Indonesia is a country rich in natural wealth, and one of its natural wealth is the existence of various kinds of biological and animal in Indonesia[1]. The variety of fauna in Indonesia makes it a special attraction for local and foreign residents. This results in many individuals who want to keep some types of fauna. Birds play a crucial role in the ecosystem, serving as natural pest control, pollinators, and seed dispersers. They also serve as indicators of environmental changes and health, including seasonal changes[2]. Because their attractive colors and melodious chirps can be used by some people as stress relievers. Indonesian endemic songbirds have a wide variety of species, ranging from protected to

unprotected, from cheap to expensive. Some of the songbird species that are in demand as pets include Murai Batu (Copsychus Malabaricus), Cucak Rowo (Pycnonotus Zeylanicus), Kacer (Copsychus Saularis), and Cucak Hijau (Chloropsis Sonnerarti)[3]. These types of songbirds are in demand because they have melodious chirps and can mimic the chirps of other birds. Because of the large number of songbirds in demand, there has been a massive capture in the wild. Excessive wild capture has caused the population of some songbird species to decline dramatically. This can lead to the extinction of some species[4].

The decline in population due to excessive illegal capture can be overcome by conducting conservation to carry out cultivation or what is familiarly called breeding. Captive breeding also cannot be carried out arbitrarily, it is necessary to pay attention to several aspects, especially the quality aspects of the captive breeding results. Superior quality is obtained from broodstock that has superior quality. This can affect the benefits obtained by breeders because if the quality is superior, the selling price of the catch is higher and balanced with the higher demand. This research implements the Simple Additive Weighting (SAW) method which is one of the methods of the decision support system. Decision Support Systems can also provide solutions in problem-solving with various conditions both structured and unstructured[5]. SAW method used to determine or select songbirds that are suitable for breeding and have superior quality. This method is done by finding the weight value on each attribute, then the ranking process is carried out to determine the optimal alternative, namely songbird broodstock that is feasible and of superior quality as a broodstock because the SAW method is widely used for deciding support system that focuses more on many criteria[6]. Not only involving criteria, the main point in determining the results in the SAW method is the existence of choices[7]. Simple Additive Weighting (SAW) method is a decision support system technique that involves summation with weights. The basic concept of this method lies in the weighted calculation of performance values for each alternative across predetermined criteria. SAW requires a calculation process to normalize the decision matrix (X) into a scale that can be compared with alternative assessment criteria. In the data processing phase, the SAW method can process all alternatives and assessment criteria, producing the best alternative among those provided in this decision support system. This process involves careful calculations to enable effective comparison among alternatives assessed based on predetermined criteria[8].

Several research results that have been conducted by previous researchers who have similar themes and fields in implementing the Simple Additive Weighting (SAW) method to provide decision recommendations with the research to be carried out. Research by Eky Khoiril Ulama[9] with the title Decision Support System for Selection of Ready-to-Sell Cattle (Lembu Jaya Lestari Central Lampung) Using the SAW Method. The research discusses the implementation of a decision support system with the Simple Additive Weighting (SAW) method for selecting cows that are ready to be sold. The input data used in this study are Weight, Health, Height, Age, and Chest Circumference. The test results conducted by this study resulted in an accuracy rate of 89.07% based on testing on 5 respondents. Research by Devi[10] with the title Best Employee Selection Application with Simple Additive Weighting Method (Case Study Citra Widya Teknik). The research implements the Simple Additive Weighting method to support the selection of the best employees with the criteria of responsibility, job knowledge, cooperation, and quality of work. The research aims to help the owner of Citra Widya Teknik choose which employee is the best of all existing employees. This research on the implementation of a decision support system with the Simple Additive Weighting (SAW) method to provide recommendations for quality bird breeders has one main goal. The goal is to help breeders choose superior quality birds to be used as brooders to produce the best quality catches possible. So that the breeder can participate in the preservation of existing songbirds and get income from breeding because it can attract more customers with superior quality breeding results. As for other goals and expectations, namely being able to help bird hobbyists in choosing birds that have superior quality to be used as pets as entertainment to relieve fatigue after doing tiring activities and can also help ordinary people who do not have experience in choosing birds that have superior quality. This system is also built as a learning medium for hobbyists and breeders to select quality birds.

2. Methods

The methodology of this research is shown in Figure 1, which describes the flow of the research. It starts with the identification of the Problem, Data Collection, Designing System, Implementation System, Testing System, and conclusion.

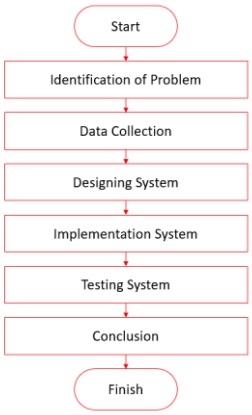


Figure 1 Research Methodology

2.1 Identification of Problem

In this state, an evaluation of the current operational system is conducted, offering streamlined solutions to enhance the efficiency of the existing processes. The analysis of the system that runs at the Mbah Kebhon Bird Farm can be seen in Figure 2. From Figure 2 it can be concluded that the steps taken by farmers are still done manually which results in frequent errors in selecting birds as broodstock. Sometimes there is also doubt in deciding which bird to choose.

Figure 2 Current System

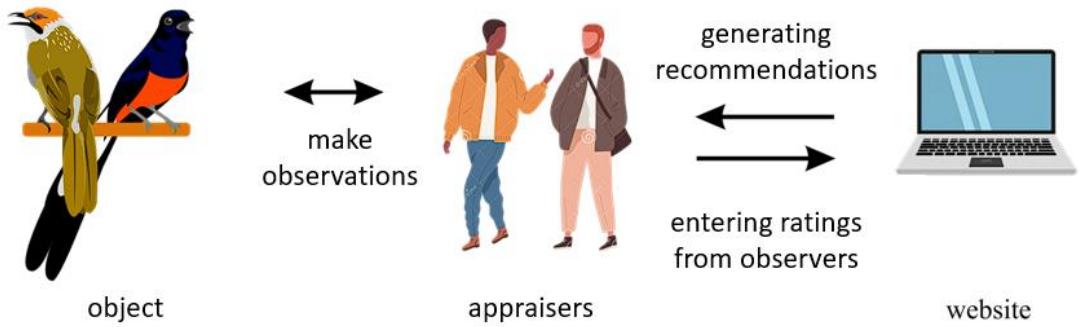


Figure 3 Proposed System

In Figure 3 is the proposed system to be created, the appraiser or in this case a breeder gets recommendations for quality songbirds to be used as broodstock. The results of the assessment are then entered into a decision support system with the SAW method for parent bird selection. Then the value is processed by the method used to produce recommendations on which songbirds have superior quality to be used as broodstock.

2.2 Data Collection

The data that will be used in the research Implementation of a Decision Support System with a Simple Additive Weighting Method for Selection of Quality Bird Breeds is obtained through interviews with breeders who breed songbirds. Interview is one of the data collection methods, especially qualitative research data by following procedures to produce maximum data results and not disappoint[11] **,** data on what criteria are usually used as reference standards in selecting birds that will be used as broodstock. They also obtained data in the form of data on the results of the assessment carried out on the available prospective brood birds. Knowledge data is obtained in the form of how the assessment is usually done by breeders and knowledge data in the form of how to breed songbirds properly and correctly. Also obtained data on how the system is desired by its users later.

The data that will be used in the research Implementation of a Decision Support System with Saw Method for Selection of Bird Breeders (Case Study: Mbah Kebhon Bird Farm), obtained directly through the owner of Mbah Kebhon Bird Farm using the interview method. In obtaining and collecting data, data collection methods are used in the form of interviews. Interviews were conducted directly with the owner of Mbah Kebhon Bird Farm, the location of this research case study. This is done to get clearer and more precise data and so that the data has high accuracy. In obtaining and collecting data, data collection methods are used in the form of interviews. The interview was conducted directly with the owner of Mbah Kebhon Bird Farm, the location of this research case study. This is done to get clearer and more precise data and so that the data has high accuracy.

2.3 System design

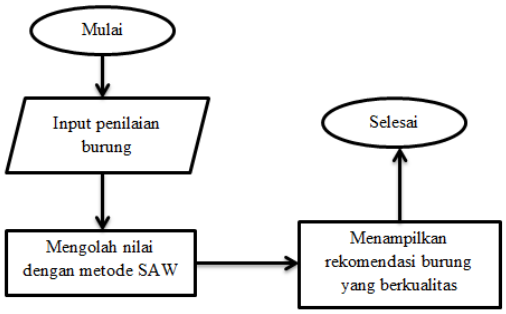


Figure 4 system workflow diagram

The design phase is employed to define the system to be constructed, encompassing the creation of workflow diagrams, activity diagrams, and feature design. In Figure 4 regarding the system workflow diagram, it can be seen the flow of the system that will be used by its users. The first flow is when the user has started entering the system, then the user can enter the results of the assessment based on observations made of prospective songbirds that will be selected as broodstock. Then the system will perform calculations with the SAW method to be able to bring up recommendations that will be displayed. then the system will display the results of songbird recommendations that have superior quality and will be used as broodstock. Then the system is finished Data Flow Diagrams, namely data or process logic, are made to describe the flow of data to and from the system where it is stored, the processes that generate data, and the interactions that occur between data and processes imposed on that model[12]

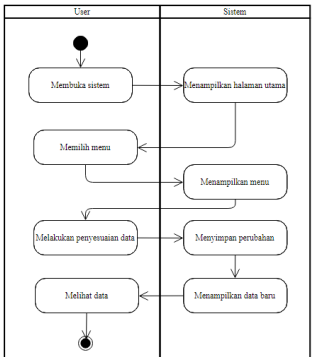


Figure 5 Activity Diagram

In Figure 3. above shows the activity diagram of the system that the user will do when the user opens the system. Activity Diagrams detail the flow of work in a system and define the order in which the system is displayed. With specialized components connected by arrows, this diagram depicts the sequence of activities from start to finish[13] . Users will first be directed to the main page which displays various features or menus available. Then after the user selects the menu that will be used, the contents of the menu page will appear. Furthermore, users can enter or adjust the data. After the user makes changes to the data, the system will save and calculate the data. Then the system will display the results of the calculation as a recommendation to the user. Next, the user sees the data from the calculation and then finishes.

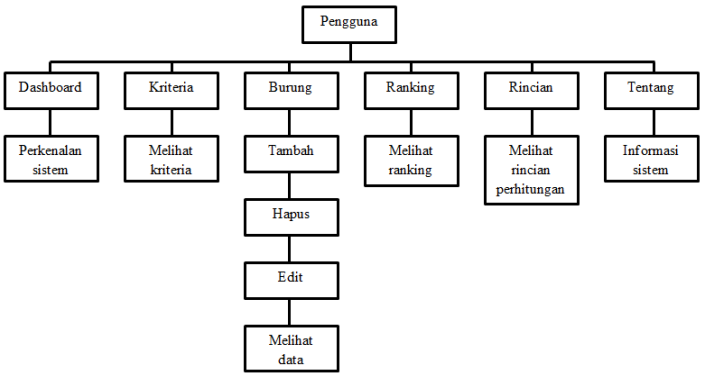


Figure 6 Feature Design.

The feature design contains all the features that can later be used by system users. The feature design is displayed in the form of a flowchart. Flowchart is a tool that shows the steps of solving a computational problem through expression in a series of special graphical symbols[14]. These features are designed according to the needs of users of this system. Because it is expected that the features created can help users appropriately. The following feature design will be built. Figure 6. shows the design of the features that will be made which will be used by users of the system. Six features that will be displayed, namely dashboard, criteria, birds, ranking, details, and about. Each feature has its uses according to the needs of its users.

2.4 Implementation Phase

This website is developed using the PHP programming language and incorporates Bootstrap to craft a user-friendly interface. Additionally, the website integrates the SAW algorithm for processing user-input data. The SAW (Simple Additive Weighting) method is employed in this research due to its relative ease of implementation,

facilitated by its straightforward concept. This simplicity enables developers to swiftly apply it in data processing. Moreover, it facilitates multi-criteria assessment, allowing each criterion to be assigned a weight based on its level of importance. So, this is a computer-based support system for decision-making management related to problems according to aspects of work. The SAW method is recommended to solve selection problems in multi-process decision-making systems. The SAW method is a method that is widely used in decision making that has many attributes. The SAW method requires a normalization process of the decision matrix (X) to a scale that can be compared with all existing alternative ratings[15]. The formula for normalizing is as follows:

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max\ x_{ij}} \ if\ j\ atribut\ benefit & (1) \\ \dfrac{Min\ x_{ij}}{x_{ij}} \ if\ j\ atribut\ cost & (2) \end{cases}$$

Caption:
Max Xij : The greatest value of each criterion i
Min Xij : The smallest value of each criterion i
Xij : The attribute value that each criterion has
Benefit : If the largest value is the best
Cost : If the smallest value is the best
Rij : Normalized performance rating

The convention value for each alternative (Vi) is given as:

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

Caption:
Vi : Ranking for each alternative
Wj : Ranking weight value (of each criterion)
Rij : Normalized performance rating value

The results of the calculation of the greater Vi value indicate that alternative i is the best alternative.

3. Results and Discussion

3.1 Results

After conducting research and design, a system is produced that can support farmers in making decisions on the selection of quality bird breeds. The resulting system uses the Simple Additive Weighting (SAW) method to provide recommendations for quality birds. The system is made with a responsive website base so that it is easy to open anywhere and on any device. Providing recommendations in the form of rankings can make it easier for users to see the results of recommendations. The main page display can be seen in Figure 7 below. In the left image, the system display is shown when accessed via a PC device while on the right, the system display is shown when accessed via a smartphone or the like.

Figure 7 Main Page.

The system that has been created has several menus that are used to support the running of the system. The menu created contains things that are used in the calculation of recommendations and information about the system. The

menus contained in the system include the Dashboard menu, this menu contains an introduction to the system to its users by displaying a brief explanation of the system such as the name and use of the system. Next, there is a Criteria menu that displays the criteria of the assessment used to assess the candidate birds to be selected as broodstock, each criterion has a percentage of the level of importance of each according to the needs of the breeder. Furthermore, there is a bird menu that contains bird identity data and the results of the assessment of the assessor in this case the breeder against the candidate bird. To get a more objective recommendation, there are two assessor inputs so that later the resulting recommendation value is the average value of the two assessors. This is expected to increase the level of accuracy in providing recommendations. There is a Ranking menu that contains the results of calculations that have been carried out by the system which is a recommendation to breeders to select prospective parent birds, recommendations are displayed in the form of a ranking to make it easier to find out which birds are worthy of being used as broodstock. Next there is a details menu that displays details of the calculations carried out by the system to produce recommendations to breeders. The menu shows the calculation stages carried out from the data entered to produce a recommendation ranking. Finally, there is an About menu that describes more about the system.

3.2 Testing

The results of the system can help breeders select birds that have superior quality to be used as broodstock. Farmers will be given recommendations for birds that have superior quality to be used as broodstock in the form of rankings so that they are easy to understand. Farmers can freely add and subtract assessment data on existing birds. From the results of the system built, the results of the analysis of the application of the Simple Additive Weighting (SAW) method in selecting quality birds to be used as brooders are as follows.

Tabel 1. Criteria

Kicauan (C1)	Usia (C2)	Postur (C3)	Silsilah (C4)	Produksi (C5)
40	70	80	70	50

Table 1. is a table that contains criteria data that will be used in calculating to get recommendations for quality birds to be used as broodstock. The data was obtained from songbird breeders directly using the interview method. Table 2. contains test data from the first appraiser which will be calculated to get the recommendation value. The data used is in the form of data on the name of the bird that is a prospective broodstock, the ring number of the bird, and the values obtained from the assessment results carried out by the first assessor according to the criteria used.

Tabel 2. Data Appraisers 1

No	Nama	No.ring	C1	C2	C3	C4	C5
1	Burung5	26	25	25	30	10	20
2	Burung6	30	30	25	10	15	20
3	Burung29	1	30	20	20	20	10
4	Burung12	8	20	10	20	25	25
5	Burung41	41	15	20	30	15	20
6	Burung32	32	30	20	15	15	20
7	Burung33	33	20	20	10	40	10

Tabel 3. Data Appraisers 2

No	Nama	No.ring	C1	C2	C3	C4	C5
1	Burung29	1	15	20	20	30	15
2	Burung12	8	20	30	10	20	20
3	Burung5	26	20	20	30	10	20
4	Burung32	31	30	15	20	15	20
5	Burung33	33	20	30	30	10	10
6	Burung41	41	30	20	20	15	15
7	Burung6	30	20	10	20	20	30

Table 3. contains test data from the second assessor which will be calculated to get the recommendation value. The data used is in the form of data on the name of the bird that is a prospective broodstock, the ring number of the bird, and the values obtained from the assessment results carried out by the second assessor according to the criteria used. The use of more than one appraisal to get more accurate recommendation value results it is expected

that the resulting recommendation value is more objective because the recommendation value is generated from the average value of the two appraisers and is expected not to be influenced by the subjective matters of the appraiser..

Tabel 4. Calculation Stage 1 appraiser 1

No	Nama	No.ring	C1	C2	C3	C4	C5	Jumlah
1	Burung5	26	25	25	30	10	20	110
2	Burung6	30	30	25	10	15	20	100
3	Burung29	1	30	20	20	20	10	100
4	Burung12	8	20	10	20	25	25	100
5	Burung41	41	15	20	30	15	20	100
6	Burung32	32	30	20	15	15	20	100
7	Burung33	33	20	20	10	40	10	100

Tabel 5. Calculation Stage 2 appraiser 1

No	Nama	No.ring	C1	C2	C3	C4	C5
1	Burung5	26	0,85	1	1	0,25	0,8
2	Burung6	30	1	1	0,33	0,38	0,8
3	Burung29	1	1	0,8	0,67	0,5	0,4
4	Burung12	8	0,67	0,4	0,67	0,63	1
5	Burung41	41	0,5	0,8	1	0,38	0,8
6	Burung32	32	1	0,8	0,5	0,36	0,8
7	Burung33	33	0,67	0,8	0,33	1	0,4

Table 4. are tables that contain the first stage of mathematical calculations in getting recommendations for quality birds to be used as broodstock. In the first stage of the calculation, the value of the value obtained by each bird is summed up. A similar calculation was performed on the second appraiser. Table 5. contain the second stage calculation of the value data obtained. in this second stage, normalization is carried out using the first formula of the Simple Additive Weighting (SAW) method to obtain the normalized value of each bird according to its criteria. A similar calculation was performed on the second appraiser.

Tabel 6. Calculation Stage 3 appraiser 1

No	Nama	No.ring	Total poin	SAW	Ranking
1	Burung5	26	110	240.8333	1
2	Burung41	41	100	222.25	2
3	Burung29	1	100	204.3333	3
4	Burung6	30	100	202.9167	4
5	Burung32	32	100	202.25	5
6	Burung12	8	100	201.76	6
7	Burung33	33	100	199.3333	7

Tabel 7. Calculation Stage 3 appraiser 2

No	Nama	No.ring	Total poin	SAW	Ranking
1	Burung33	33	100	216.6667	1
2	Burung29	1	100	215	2
3	Burung5	26	100	210	3
4	Burung12	8	100	203.3333	4
5	Burung41	41	100	200	5
6	Burung6	30	100	200	6
7	Burung32	32	100	196.6667	7

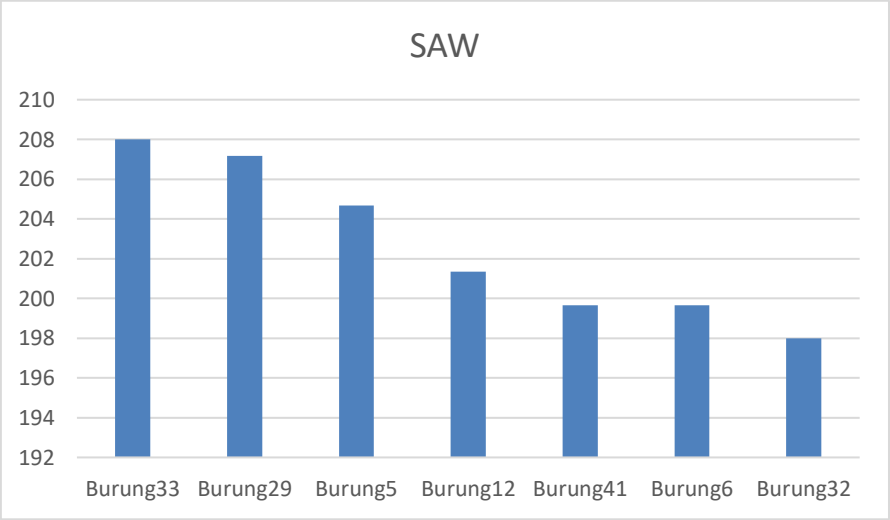
Table 6. and Table 7. contain the third stage calculations used to obtain recommendations. In the third stage, mathematical calculations are carried out with the formula of the Simple Additive Weighting (SAW) method which will get the final results of the calculation with this method.

Tabel 8. Average Value Calculation

Ranking	Nama	No.ring	Total poin	SAW
1	Burung33	33	200	208
2	Burung29	1	200	207.16665
3	Burung5	26	200	204.66665
4	Burung12	8	200	201.3333
5	Burung41	41	200	199.66665
6	Burung6	30	200	199.66665
7	Burung32	32	200	198

Table 8. contains the average results of recommendations from the two assessors. The average is done because it is to get the results of recommendations that are more objective in providing recommendations. Chart 1 represents the outcomes of the preceding calculations, indicating that Burung33 is the most suitable candidate for domestication as a breeding bird.

Figure 8. Final Result



4. Conclusions

Based on the results of the research that has been done, the implementation of a decision support system with the simple additive weighting (SAW) method to select superior quality bird breeds, it is concluded that the system can help breeders in selecting quality birds that will be used as breeds for breeding. In addition, with the continuous use of this system, breeders over time can distinguish birds that have superior quality by just looking directly without having to get help from anyone else. By using the system properly and correctly, breeders will get recommendations for birds that really have superior quality to be used as breeders or just to be used as pets.

Acknowledgments

The author would like to thank the Mbah Kebhon Bird Farm for supporting this project.

References

[1] D. Iswandaru, N. Novriyanti, I. S. Banuwa, and S. P. Harianto, “Distribution of bird communities in university of lampung, indonesia,” *Biodiversitas*, vol. 21, no. 6, pp. 2629–2637, Jun. 2020, doi: 10.13057/biodiv/d210634.

[2] I. Fitri Sari, A. Setiawan, D. Iswandaru, and B. Sari Dewi, “Peran Ekologi Spesies Burung pada Ekosistem Hutan Kota (Studi Kasus di Kota Metro).”
[3] Anastasia Anik Adisti and Rosa Zulfikhar, “Mengenal Berbagai Macam Burung di Indonesia,” 2021.
[4] H. Sukmantari and A. Januarsa, “Mengenalkan Keanekaragaman Burung Endemik Indonesia Melalui Perancangan Buku Ensiklopedia untuk Anak-anak.”
[5] S. Akbar, M. Indra, and G. Anugrah, “Sistem Pendukung Kepustusan Pemilihan Tempat Kos Untuk Mahasiswa Di Gresik Dengan Metode Saw,” vol. 7, no. 2, 2022.
[6] K. H. Manurung, A. E. Syaputra, and Y. S. Eirlangga, “Design the Best Student Selection Decision Support System With Simple Addictive Weighting (SAW) Method,” *INTERNATIONAL JOURNAL of DYNAMICS in ENGINEERING and SCIENCES (IJDES) LLDIKTI WILAYAH X*, vol. 7, no. 2, 2022, doi: 10.22216/jod.v7i1.1089.
[7] E. F. Wati, “Penerapan Metode SAW Dalam Menentukan Lokasi Usaha (Embun Fajar Wati) |241 Universitas Bina Sarana Informatika Jl,” 2021.
[8] U. Apsiswanto, A. Setiawan STMIK Dharma Wacana, and M. Lampung, “PENERAPAN METODE SIMPLE ADDITIVE WEIGHTING (SAW) DALAM MENENTUKAN KELUARGA MISKIN (STUDI KASUS : DESA NAMPIREJO).”
[9] E. Khoiril Ulama, A. Thyo Priandika, and F. Ariany, “SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN SAPI SIAP JUAL (TERNAK SAPI LEMBU JAYA LESTARI LAMPUNG TENGAH) MENGGUNAKAN METODE SAW,” *Jurnal Informatika dan Rekayasa Perangkat Lunak (JATIKA)*, vol. 3, no. 2, pp. 138–144, 2022, [Online]. Available: http://jim.teknokrat.ac.id/index.php/informatika
[10] D. Witasari and Y. Jumaryadi, “APLIKASI PEMILIHAN KARYAWAN TERBAIK DENGAN METODE SIMPLE ADDITIVE WEIGHTING (STUDI KASUS CITRA WIDYA TEKNIK),” Teknologi Informatika dan Komputer. [Online]. Available: https://jurnal.umj.ac.id/index.php/just-it
[11] Eko Haryono, “METODOLOGI PENELITIAN KUALITATIF DI PERGURUAN TINGGI KEAGAMAAN ISLAM,” 2023.
[12] S. Silvia Infromatika, “PERANCANGAN SISTEM INFORMASI PENGARSIPAN DATA PAJAK (STUDI KASUS : PT KURNIA ABADI JAYA BANDAR LAMPUNG).”
[13] B. Simare Mare, A. A. Yana, and U. N. Mandiri, “PERANCANGAN SISTEM INFORMASI BERBASIS WEB PADA KOPERASI SIMPAN PINJAM SEJAHTERA BERSAMA,” Online.
[14] Jindra Hakim, “KLASIFIKASI TERHADAP IKLAN PROMOSI DENGAN PERHITUNGAN ALGORITMA POHON KEPUTUSAN C4.5,” 2022.
[15] Kanim, Tukiyat, and Murni Handayani, “ANALISIS PERBANDINGAN METODE TECHNIQUE FOR ORDER PREFERENCE BY SIMILARITY TO IDEAL SOLUTION, SIMPLE ADDITIVE WEIGHTING DAN WEIGHTED PRODUCT DALAM SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN GURU TERBAIK,” *JSiI (Jurnal Sistem Informasi)*, vol. 10, no. 1, pp. 33–40, Mar. 2023, doi: 10.30656/jsii.v10i1.6134.