Jurnal Sisfotek Global
ISSN (Online): 2721 - 3161, ISSN (Print): 2088 – 1762
DOI: http://dx.doi.org/10.38101/sisfotek.v14i1.10879
Vol. 14, No. 1, March 2024, pp. 22-28

Multifactor Evaluation Process for a Decision Support System for Selecting the Best Students

M. Bucci Ryando[1], Ferawati[2], Muchamad Iqbal[3] & Prayoga Setiawan[4]

[1,2,3,4] Institut Teknologi dan Bisnis Bina Sarana Global, Tangerang, Indonesia, 15113
E-mail: [1]bucci@global.ac.id, [2]ferawati@global.ac.id, [3]miqbal@global.ac.id, [4]prayogasetiawan@gmail.com

ARTICLE HISTORY

Received : February 12th, 2024
Revised : March 20th, 2024
Accepted : March 30th, 2024

KEYWORDS

Decision Support System
Multifactor Evaluation Process
Best Students
Black Box Testing

ABSTRACT

The utilization of information systems can significantly contribute to enhancing efficiency and service delivery at MA Daarul Falah, an educational institution in Pondok Pesantren Daarul Falah. Previously, there were often issues with subjective assessment of high-achieving students and inadequate archiving of previous years' assessment records. This study aims to expedite the collection of student assessment data from each class, automate the student grading process, and improve the objectivity of the school's assessments of all students. The method employed in this research is the Multi-Factor Evaluation Process (MFEP), implemented using the PHP programming language. The results of the study indicate that students who receive a total evaluation score above 90.00 are considered eligible to serve at Pondok Pesantren Daarul Falah, while those who score below 90.00 are deemed ineligible to serve there.

1. Introduction

A decision support system (Decision Support System) is a knowledge-based computerized system that can be used as a basis for decision making. Decision support systems act as instruments that help decision makers improve their abilities, but are not intended to replace evaluations carried out by these decision makers. To avoid subjectivity in decisions taken, a decision support system is needed to determine outstanding students based on specified assessment criteria as in research conducted by Kusuma and his team [1].

MA Daarul Falah, who is at the Daarul Falah Islamic Boarding School, has often had non-objective assessments from the school in selecting outstanding students, as in the research conducted by Kurnia and Muhtarom [2]. Teachers also sometimes find it difficult to assess each student because the criteria for assessing students are not clear, track records of assessments in previous years are not properly archived so data is easily lost. Calculations are also relatively slow because computer technology has not been utilized optimally.

MA Daarul Falah, who is at the Daarul Falah Islamic Boarding School, has often experienced non-objective assessments from the school in selecting outstanding students. Teachers sometimes find it difficult to assess each student because the criteria for assessing students are not clear and the files are not well documented. So, there will be a buildup of data which can cause data to be lost and lead to a lack of time efficiency in direct assessments because time is needed to calculate the assessments.

Wahyuni and Niska [3] in their research, the existence of this decision support system can help the H. Adam Malik Hospital Medan in determining high-achieving employees easily and quickly.

Apart from that, the method used by Ristiani and his team [4] is the Multifactor Evaluation Process (MFEP). This research concluded that the selection process for PPA scholarship recipients at STMIK Insan Pembangunan currently does not adopt a decision support system, but still relies on quotas, which results in a lack of use of mathematical calculations. This causes the distribution of PPA scholarships not to meet the expected targets.

Hidayatullah and Eska also used a decision support system [5] using the MFEP method which is one of the methods for selecting PPA scholarship recipients at STMIK Insan Pembangunan. Here, they have not implemented a Decision Support System (SPK) so there is no objectivity from the assessors which causes the provision of PPA scholarships to not be on target.

Heriyantoro and his team [6] developed an application to assess and determine outstanding teachers. This research aims to help schools select teachers who meet previously established achievement criteria. The application was developed using Visual Studio Code with the PHP programming language and uses a MySQL database as data storage.

Muslihudin and Rahayu [7] in their research used the Weighted Product method to create a Decision Support System for high achieving students with the result that there were 6 alternatives, namely 1 student with the lowest score and 1 student with the best score.

Therefore, based on the results of previous research, this research is entitled "Multifactor Evaluation Process for a Decision Support System for Selecting the Best Students". This title was chosen because the application developed in this research has the potential to reduce the time and selection process required. With this decision support system, it is hoped that it can help the Daarul Falah Islamic Boarding School in determining outstanding students efficiently and quickly.

2. Research Method

2.1 Multifactor Evaluation Process (MFEP)

A Decision Support System is a system designed to support decision making by an organization or company. This system is designed to facilitate complex decision-making processes by providing structured and relevant information. The process steps of the Multifactor Evaluation Process method as carried out by Verina and her team [8]. The first step is to assign the factors and their weights such that the total weighting is equal to 1 (Σ weighting = 1), which is called the factor weight. Then, the value of each factor that influences the decision-making process is input based on the data that has been processed, where this value is objective. The final step is to calculate the Weight Evaluation (WE) which involves calculating the weight between factor weights (FW) and factor evaluations (E), as well as adding up the results of the overall Weight Evaluation. From this process, the total evaluation results will be obtained. Details of the Multifactor Evaluation Process model can be seen below:

a. Calculating the evaluation weight value in Equation (1).

$$WE = FW \; x \; E \quad (1)$$

WE : Weight Evaluation Score
FW : Factor Weight Score
E : Evaluation Factor Score

b. Calculating the total evaluation value in Equation (2).

$$\Sigma WE = WE1 + WE2 + \ldots . + WEn \; (2)$$

2.2 Method

This research uses a software development method known as Software Development Life Cycle (SDLC) with the application of the Prototype Model as in research conducted by Maisaroh & Sofia [9]. The following is the flow of the Prototype Model carried out by the author in conducting research:

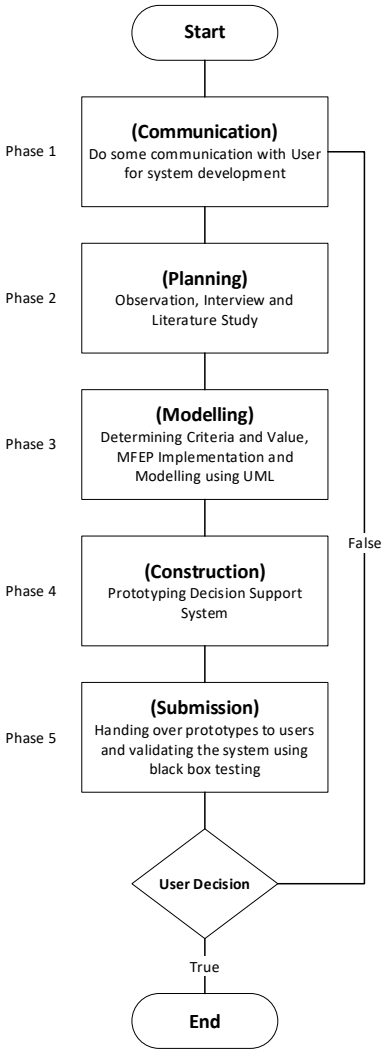

Figure 1. Research Method Adaptation of Prototype Model

In Figure 1 above, you can see that the initial stage of this research carried out communication first. Where the author communicates with the school principal as a stakeholder for the development of the system that will be created. After that, in the second stage, the author carried out planning, namely by conducting observations, interviews as carried out by Pratama and his team [10] and also a literature study carried out by Anin and his team [11]. The third stage, writing, modeling by determining criteria and weights before implementing the Multi Factor Evaluation Process (MFEP) method as done by Christy and his team [12] and creating UML for the decision support system that will be created. In the fourth stage, the author creates a construction in the form of a prototype of a decision support system. The next stage, namely the fifth stage, is the submission of the Prototype and validation in the form of Black Box Testing to Stakeholders as carried out by Zuhair and his team [13]. If it meets stakeholder expectations, then this research is declared complete. If not, then return to stage 1, namely Communication to adjust the needs of Stakeholders.

3. Result and Discussion

The proposed system is expected to be able to provide a detailed picture in the development of an information system that supports the research process regarding the selection of Outstanding Students at the Daarul Falah Islamic Boarding School using the Multifactor Evaluation Process (MFEP) Method. The detailed activity plan is as follows:

a. Admin logs into the system to select outstanding students.
b. Admin fills in the form to process the selection of outstanding students.
c. Admin collects students' grades.
d. Admin gets the results issued by the system.
e. The school principal gets the results of the assessment and selection of outstanding students.

3.1 System Design Diagram

Process design in a system is intended to simplify the flow of data in the program, making it easier to create a system that can be easily understood by users, as in research conducted by Jantce TJ Sitinjak and his team [14]. The system design itself can be described with an analytical model using the Unified Model Language (UML) diagram as done by Ryando and his team [15]. Meanwhile, software development is carried out using the PHP programming language and a MySQL database system based on research conducted by Erdiwansyah and his team [16]. This application uses only four design diagrams, including Use Case Diagrams, Activity Diagrams, Sequence Diagrams, and Class Diagrams as done in Setiaji and Sastra research [17]. Below is an image of the proposed use case diagram as follows:

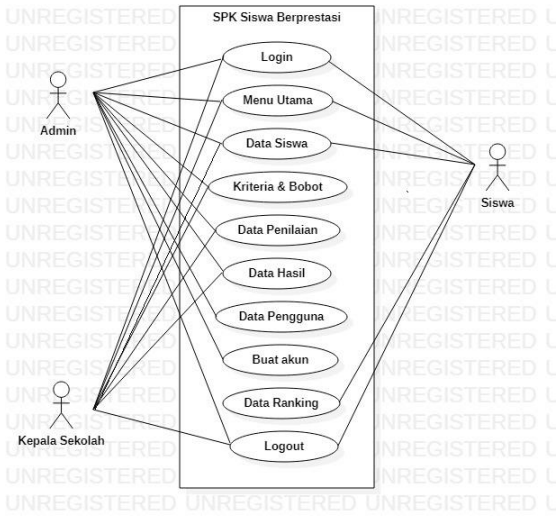

Figure 2. Use Case Diagram of the proposed system

In Figure 2 Use Case System Diagram, there are 3 (three) actors, namely Admin, Principal and Santri.

Table 1. Actor description

No	*Actor*	*Description*
1.	Admin	Users who have access rights can carry out the login process, access the main menu, view student data, set criteria and weight data, record assessment data, access results data, manage user data, create new accounts, and carry out the logout process.
2.	Headmaster	Users who have the authority to log in, access the main menu, view student data, manage criteria and weight data, record assessment data, review results data, and log out.
3.	Student	Users who have access rights to login, ranking data, and log out.

Activity Diagrams describe a series of activities in a system that is being designed, including how each activity begins, the decisions that may be taken, and how the activity ends. The design of the new system at the Daarul Falah Islamic boarding school is also depicted in the Activity Diagram in Figure 3 which is intended to show the assessment flow of the system.

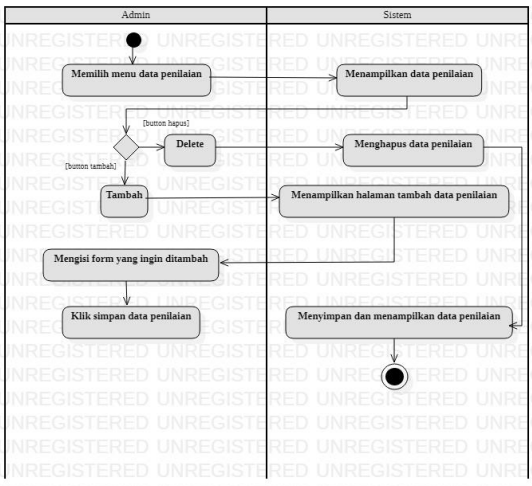

Figure 3. Activity Diagram managing assessment data

Figure 3 depicts the Activity Diagram flow for managing assessment data, the activities carried out by the admin to manage student assessment data, this activity is carried out after the admin adds new student data and after the student assessment data is added, the school principal can then give approval.

The following Sequence Diagram image for managing assessment data can be seen in Figure 4:

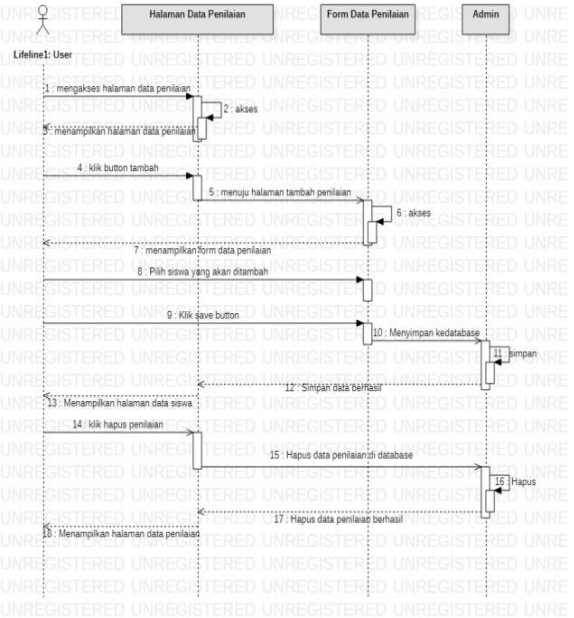

Figure 4. Sequence Diagram transaction details

In Figure 4 the Sequence Diagram for managing assessment data depicts the activities carried out by the admin in managing student assessment data. In this process the admin carries out activities to add student assessment data or delete student assessment data.

The following Class Diagram image can be seen in Figure 5:

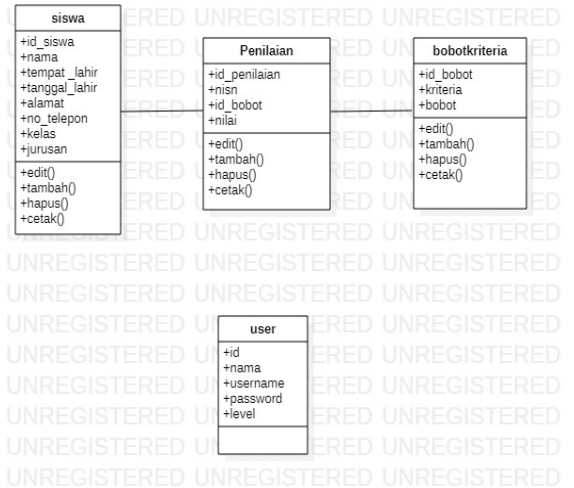

Figure 5. Class Diagram System

Based on Figure 5 Class Diagram of the system there are 4 classes, namely Students, Assessment, Weight Criteria and Users. Before creating a class diagram, the author creates a list of potential classes by identifying nouns that might describe the class.

3.2 System Calculation Results Using the Multi Factor Evaluation Process (MFEP) Method

The calculation stages using MFEP are as follows:

a. Determining criteria and weights. This is used as a measure in assessing. The following criteria and weightings can be seen in Table 2:

Table 2. Criteria and Value

No.	*Criteria*	*Value*
1	Report Card Value	0.4
2	Presence	0.3
3	Extracurricular	0.3
4	Attitude	0.5

b. After determining the evaluation weight value for each criterion, the next step is to add up the total evaluation values for all these criteria. The calculation can be done using the formula Equation (1). The following are the results of the sample counting for the selection of outstanding students at MA Daarul Falah, which can be seen in 4 tables including Table 3 the calculation of the students in the name of Ahmad Rifai, Table 4 the calculation of the students in the name of Diana Aulia, Table 5 the calculation of the students in the name of Yusuf Dani and Table 6 calculation of students on behalf of Prasetyo.

Table 3. Outstanding Santri on behalf of Ahmad Rifai

No.	*Criteria*	*Weight*	*Value*	*Evaluation Factor Value*	*Weight Factor Value*
1	Report Card Value	0.4	77	0.4 * 77	30.80
2	Presence	0.3	64	0.3 * 64	19.20
3	Extracurricular	0.3	56	0.3 * 56	16.80
4	Attitude	0.5	88	0.5 * 88	44.00
Total					110.80

Table 4. Outstanding Santri on behalf of Diana Aulia

No.	*Criteria*	*Weight*	*Value*	*Evaluation Factor Value*	*Weight Factor Value*
1	Report Card Value	0.4	44	0.4 * 44	17.60
2	Presence	0.3	50	0.3 * 50	15.00
3	Extracurricular	0.3	55	0.3 * 55	16.50
4	Attitude	0.5	40	0.5 * 40	20.00
Total					69.10

Table 5. Outstanding Santri on behalf of Yusuf Dani

No.	*Criteria*	*Weight*	*Value*	*Evaluation Factor Value*	*Weight Factor Value*

1	Report Card Value	0.4	55	0.4 * 55	22.00
2	Presence	0.3	45	0.3 * 45	13.50
3	Extracurricular	0.3	45	0.3 * 45	13.50
4	Attitude	0.5	60	0.5 * 60	30.00
Total					79.00

Table 6. Outstanding Santri on behalf of Prasetyo

No.	*Criteria*	*Weight*	*Value*	*Evaluation Factor Value*	*Weight Factor Value*
1	Report Card Value	0.4	66	0.4 * 66	26.40
2	Presence	0.3	70	0.3 * 70	21.00
3	Extracurricular	0.3	75	0.3 * 75	22.50
4	Attitude	0.5	80	0.5 * 80	40.00
Total					109.90

From these four tables, it can be concluded that students who get a score of 90.00 or less are considered not to meet the requirements to be recognized as outstanding students at MA Daarul Falah, while students who get a score above 90.00 are considered to meet the criteria to be recognized as outstanding students. Below you can see the table of decision results as follows:

Table 7. Result of Decision

No.	*Name*	*School Grade*	*Evaluation Total*	*Result*
1	Ahmad Rifai	XII	110.80	Congratulations, you are eligible to serve.
2	Diana Aulia	XII	69.10	Sorry, you are not eligible to serve.
3	Yusuf Dani	XII	79.00	Sorry, you are not eligible to serve.
4	Prasetyo	XII	109.90	Congratulations, you are eligible to serve.

3.3 Prototype

Figure 6. Analysis Results Data Page Display

Figure 6 is a display of analysis results data which is a display form of analysis results that have gone through the process stages of the application using a multifactor evaluation process.

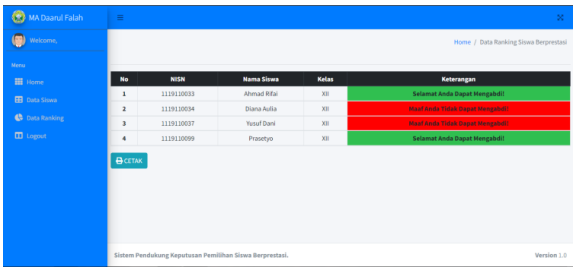

Figure 7. Ranking Data Page Display

Figure 7 depicts the student ranking data page which includes a form for tracking ranking results that have been validated by the school principal.

3.4 Testing

In this step, application testing is carried out using the Black Box Testing approach. The complete test scenario is listed in Table 8 below.

Table 8. Black Box Testing

No.	*The function being tested*	*Testing method*	*Result*	*Testing Status*
1	Student data menu	Admin enters the student data menu	Student Data Page	Successful
2	Input student data	Admin Inputting the student data (Click Add Data)	Admin Processing Input student data with adding student data	Successful
3	Change student data	Admin changes student data (click change data), input new data (click save data)	Admin changed the data	Successful

4	Delete student data	Admin delete the student data (click delete data icon)	Admin deleted the data	Successful
5	Print student data	Admin print the data (click print icon)	Enter the print page	Successful
6	Criteria & weight data menu	Admin enters the criteria & weight data menu	Criteria & weight data page	Successful
7	Input criteria & weight data	Admin input criteria & weight data (click add)	Admin carries out the criteria data input process by entering criteria and weights.	Successful
8	Change criteria & weight data	Admin changes criteria & weight data (click icon change criteria & weight) enter criteria & weight data that you want to change (click save)	Admin changes criteria & weight data	Successful
9	Delete criteria & weights data	Admin deletes criteria & weights data (click icon delete criteria & weights)	Admin deletes criteria & weights data	Successful
10	Print criteria & weight data	Admin will print criteria & weight data (click the print criteria & weight icon)	Print display process	Successful
11	Assessment data menu	Admin enters the assessment data menu,	Assessment data page	Successful
12	Input assessment data	Admin input assessment data (click add)	Admin carries out the assessment data input process by entering the assessment.	Successful
13	Change assessment data	Admin changes assessment data (click the change assessment icon) enter the assessment data you want changed (click save)	Admin changed the assessment data.	Successful
14	Delete assessment data	Admin deletes assessment data (click delete assessment icon)	Admin deletes assessment data	Successful
15	Print assessment data	Admin will print assessment data (click the print assessment icon)	The printing display process	Successful
16	Analysis results data menu	Admin enters analysis results data menu	Analysis results data page	Successful
17	Print data from analysis results.	Admin will print data from analysis results (click the print analysis results icon)	The printing display process	Successful

From the table 8, result of the testing shows there are the feature of the decision support system are completely successful after tested 5 times.

4. Conclusions

The findings of this research indicate that the Decision Support System for Selecting Outstanding Students at Pondok Pesantren Daarul Falah is developed using Hypertext Preprocessor (PHP) and MySQL as the database system to ensure data sustainability. The approach employed in this system is the multifactor evaluation process method. This method is utilized to determine the weight of each criteria parameter, where these parameters are established based on school data, and the priority scale of parameters is determined based on interviews with the school principal, who is the sole decision-maker.

Furthermore, the results generated by the system show that the first student received a total evaluation of 110.80 with the notation "Congratulations, you are eligible to serve"; the second student received a total evaluation of 69.10 with the notation "Sorry, you are not eligible to serve"; the third student received a total evaluation of 79.00 with the notation "Sorry, you are not eligible to serve"; and the last student received a total evaluation of 109.90 with the notation "Congratulations, you are eligible to serve".

From these explanations, it can be concluded that students who receive a total evaluation score above 90.00 are considered eligible to serve at Pondok Pesantren Daarul Falah, while those who receive a total evaluation score below 90.00 are deemed ineligible to serve there.

References

[1] A. J. Kusuma, A. P. Putra, and J. Lemantara,

"Implementasi Sistem Pendukung Keputusan untuk Pemilihan Siswa Berprestasi di Sekolah Menengah Atas dengan Metode AHP dan TOPSIS," *J. Komunika J. Komunikasi, Media dan Inform.*, vol. 10, no. 2, p. 73, 2021, doi: 10.31504/komunika.v10i2.4488.

[2] I. Kurnia and A. Muhtarom, "Sistem Pendukung Keputusan Untuk Menentukan Siswa Terbaik Menggunakan Kombinasi Metode AHP Dan Saw," *JIKO (Jurnal Inform. dan Komputer)*, vol. 4, no. 3, pp. 164–172, 2021, doi: 10.33387/jiko.v4i3.3339.

[3] S. Wahyuni and D. Y. Niska, "Sistem Pendukung Keputusan Pemilihan Pegawai Berprestasi Menggunakan Metode Multifactor Evolution Process (MFEP) (Studi Kasus : Rsup H . Adam Malik Medan)," *J. Mantik Penusa*, vol. 3, no. 2, pp. 124–129, 2019, [Online]. Available: https://e-jurnal.pelitanusantara.ac.id/index.php/mantik/article/view/687

[4] D. Ristiani, M. Asbari, and D. Novitasari, "Analisis Perancangan Sistem Pendukung Keputusan Penerima Beasiswa Menggunakan Metode Multi Factor Evaluation Process," *J. Ind. Eng. Manag. Res.*, vol. 1, no. 3, pp. 235–247, 2020.

[5] H. Hidayatullah and J. Eska, "Sistem Pendukung Keputusan Seleksi Calon Polri Baru Di Polres Asahan Menggunakan Metode Multifactor Evaluation Process (Mfep)," *J. Sci. Soc. Res.*, vol. 5, no. 2, p. 230, 2022, doi: 10.54314/jssr.v5i2.908.

[6] R. D. Heriyantoro, M. I. Dzulhaq, and L. S. M. Silitonga, "Sistem Pendukung Keputusan Penentuan Guru Berprestasi dengan Metode AHP dan SAW pada SMA Markus Tangerang," *Acad. J. Comput. Sci. Res.*, vol. 2, no. 2, pp. 2–9, 2020, doi: 10.38101/ajcsr.v2i2.284.

[7] M. Muslihudin and D. Rahayu, "Sistem Pendukung Keputusan Siswa Berprestasi Menggunakan Metode Weighted Product," *Technol. Accept. Model*, vol. 9, no. 2, pp. 114–119, 2018.

[8] W. Verina, M. Fauzi, F. Nasari, D. H. Tanjung, and J. Iriani, "Decision Support System for Employee Recruitment Using Multifactor Evaluation Process," *2018 6th Int. Conf. Cyber IT Serv. Manag. CITSM 2018*, 2018, doi: 10.1109/CITSM.2018.8674277.

[9] S. Maisaroh and D. Sofia, "Web-Based Learning Design and its Implementation on TOEIC Reading Skills to Measure the Usability and Learning Outcome A Case Study at Global Institute," *J. Sisfotek Glob.*, vol. 12, no. 2, p. 94, 2022, doi: 10.38101/sisfotek.v12i2.536.

[10] I. D. Pratama, A. Sanjaya, and N. Shofia, "Sistem Pendukung Keputusan Seleksi Siswa Terbaik Menggunakan Metode Profile Matching," *Semnas Ristek (Seminar Nas. Ris. dan Inov. Teknol.*, vol. 1, no. 1, pp. 60–68, 2022.

[11] K. Anin, Y. P. K. Kelen, and D. Nababan, "Sistem Pendukung Keputusan Pemilihan Siswa Berprestasi Menggunakan Metode Profile Matching Berbasis Web (Studi Kasus : SMK Negeri 1 Kefamenanu)," *J. Krisnadana*, vol. 2, no. 3, pp. 388–402, 2023, doi: 10.58982/krisnadana.v2i3.315.

[12] T. Christy, H. Herasmus, E. L. Febrianti, and F. M. Yuma, "Penerapan Metode MFEP Seleksi Penerimaan Siswa Baru Pada MTS Darul Fallah," *J. SAINTIKOM (Jurnal Sains Manaj. Inform. dan Komputer)*, vol. 22, no. 2, p. 456, 2023, doi: 10.53513/jis.v22i2.8687.

[13] A. Zuhair, F. Khadafi, A. M. Andriansyah, B. Saputra, and A. Saifudin, "Teknik Pengujian Equivalence Partions untuk Pengujian Aplikasi Sistem Penunjang Keputusan Pegawai Terbaik Menggunakan Black Box," *J. Teknol. Sist. Inf. dan Apl.*, vol. 3, no. 3, p. 132, 2020, doi: 10.32493/jtsi.v3i3.5365.

[14] D. D. Jantce TJ Sitinjak, . Maman, and J. Suwita, "Analisa Dan Perancangan Sistem Informasi Administrasi Kursus Bahasa Inggris Pada Intensive English Course Di Ciledug Tangerang," *Insa. Pembang. Sist. Inf. dan Komput.*, vol. 8, no. 1, 2020, doi: 10.58217/ipsikom.v8i1.164.

[15] M. B. Ryando, A. R. Mariana, and R. A. Hakim, "Sistem Pendukung Keputusan Pemilihan Sepeda Motor Second Terbaik di Kelas Matic 150cc Menggunakan Metode AHP dan TOPSIS," *Acad. J. Comput. Sci. Res.*, vol. 5, no. 1, p. 47, 2023, doi: 10.38101/ajcsr.v5i1.611.

[16] E. Erdiwansyah, M. Munawir, S. Susmanto, Z. Zulfan, and T. Hidayat, "Sistem Pendukung Keputusan Managemen BUMG Gampong Lambeugak Kecamatan Kuta Cot Glie Aceh Besar," *BAKTIMAS J. Pengabdi. pada Masy.*, vol. 3, no. 3, pp. 93–100, 2021, [Online]. Available: http://ojs.serambimekkah.ac.id/BAKTIMAS/article/view/3484

[17] S. Setiaji and R. Sastra, "Implementasi Diagram UML (Unified Modelling Language) Pada Perancangan Sistem Informasi Penggajian," *J. Tek. Komput. AMIK BSI*, vol. 7, no. 1, pp. 106–111, 2021, doi: 10.31294/jtk.v4i2.