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Decision Support System for Major Selection in Higher Education Using the Simple Additive Weighting Method

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Abstract

Choosing a college major is an important decision that affects a student's future, where the wrong choice can lead to incompatibility, academic difficulties, and wasted expenses. To help students determine a major that suits their interests, talents, and other criteria such as cost, accreditation, and job prospects, this study developed a Decision Support System (DSS) using the Simple Additive Weighting (SAW) method. The research was conducted using the Rapid Application Development (RAD) method, encompassing planning, design, coding, and testing stages, as well as data collection through interviews and document analysis. The results indicate that the SAW method is effective in providing major recommendations through ranking based on the weights of relevant criteria, thereby helping students make objective and swift decisions. As a result, this system simplifies the major selection process, enhances efficiency, and reduces the risk of errors in decision-making.

Keywords: *Decision Support System, Major Selection, Simple Additive Weighting Method*

1. Introduction

Errors in selecting a major can lead to a mismatch with an individual's interests, talents, and abilities, ultimately reducing learning motivation, academic performance, and the efficiency of both time and educational costs [10]. In many higher education institutions, including STAIN Bengkalis, the process of choosing a major still tends to be conventional and subjective, thus requiring a more objective, structured, and data-driven system to support decision-making [17].

The advancement of information technology presents significant opportunities for developing Decision Support Systems (DSS) capable of processing various important criteria systematically and accurately [1]. Previous studies have proposed the use of certain methods in major selection systems, such as the Analytical Hierarchy Process (AHP), Fuzzy Tsukamoto, K-Means, OCRA, and ELECTRE [7]. Although these methods have contributed to decision-making, each carries its own complexity and limitations, particularly in result interpretation and the need for extensive data [6].

The Simple Additive Weighting (SAW) method offers a simpler, more transparent, and easier-to-implement approach as it is based on the weighted summation of criteria values, making it highly suitable for major selection applications that require speed and clarity in the recommendation process [14]. However, the specific application of SAW in the context of religious higher education particularly at STAIN Bengkalis remains underexplored, especially in terms of integration with digital systems accessible to prospective students [12].

The gap between the need for an objective recommendation system and the limited application of simple yet effective methods such as SAW in religious institutions forms the basis of this study's urgency [16]. This research addresses the gap by designing and developing a decision support system tailored to the needs of STAIN Bengkalis, employing the SAW method integrated with local criteria such as religious background, interest in Islamic scholarship, and preaching skills [9].

The novelty of this study lies in the adaptation of the SAW method combined with a contextually relevant criteria structure, as well as its implementation in the form of a responsive, user-friendly digital application for prospective students [18]. The objective of this research is to design and implement a SAW-based decision support system for major selection that can provide accurate, objective, and personalized recommendations aligned with the interests, talents, and backgrounds of prospective students at STAIN Bengkalis [2].

2. Literatur Review

2.1. Decision Support System

A Decision Support System (DSS) is a system designed to assist managerial decision-makers in situations involving unstructured decisions. A DSS is intended to serve as a tool that enhances the capabilities of decision-makers without replacing their judgment. Furthermore, decision support systems are aimed at decisions that require judgment or those that cannot be fully supported by algorithms [15].

2.2. Simple Additive Weighting (SAW) Method

The Simple Additive Weighting (SAW) method, also known as the weighted summation method, is one of the most commonly used approaches for solving decision-making problems [5]. Several versions of the SAW method exist according to experts, where the criteria and scoring can be determined based on specific needs, using the following formulas:

$$R_{ij} = \frac{\chi ij}{Max\ \chi ij}$$

$$R_{ij} = \frac{Min\ \chi ij}{\chi ij}$$

Here, Rij represents the normalized performance rating of alternative Ai. The preference value is then calculated as:

$$(Vi) = \sum_{j=1}^{n} WiRij$$

A higher Vi value indicates that alternative Ai is more preferable. Vi denotes the final score of an alternative, WjW_jWj represents the predetermined weight for each criterion, and Rij is the normalized decision matrix [13].

The steps of the Simple Additive Weighting (SAW) method are as follows:
1. Determine the criteria to be used as the basis for decision-making.
2. Determine the suitability rating of each alternative for each required attribute.
3. Construct the decision matrix based on the criteria, then normalize the matrix according to the type of attribute (benefit or cost) to obtain the normalized matrix.
4. Calculate the final ranking by summing the products of the normalized matrix RRR and the weight vector WWW, selecting the alternative with the highest value as the optimal solution.

2.3. Rapid Application Development (RAD) Method

The application in this study was developed using the Rapid Application Development (RAD) method, which emphasizes short development cycles and employs an iterative approach [19]. In this model, the working prototype is constructed at the early stage of development to determine user requirements and is subsequently refined or discarded as needed [11].

2.4. PHP (Hypertext Preprocessor)

PHP is a web-based programming language that functions as the backend of a website. PHP offers various frameworks, one of which is Laravel. Laravel is open-source and adopts the MVC (Model–View–Controller) architectural pattern [3]. Laravel is an enhancement of PHP designed to improve software quality, save time, and reduce both initial development costs and maintenance expenses [8].

2.5. Website

A website is a collection of interconnected pages used to display information [20]. The information presented on a website may include text, images, animations, audio, or a combination of these elements, and can be displayed either dynamically or statically, with each component interconnected [4].

3. Research Methods

3.1. Research Data

Detailed In the Decision Support System for Selecting University Majors using the Simple Additive Weighting (SAW) method, several types of data are required to support the system being developed. The data is obtained through interviews with relevant stakeholders.

3.2. Research Procedure

The research procedure uses the Rapid Application Development (RAD) method, which consists of four stages: Requirements Planning, User Design, Construction, and Cutover.

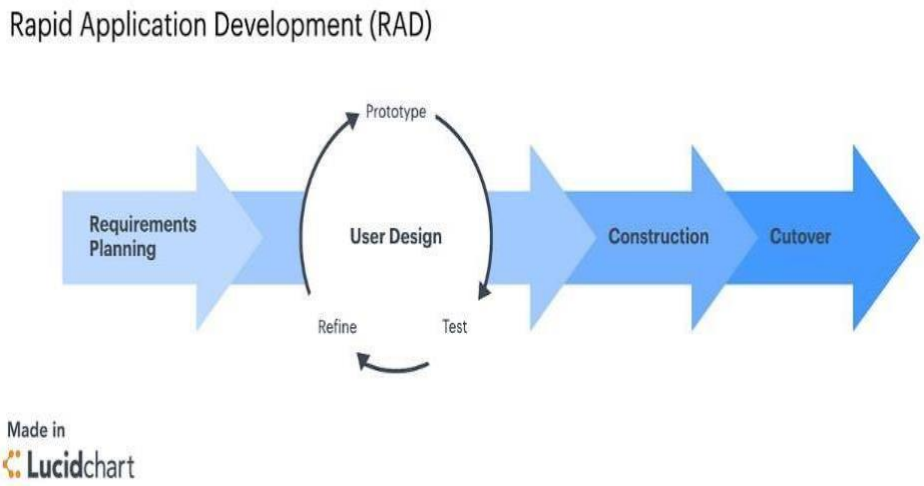

Fig. 1: RAD Method Stages

3.2.1. Requirements Planning

a. Functional Requirements Analysis

Functional requirements refer to the functions needed by each user of the system being developed. The functional requirements for the major selection application are as follows:

1. User Requirements
   a. Select sub-criteria
   b. View recommendation results
2. Admin Requirements
   a. Login
   b. Input criteria, sub-criteria, and weights
   c. View, update, and delete data
   d. Logout

b. Non-Functional Requirements Analysis

Non-functional requirements refer to needs that are not directly related to the features within the system. The non-functional requirements for the major selection application are:

1. The application can be accessed via a website.
2. The application has an attractive and user-friendly interface.
3. The application can determine major recommendations according to the inputted data.
4. The application implements the SAW (Simple Additive Weighting) method.

c. Use Case Diagram

The Use Case Diagram is used to design the software development process and to determine the functional requirements of the system.

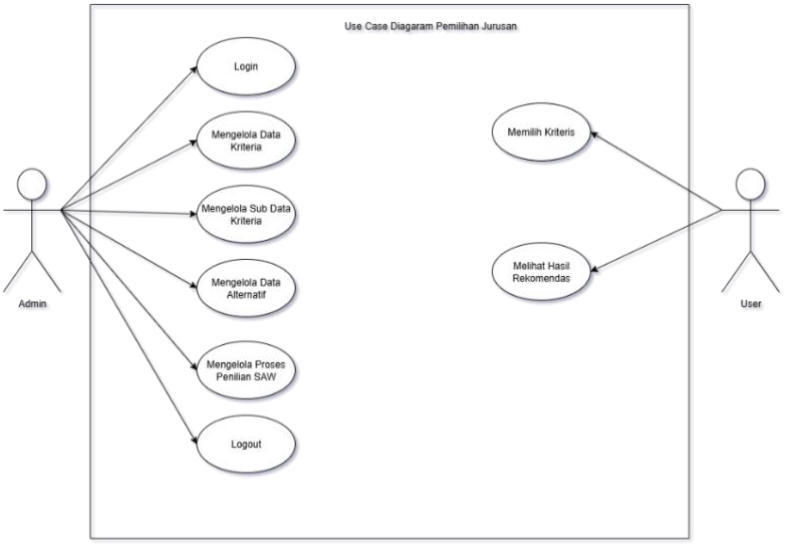

Fig. 2: Use Case Diagram

d. Class Diagram

The Class Diagram is one type of diagram in the Unified Modeling Language (UML) used to depict the static structure of a system. It shows the classes in the system, their attributes, methods or operations, and the relationships between classes.

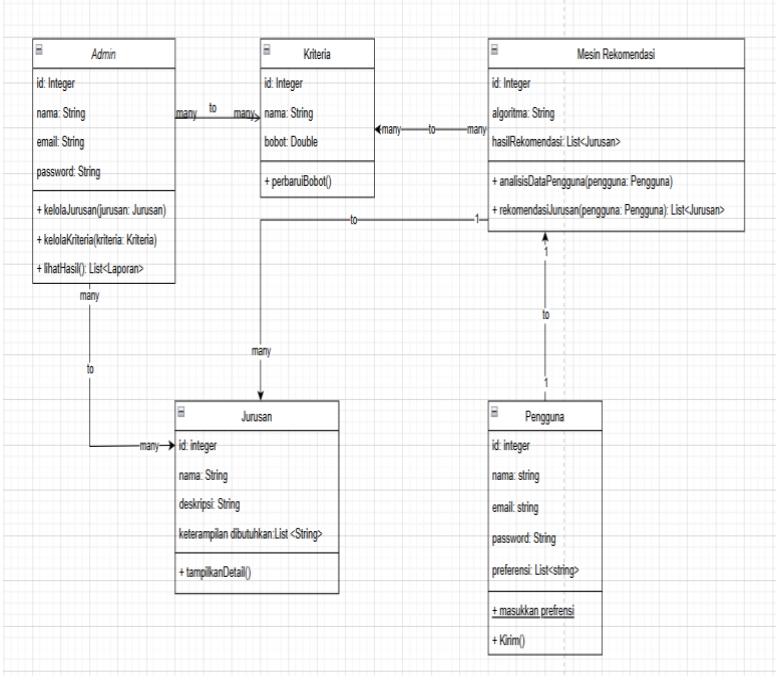

Fig. 3: Class Diagram

3.2.2. User Design

1. Home Page

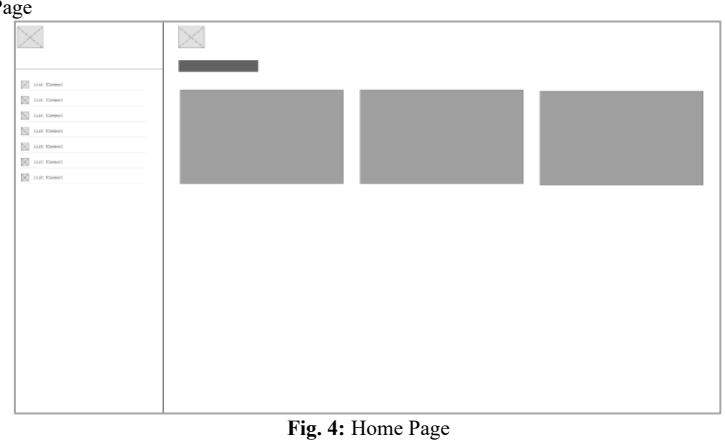

Fig. 4: Home Page

2. Criteria and Sub-Criteria Page

Fig. 5: Criteria and Sub-Criteria Page

3. Weighting Page

Fig. 6: Weighting Page

4. Recommendation Page

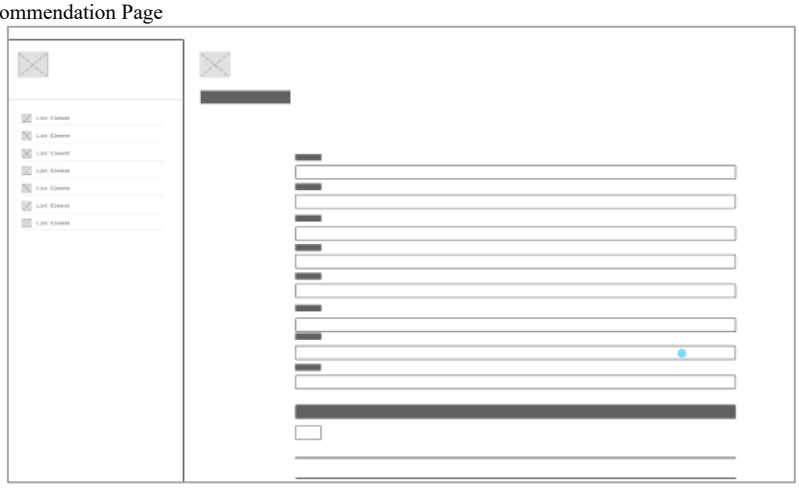

Fig. 7: Recommendation Page

3.2.3. Construction

At this stage, the development team focuses on implementing and refining the system, ensuring that all functions—from user data input to generating major recommendations—are built according to the planned design. The system is developed using the PHP programming language with the Laravel framework, which supports efficient web application development. This includes integrating core features such as a preference-based recommendation mechanism, data analysis using the SAW method, and synchronization between local and server data to ensure data availability and enhance user experience.

3.2.4. Cutover

In the final development stage, system testing is carried out using the Blackbox Testing method to verify that the major recommendation system functions according to the established specifications. The testing focuses on validating system inputs and outputs without analyzing the internal code, ensuring that key functions such as user data input, SAW-based recommendation calculations, and result display operate as intended.

3.3. Implementation of the Simple Additive Weighting (SAW) Method

In the process of determining majors, several criteria serve as references. These criteria were obtained through interviews with universities across Bengkalis Regency. The criteria used for decision-making are symbolized by Ci, while the alternatives (students) are symbolized by Ai.

Table 1: Criteria

Code	Criteria	Attribute	Weight
C1	Scientific Interest	Benefit	10 (0.1)
C2	Language Skills	Benefit	15 (0.15)
C3	Future Career Interest	Benefit	25 (0.25)
C4	Educational Background	Benefit	20 (0.2)
C5	Speaking Ability	Benefit	20 (0.2)

Table 2: Importance Level for Each Alternative

Description	Weight
Very Low	5
Low	4
Medium	3
High	2
Very High	1

Table 3: Importance Level for Each Alternative

Islamic Religious Education		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	5
C2	Language Skills	4
C3	Future Career Interest	5
C4	Educational Background	1
C5	Speaking Ability	3

English Language Education		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	5
C2	Language Skills	5
C3	Future Career Interest	4
C4	Educational Background	3
C5	Speaking Ability	4

Early Childhood Islamic Education		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	3
C2	Language Skills	4
C3	Future Career Interest	5
C4	Educational Background	2
C5	Speaking Ability	3

Islamic Education Management		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	3
C2	Language Skills	4
C3	Future Career Interest	5
C4	Educational Background	1
C5	Speaking Ability	2

Arabic Language Education		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	3
C2	Language Skills	5
C3	Future Career Interest	4
C4	Educational Background	5
C5	Speaking Ability	3

Sharia Economics		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	4
C2	Language Skills	3
C3	Future Career Interest	2
C4	Educational Background	4
C5	Speaking Ability	1

Sharia Banking		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	5
C2	Language Skills	4
C3	Future Career Interest	3
C4	Educational Background	4
C5	Speaking Ability	3

Sharia Accounting		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	5
C2	Language Skills	2
C3	Future Career Interest	3
C4	Educational Background	4
C5	Speaking Ability	5

Sharia Financial Management		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	4
C2	Language Skills	3
C3	Future Career Interest	2
C4	Educational Background	5
C5	Speaking Ability	4

Islamic Constitutional Law		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	4
C2	Language Skills	2
C3	Future Career Interest	3
C4	Educational Background	5
C5	Speaking Ability	3

Islamic Family Law (Ahwal Syakhsiyyah)		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	3
C2	Language Skills	5
C3	Future Career Interest	4
C4	Educational Background	2
C5	Speaking Ability	3

Da'wah Management		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	4
C2	Language Skills	5
C3	Future Career Interest	3
C4	Educational Background	2
C5	Speaking Ability	3

Islamic Communication and Broadcasting		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	3
C2	Language Skills	4
C3	Future Career Interest	2
C4	Educational Background	5
C5	Speaking Ability	3

Sociology of Religion		
Code	**Criterion Name**	**Weight**
C1	Scientific Interest	5
C2	Language Skills	5
C3	Future Career Interest	4
C4	Educational Background	3
C5	Speaking Ability	4

Table 4: Sub-Criteria Weighting

Scientific Interest (C1)	**Weight**
Islamic Studies and Education	5
Arabic/English Language	4
Sharia Economics and Finance	3
Communication and Da'wah	2
Islamic Law and Constitutional Law	1

Language Skills (C2)	**Weight**
Excellent (Arabic and English)	5
Good (One Language)	4
Fair	3
Poor	2
None	1

Future Career Interest (C3)	**Weight**
Teacher/Educator	5
Translator/Language Researcher	4
Sharia Banker/Accountant	3
Islamic Communicator/Broadcaster	2
Islamic Law Expert	1

Educational Background (C4)	**Weight**
MA/Modern Islamic Boarding School	5
Senior High School – Social Sciences	4
Vocational High School – Economics/Office Administration	3
Senior High School – Natural Sciences	2

Package C/Other	1

Speaking Ability (C5)	**Weight**
Very Confident	5
Confident	4
Fair	3
Less Confident	2
Not Confident	1

Table 5: Alternatives

Alternative Code	**Alternative Name**
A1	Islamic Religious Education
A2	English Language Education
A3	Early Childhood Islamic Education
A4	Islamic Education Management
A5	Arabic Language Education
A6	Sharia Economics
A7	Sharia Banking
A8	Sharia Accounting
A9	Sharia Financial Management
A10	Siyasah Syar'iyyah (Islamic Constitutional Law)
A11	Ahwal Syakhsiyyah (Islamic Family Law)
A12	Da'wah Management
A13	Islamic Communication and Broadcasting
A14	Sociology of Religion

4. Conclusion

Based on the research conducted, the major selection recommendation system using the Simple Additive Weighting (SAW) method has been successfully developed and is capable of providing objective major recommendations by considering interests, talents, and other relevant criteria in accordance with the needs of prospective students at STAIN Bengkalis. The system has undergone testing, which demonstrated its accuracy in producing a ranking of majors based on the highest final score from the SAW calculation, thereby assisting users in making faster and more precise decisions.

References

[1] Anjarwati, Putri Kartika, Rahnita Nuzulah, dan Rosdiana Rosdiana. 2024. "Sistem Pendukung Keputusan Pemilihan Jurusan Menggunakan Metode Simple Additive Weighting." Jurnal Rekayasa Komputasi Terapan 4(03):242–48. doi:10.30998/jrkt.v4i03.12077.

[2] Ariani Susanti. 2022. "Perancangan Sistem Pendukung Keputusan Penentuan Jurusan Siswa Sma Negeri 2 Kutacane Berbasis Web Dengan Menggunakan Metode Analytical Hierarchy Process (AHP)." Jurnal Multimedia dan Teknologi Informasi (Jatilima) 3(02):68–74. doi:10.54209/jatilima.v3i02.152.

[3] Al Faruq, Muhammad Rifky. 2023. "Rancangan Media Pembelajaran Localizer Berbasis Web Menggunakan Php Dan Mysql." In Prosiding SNITP (Seminar Nasional Inovasi Teknologi Penerbangan) 7(1).

[4] Ghofur, Abd, Halimatus Sya'diyah, dan Ahmad Lutfi. 2023. "Sistem Informasi Persuratan Di Fakultas Sains Dan Teknologi Universitas Ibrahimy Menggunakan Php Dan Mysql." Prosiding Sains Nasional dan Teknologi 13(1):149–55. doi:10.36499/psnst.v13i1.8982.

[5] Hamid Muhammad Jumasa, dan Wahju Tjahjo Saputro. 2022. "The Implementation of Simple Additive Weighting Method in deciding Apprentice Assistant." Digital Zone: Jurnal Teknologi Informasi dan Komunikasi 13(1):90–101. doi:10.31849/digitalzone.v13i1.9880.

[6] Hidayat, Rachmad Noer, Budi Santoso, dan Lambang Probo Sumirat. 2024. "Sistem Pendukung Keputusan Pemilihan Siswa Berprestasi Menggunakan Metode Simple Additive Weighting dan Weighted Product." MALCOM: Indonesian Journal of Machine Learning and Computer Science 5(1):379–90. doi:10.57152/malcom.v5i1.1787.

[7] Ismail, dan M. Ilham. 2022. "Sistem Pendukung Keputusan Penerimaan Siswa Baru Sman 7 Watansoppeng Menggunakan Metode Simple Additive Weighting." Jurnal Ilmiah Sistem Informasi dan Teknik Informatika (JISTI) 5(1):29–36. doi:10.57093/jisti.v5i1.106.

[8] Mahendra, Gede Surya. 2023. Implementasi Sistem Pendukung Keputusan. Jambi: Sonpedia Publishing Indonesia.

[9] Maziyyah, Zarra, Bambang Minto Besuki, dan Anang Habibi. 2022. "Rancang Bangun Sistem Pendukung Keputusan Untuk Mencari Kecocokan Siswa Dalam Memilih Jurusan di Kampus Berbasis Web Dengan Metode (Simple Additive Weighting) Saw." Informatics, Electrical and Electronics Engineering (Infotron) 2(1):15–22. doi:10.33474/infotron.v2i1.14766.

[10] Moh Ridwan, Fawaidul Badri, Abdullah Faqih, dan Riski Mono Sari. 2023. "Rancang Bangun Sistem Pendukung Keputusan Rekomendasi Jurusan Kuliah Menggunakan Metode Simple Additive Weighting." Informatics, Electrical and Electronics Engineering (Infotron) 3(1):26–35. doi:10.33474/infotron.v3i1.19788.

[11] Nurulita, Khiara, Nurcahya PradanaTaufik Prakisya, dan Dwi Maryono. 2024. "Utilization Method Simple Additive Weighting in Decision Support Systems to Determine Outstanding Students." Jurnal Media Informasi Teknologi 1(2):71–82. doi:10.69616/mit.v1i2.189.

[12] Permata, Tasya Julia. 2021. "Sistem Pendukung Keputusan Pemilihan Jurusan Berbasis Website Dengan Metode Simple Additive Weighting (Saw) Di Sma Negeri 6 Tangerang Selatan." In Prosiding Seminar Nasional Mahasiswa Bidang Ilmu Komputer dan Aplikasinya 2(1):543–50.

[13] Prapto, Aryo Suryo. 2024. "Perancangan Knowledge Management System untuk Startup dengan Metode Rapid Application Development Berbasis Website." Jurnal Ilmu Komputer dan Informatika 4(2):127–42.

[14] Rahmah, Anisah. 2023. "Sistem Pendukung Keputusan Pemilihan Program Studi Menggunakan Metode Simple Additive Weighting (SAW): Decision Support System for Selecting Study Programs Using The Simple Additive Weighting (SAW) Method." Prosiding SNPSITI: Seminar Nasional Pendidikan, Sains dan Teknologi 1(1).

[15] Ramadhan, Erlangga Fajar. 2025. "Optimalisasi Antarmuka Pengguna Situs Web cidahucampingground. com dengan Metode Design Thinking." In Prosiding SEMNAS INOTEK (Seminar Nasional Inovasi Teknologi) 9(3):2008–20017.

[16] Rizal Adi Saputra, dan Abdul Aziz. 2023. "Sistem Pendukung Keputusan Dalam Pemilihan Perguruan Tinggi Terbaik di Kabupaten Kotawaringin Timur Menggunakan Metode Simple Additive Weighting (SAW)." Kompak :Jurnal Ilmiah Komputerisasi Akuntansi 16(2):274–84. doi:10.51903/kompak.v16i2.1280.

[17] Salsabilla, Nadia, dan Helmi Fauzi Siregar. 2024. "Sistem Pendukung Keputusan Pemilihan Anggota HIMPROSI Menggunakan Metode Simple Additive Weighting." Sistem Pendukung Keputusan dengan Aplikasi 3(1):13–24. doi:10.55537/spk.v3i1.752.

[18] Simbolon, Devi Silvia. 2024. "Perancangan Sistem Pendukung Keputusan Pemilihan Jurusan What's Your Plan Berbasis Web di Fakultas Ilmu Komputer." In Seminar Nasional Inovasi Sains Teknologi Informasi Komputer 359–64.

[19] Thoyyib, Basyir. 2023. "Desain UI/UX Website Referral untuk Program Gerakan Funding Culture Menggunakan Figma." In Prosiding Seminar Nasional Teknologi Komputer dan Sains 1(1):232–41.

[20] Yuricha, Yuricha, dan Irwan Kurnia Phan. 2024. "Rancang Bangun Aplikasi Jurnal Perkuliahan Berbasis Progressive Web Application Menggunakan Metode Rapid Application Development." MALCOM: Indonesian Journal of Machine Learning and Computer Science 4(3):901–10. doi:10.57152/malcom.v4i3.1370.