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Decision Support System in Determining TPQ/TQA Teacher Certification Categories Using the SAW Method

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Abstract

TPQ/TQA teacher certification is a strategic effort to improve the quality of Qur'an educators. However, the assessment process often faces obstacles in the form of subjectivity and inconsistency of criteria, so a decision support system is needed that is able to produce objective and measurable assessments. This study aims to analyze the TPQ/TQA teacher certification assessment process in Padang City using the Simple Additive Weighting (SAW) method. This method was chosen because of its ability to perform calculations based on predetermined criteria and weights systematically. The research data consisted of 60 certification assessment documents that were analyzed through the stages of determining criteria, normalizing weights, calculating preference values, and ranking. The results showed that 9 teachers received a certification grade of A, 11 teachers received a grade of B, and 40 teachers received a grade of C. This finding confirms that the SAW-based decision support system can provide accurate, transparent, and efficient assessment results, and can be used as a reference by TPQ/TQA management institutions in determining teacher certification eligibility.

Keywords: Decision Support System, Teacher Certification, TPQ/TQA, Simple Additive Weighting, Technology.

1. Introduction

Technological advances, such as in hardware and software, are one of the impacts of globalization [1]. Globalization is the spread of ideas from one nation followed by other nations, which is characterized by technological progress [2]. Basically, technological progress provides many conveniences for human activities in doing positive things [3]. The long journey of technological evolution in basic devices such as computers [4]. The development of science and technology today has seen many changes in all fields [5]. For example, in the world of government in making decisions.

Decision Support System (DSS) is a computer information system that combines models and data to support decision makers in solving semi-structured problems [6]. One of the models in Decision Support System that can perform ranking [7]. selection of the best normalization technique in the Simple Additive Weighting (SAW) method to help the multi-criteria decision making (MCDM) process. Based on the results obtained, the Max and Max-Min normalization techniques were selected as the best techniques for the case study used in the research [8].

Previous research related to decision support systems, both with similar and different case studies, and using the same or different methods and objects, has been conducted by various researchers. These studies can be used as comparative material to evaluate the effectiveness of the methods used, which will be discussed further in this study. The next study introduced a new method called DOESAW, which is a combination of Design of Experiments (DOE) and the Simple Additive Weighting (SAW) method for faster multi-criteria decision making [9]. Another study showed the application of the Simple Additive Weighting method in determining lecturer performance by collecting questionnaire development data from students to obtain results that are able to provide the implementation of a SAW-based Decision Support System to increase objectivity and efficiency in assessing lecturer performance [10]. Previous research history on the problem of searching for Residence housing The results of the research that has been done then obtained Bale Asra housing with a value of 0.96, Budiman Asri Cimayang housing 0.7, Grand Vila Cahaya housing 0.72 and Mulia Land Bogor housing with a value of 1 Mulia Land Bogor housing is the most suitable housing based on the criteria in the Bogor area [11]. Previous research history on determining the best sales The results of the study show that the 6th alternative, represented by Rahman Rianto, has the highest value with 0.879, making it the best sales [12]. The next study discussed the recruitment of the general election committee resulting in an accurate and fast Decision Support System in the process of selecting the general election voting committee from the existing data there are 7 people selected from each region who will be selected as the general election committee [13]. Previous research history that discussed the problem of employee performance assessment in a national logistics company The results of the study show that

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the system can run effectively by carrying out its function as a website-based employee performance assessment [14]. Next, the discussion on the selection of the best doctor is based on the research results that were conducted in accordance with the criteria of the data used in selecting the best health workers at Ahmad Brahim Hospital [15]. Next, previous research on the results of the decision from the application of the ROC and SAW methods found 5 alternatives that were accepted to receive credit because they were considered worthy and met the criteria for managing basic food donations for orphanages [16]. Decision Support Systems (DSS) serve as a tool in the decision-making process. Through DSS, decision results can be obtained quickly and considered the best alternative quantitatively, based on the weighting or importance of criteria determined by the decision-maker. DSSs can simplify complex decision-making processes while enhancing decision-makers' capabilities without replacing their judgment. DSSs are generally used for types of decisions that are difficult to assess using algorithms alone [17]. The application of Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) methods in Decision Support Systems (DSS) can help accelerate and improve the accuracy of teacher promotion determination. By utilizing historical data on teacher performance and achievements, this system can provide more objective and efficient results than manual methods, which are often time-consuming and prone to errors [18]. The next research focused on developing a web-based decision support system for selecting outstanding students using the SAW and WP methods. The system proved faster and more accurate than manual methods and was able to provide objective ranking results. Implementation showed Abu Amrin Sodik as the best student with a final score of 0.1112. In the future, the system can be expanded by adding alternatives, new criteria, and implementation at other institutions [19]. The following study implemented the Simple Additive Weighting (SAW) method in a decision support system for selecting tutoring institutions. The system was able to evaluate several alternatives based on cost, distance, facilities, and instructor criteria, and produced an objective and accurate ranking. The results showed that Bimbel Camat ranked first with a score of 82.25, followed by Zefanya, Quantum, and Bintang Pelajar. These findings demonstrate that the SAW method effectively supports decision-making in selecting tutoring institutions [20]. Several previous studies have utilized decision support systems and the Simple Additive Weighting (SAW) method to assist decision making in various fields.

From the research results, a research gap can be identified: there is no research specifically discussing the Simple Additive Weighting (SAW) method for determining TPQ/TQA teacher certification scores based on multi-criteria. However, this method has the advantage of solving multi-criteria decision-making problems with a simpler, more measurable, and systematic approach. Therefore, this research contribution is raised to provide an impactful update to the system that was previously based on the performance of the implementation of a decision support system.

2. Methods

A research method is a systematic design used by researchers in the process of searching, formulating, and analyzing data to develop appropriate steps in accordance with the research objectives. Furthermore, research methods also serve as guidelines for determining the time and procedures required to obtain accurate analysis results. Applying appropriate research methods is crucial for the research process to proceed in a focused manner and in accordance with the research problem being studied, as shown in Figure 1.

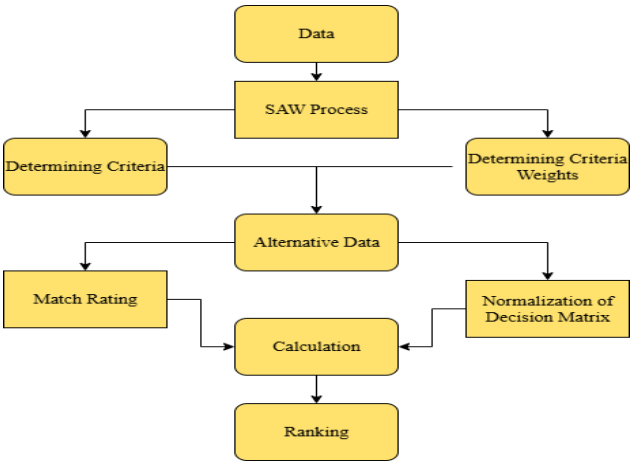

Figure 1. Planning Model

Figure 1 shows a research framework that incorporates the performance of the Simple Additive Weighting (SAW) method in determining certification categories. SAW is a decision-making method frequently used to determine the best alternative based on a number of predetermined criteria. The implementation process can be explained through the following stages:

2.1 Data

The data collection process was conducted through interviews and data collection at the Kesra Padang City. In this study, sample data to be processed using the SAW method as data to determine the TPQ/TQA teacher certification score consisted of length of teaching, last education, microteaching exam, Al-Quran reading exam, and achievement. The data used in the SAW process is in Excel format that has been summarized. There are 60 sample data from TPQ/TQA teachers in Padang City that will be used as samples for this study.

2.2 SAW Process

Based on the flow of implementing the SAW method, there are a number of important stages that need to be carried out sequentially, namely:

Determining Criteria
The initial step in the SAW method is to determine the criteria that will be used as the basis for evaluating alternatives. These criteria must align with the research objectives and significantly influence decision-making.

Determining the weight of the criteria
Each criterion is weighted to reflect its importance in the decision-making process. These weights are based on subjective and objective considerations, which can be obtained through literature studies, expert interviews, or specific statistical methods. The purpose of weighting is to prioritize criteria that have a greater influence on the final decision outcome.

Determining the Match Rating
Alternatives are a set of choices that will be evaluated based on predetermined criteria. Each alternative has distinct characteristics and requires objective analysis. In this study, the alternatives referred to are teachers teaching at TPQ/TQA. Each alternative is assigned a code to facilitate data analysis and processing.

Defining the Decision Matrix
Actual data from each alternative is evaluated against each criterion. The data is then converted to a numerical scale (usually in decimal form) so it can be processed using the SAW method. This process is carried out by referring to predetermined criteria weights. The suitability rating indicates the extent to which an alternative meets the predetermined criteria.

Matrix Normalization
Decision Matrix Normalization. A decision matrix is a tabular representation of data that displays the suitability of each alternative to predetermined criteria. Normalization is the process of obtaining the final value using the normalization matrix formula listed below.

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\underset{i}{Max} x_{ij}} \\ \dfrac{\underset{i}{Min} x_{ij}}{x_{ij}} \end{cases} \quad (1)$$

The matrix normalization process aims to convert the initial values in the decision matrix to a uniform scale so that they can be compared fairly. This is important because each criterion often has different units, value ranges, or assessment directions. After all values in the decision matrix have been normalized, the next step is to calculate the preference values. At this stage, each normalized value is multiplied by the previously determined criterion weights, using the following formula:

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \quad (2)$$

This process aims to emphasize each criterion's importance, so that criteria with higher weights will have a more significant impact on the final result. All the multiplication results between the normalized values and the criteria weights are then summed for each alternative, resulting in a preference value, Vi. This preference value represents the final score of each alternative based on all the criteria considered. The alternative with the highest preference value is considered the best alternative, as it optimally meets the criteria according to the predetermined weights.

Ranking
Ranking. This stage is the final step in the process, which involves calculations using a formula. The results are then ranked based on the Vi values obtained. The highest Vi value becomes the best alternative, and vice versa.

3. Results and Discussions

The Decision Support System developed in this study is implemented in the form of a website to support the decision-making process efficiently. The Simple Additive Weighting (SAW) method is used in the calculation to determine priority rankings based on predetermined criteria. The dataset used contains information about TPQ/TQA teachers. Each row in the table represents one teacher as an alternative to be evaluated, while the columns contain data including: Name, TPQ/TQA Description, Length of Teaching, Last Education, Microteaching Test Results, Al-Qur'an Test, and Achievements. Sample data for this study are presented in Table 1.

Table 1. Data

Name	Description	L.Teaching
Afdal Zikri, S.Kom	TPQ MRJR SP	1-2 Th
Riko Pebrianto, S.Pd.I	TPQ MRJR SP	>5 Th
Khalillur.r,S.I.Q., S.Pd.I	TPQ MRJR SP	2-4 Th
Novia Mardani, S.Pd	TPQ MRJR SP	1-2 Th
Reni Afrita, A.Md	TPQ MRJR SP	2-4 Th
Masradeli, S.Pd	TPQ Taqwa	>5 Th
Syamsuarina,S.I.Q.,M.A	TPQ MRJR SP	>5 Th
Mahadi, S.Pd	TPQ B.Rahmah	>5 Th
…	…	…
Olivia Aulia Arrahman	TPQ S.Manggih	3-4 Th

Tabel 1. Data (Advanced)

Last education	U. Mikroteaching	U. Al Qur'an	Performance
S(1)	Good	Smooth	There is
S(1)	Very Good	Very Smooth	There is
S(1)	Very Good	Very Smooth	There is
S(1)	Very Good	Very Smooth	There isn't any
S(1)	Good	Smooth	There is

S(1)	Very Good	Very Smooth	There is
S(2)	Very Good	Smoth	There is
S(1)	Very Good	Very Smooth	There is
…	…	…	…
SMP	Enough	Smooth	There isn't any

Next, determine the criteria to facilitate the calculation process using the Simple Additive Weighting method. The criteria can be seen in Table 2.

Table 2. Determining Criteria

Code Criterion (Ci)	Criteria Provisions	Attribute
C1	Long time teaching	Benefit
C2	Last educatio	Benefit
C3	Microteaching Exam	Benefit
C4	Al-Qur'an Reading Test	Benefit
C5	Performance	Benefit

Table 2 presents the criteria used in the criteria-setting process. The next step is to determine the weights for each criterion and their preference weights. The criteria and preference weights can be found in Table 3-8.

Table 3. Weighting Value of Criteria C1

C1	Mark
1-2 Years	0.5
2-4 Years	0.75
>5 Years	1

Table 4. Weighting Value of Criteria C2

C2	Mark
SHS	0.5
Bacelor Degree (S1)	0.75
Magister (S2)	1

Table 5. Weighting Value of Criteria C3

C3	Mark
Enough	0.5
Good	0.75
Very good	1

Table 6. Weighting Value of Criteria C4

C4	Mark
Less Smooth	0.5
Fluent	0.75
Very Smooth	1

Table 7. Weighting Value of Criteria C5

C4	Mark
There isn't any	0.5
There is	1

Tabel 1. Data

Kriteria	Bobot P.(W)	Bobot P.(W) %
L. Teaching	0,20	20 %
P. Last	0,25	25 %
U. Microteaching	0,30	30 %
U. Reading the Qur'an	0,20	20 %
Performance	0,05	5 %
Amount	1,0	100 %

Table 3-8 presents the weighting of the criteria used in determining certification categories. This is the next step in the certification category determination process to provide information used in evaluating each alternative based on the specified criteria. Alternative data can be seen in Table 9.

Table 9. Alternative Data

No	Code	Alternative Name	Information
1	A01	Afdal Zikri, S.Kom	TPQ MRJR SP
2	A02	Riko Pebrianto, S.Pd.I	TPQ MRJR SP
3	A03	Khalillurrahman,S.I.Q., S.Pd.I	TPQ MRJR SP
4	A04	Novia Mardani, S.Pd	TPQ MRJR SP
5	A05	Reni Afrita, A.Md	TPQ MRJR SP
6	A06	Masradeli, S.Pd	TPQ Taqwa
7	A07	Syamsuarina, S.I.Q., M.A	TPQ MRJR SP
8	A08	Mahadi, S.Pd	TPQ Bairurrahmah
…	…	…	…
60	A60	Olivia Aulia Arrahman	TPQ S.Manggih

Table 9 presents the alternative data used in the certification category determination process. This alternative data is then processed into a suitability rating for each alternative. The data can be viewed in Tables 10 and 11.

Table 10. Matching Rating

Nama	Information	L. Teaching
Afdal Zikri, S.Kom	TPQ MRJR SP	1-2 Th
Riko Pebrianto, S.Pd.I	TPQ MRJR SP	>5 Th
Khalillur.r,S.I.Q., S.Pd.I	TPQ MRJR SP	2-4 Th
Novia Mardani, S.Pd	TPQ MRJR SP	1-2 Th
Reni Afrita, A.Md	TPQ MRJR SP	2-4 Th
Masradeli, S.Pd	TPQ Taqwa	>5 Th
Syamsuarina,S.I.Q.,M.A	TPQ MRJR SP	>5 Th
Mahadi, S.Pd	TPQ B.Rahmah	>5 Th
…	…	…
Olivia Aulia Arrahman	TPQ S.Manggih	3-4 Th

Table 10. Match Rating (Continued)

P. Last	U. Mikroteaching	U. Al Qur'an	Performance
S(1)	Good	Smooth	There is
S(1)	Very Good	Very Smooth	There is
S(1)	Very Good	Very Smooth	There is
S(1)	Very Good	Very Smooth	T.There is
S(1)	Good	Smooth	There is
S(1)	Very Good	Very Smooth	There is
S(2)	Very Good	Smoth	There is
S(1)	Very Good	Very Smooth	There is
…	…	…	…
SMP	Enough	Smooth	T.There is

Table 11. Conversion Value Alternatives and Criteria

Kode	C1	C2	C3	C4	C5
A01	0.5	0.75	0.75	0.75	1
A02	1	0.75	1	1	1
A03	0.75	0.75	1	1	1
A04	0.5	0.75	1	1	0.5
A05	0.75	0.75	0.75	0.75	1
A06	1	0.75	1	1	1
A07	1	1	1	0.75	1
A08	1	0.75	1	1	1
…	…	…	…	…	…
A60	0.75	0.5	0.5	0.75	0.5

After completing the value conversion, the next step is to enter the decision matrix and matrix normalization stages.

$$Matriks\ x = \begin{bmatrix} 0.5 & 0.75 & 0.75 & 0.75 & 1 \\ 1 & 0.75 & 1 & 1 & 1 \\ 0.75 & 0.75 & 1 & 1 & 1 \\ 0.5 & 0.75 & 1 & 1 & 0.5 \\ 0.75 & 0.75 & 0.75 & 0.75 & 1 \\ 1 & 0.75 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0.75 & 1 \\ 1 & 0.75 & 1 & 1 & 1 \\ \dots & \dots & \dots & \dots & \dots \\ 0.75 & 0.5 & 0.5 & 0.75 & 0.5 \end{bmatrix}$$

The x-matrix shows each row representing an alternative, and each column representing an assessment criterion. This matrix forms the basis for calculating preference scores using the weighted criteria to determine the final ranking. The next step is to calculate preference scores by considering the weight of each criterion to determine the final ranking. The next step is to normalize the scores based on the criteria.

$$R = \begin{bmatrix} 0.5 & 0.75 & 0.75 & 0.75 & 1 \\ 1 & 0.75 & 1 & 1 & 1 \\ 0.75 & 0.75 & 1 & 1 & 1 \\ 0.5 & 0.75 & 1 & 1 & 0.5 \\ 0.75 & 0.75 & 0.75 & 0.75 & 1 \\ 1 & 0.75 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0.75 & 1 \\ 1 & 0.75 & 1 & 1 & 1 \\ \dots & \dots & \dots & \dots & \dots \\ 0.75 & 0.5 & 0.5 & 0.75 & 0.5 \end{bmatrix}$$

The R matrix represents the alternatives, with each column representing an assessment criterion. This R matrix will then be used in the next stage, which is calculating preference scores by multiplying each value in the matrix by the corresponding criterion weight to determine the final ranking. The next stage is to multiply the normalized values by the preference weights to produce the following ranking R.

W : C1=0.2; C2=0.25; C3=0.3; C4=0.2; C5=0.05
V1= (0.2*0.5)+(0.25*0.75)+(0.3*0.75)+(0.2*0.75)+(0.05*1) =0.7125
V2= (0.2*1)+(0.25*0.75)+(0.3*1)+(0.2*1)+(0.05*1)= 0.9375
V3= (0.2*0.75)+(0.25*0.75)+(0.3*1)+(0.2*1)+(0.05*1)= 0.8875
V4= (0.2*0.5)+(0.25*0.75)+(0.3*1)+(0.2*1)+(0.05*0.5)= 0.8125
V5=(0.2*0.75)+(0.25*0.75)+(0.3*0.75)+(0.2*0.75)+(0.05*1)= 0.7625
V6= (0.2*1)+(0.25*0.75)+(0.3*1)+(0.2*1)+(0.05*1)= 0.9375
V7= (0.2*1)+(0.25*1)+(0.3*1)+(0.2*0.75)+(0.05*1)= 0.95
V8= (0.2*1)+(0.25*0.75)+(0.3*1)+(0.2*1)+(0.05*1)= 0.9375
…
V60= (0.2*0.75)+(0.25*0.5)+(0.3*0.5)+(0.2*0.75)+(0.05*0.5)= 0.6

The multiplication results for each criterion are then summed to obtain a preference value (Vi) for each alternative. The Vi value represents the final score that will be used as the basis for determining ranking. The higher the preference value obtained, the higher the priority of that alternative in decision-making. The final stage, namely ranking, can be seen in Table 12.

Table 12. Ranking

Name	Information	Mark	Is
Afdal Zikri, S.Kom	TPQ MRJR SP	0.95	A
Riko Pebrianto, S.Pd.I	TPQ MRJR SP	0.9375	A
Khalillur.r,S.I.Q., S.Pd.I	TPQ MRJR SP	0.9375	A
Novia Mardani, S.Pd	TPQ MRJR SP	0.9375	A
Reni Afrita, A.Md	TPQ MRJR SP	0.8875	A
Masradeli, S.Pd	TPQ Taqwa	0.8125	B
Syamsuarina,S.I.Q.,M.A	TPQ MRJR SP	0.7625	C
Mahadi, S.Pd	TPQ B.Rahmah	0.7125	C
…	…	…	…
Olivia Aulia Arrahman	TPQ S.Manggih	0.6	C

Based on the calculation results using the Simple Additive Weighting (SAW) method, the final rankings were obtained as presented in Table 12. The highest certification score was achieved by Syamsuarina, S.I.Q., M.A with a score of 0.95 who was ranked first and obtained category A certification with the description Very Good. The second to fifth ranks were occupied by Marsadeli, B.A, Mahadi, S.Pd, Riko Pebrianto, S.Pd.I, and Khalilurrahman, S.I.Q., S.Pd.I with scores between 0.9375 to 0.8875, all of whom also achieved A certification.

Alternatives with medium preference values are in the range of 0.8375 to 0.8125, such as Svofi El Fika, S.Pd.I, Svofi Yanto, A.Md, and Novia Mardani, S.Pd, who obtained category B certification. Meanwhile, the lowest preference values were achieved by Reni Afita, A.Md (0.7625) and Afdal Zikri, S.Kom (0.7125), both of whom are in category C certification with the description Sufficient. The results of this ranking indicate that the SAW method is able to provide objective and measurable assessments based on the weight of the predetermined criteria, thus facilitating the decision-making process in determining the eligibility of TPQ/TQA teacher certification.

The results of this study indicate that the SAW method provides a numerical-based assessment and does not consider operational costs and certification duration in detail. Furthermore, the system has not been directly tested in the real-time TPQ/TQA teacher certification assessment process. Future research is recommended to include variables such as implementation costs and duration, as well as conduct system trial simulations in various real-world settings.

4. Conclusion

The application of the Simple Additive Weighting (SAW) method in this study proved highly effective in producing objective, transparent, and systematic assessments for determining TPQ/TQA teacher certification. The calculation results showed that the

teacher with the highest score achieved a value of 0.95, which quantitatively confirms the optimal level of eligibility based on the criteria and preference weights that have been formulated methodologically. Theoretically, this finding expands the scope of the SAW method implementation in the non-formal education sector, while filling the literature gap regarding the use of decision support systems for teacher certification in the TPQ/TQA environment, a topic that has until now received minimal scientific exploration. From a practical perspective, this study presents a prototype decision support system that can be adopted by certification institutions to determine teacher eligibility in a measurable, efficient, and consistent manner with actual conditions. However, the limitations of this study lie in the use of limited criteria, without considering factors such as implementation costs, duration, or real-time system testing. Therefore, further research with a broader scope, additional variables, and an integrated trial scheme is highly recommended to increase the external validity and practical relevance of the results

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Ir. Gunadi Widi Nurcahyo, MSc., PhD is an academic and researcher at Universitas Putra Indonesia YPTK Padang, specializing in Fuzzy Logic and Philosophy. He is recognized as a dedicated lecturer and researcher actively advancing knowledge in the fields of intelligent systems, artificial intelligence, and the application of algorithms for solving complex problems. Throughout his academic career, he has produced numerous scientific works published in both national and international journals. As of 2025, his research works have received more than 1,596 citations, with an h-index of 20 and an i10-index of 46, reflecting his significant contribution to the academic community. In addition to his publications, he plays an important role in supervising students and engaging in research collaborations with fellow academics from various institutions. His research interests focus on the application of computational algorithms, fuzzy logic, expert systems, and data mining across multiple domains, including transportation, healthcare, and technology-based learning. With his dedication and consistency, Ir. Gunadi Widi Nurcahyo, MSc., PhD continues to contribute to the development of computer science and artificial intelligence, while inspiring the younger generation to innovate and harness technology for the advancement of society.

Assoc. Prof. dr. Ir. Sumian, MSc is an academic and researcher who is active at the University of Putra Indonesia YPTK Padang. He is active in the fields of Digital Image Processing, Expert System, and Deep Learning, with a reputation as one of the productive researchers in Indonesia. In his academic career, he has produced many scientific works published in national and international journals. His scientific works have obtained more than 1,780 citations, with an h-index of 24 and an i10-index of 51. This data shows the

	consistency and quality of research recognized by the academic community, both at the national and international levels. Assoc. Prof. Dr. Ir. Sumijan, MSc is known as an academic figure who is highly dedicated to the development of science, as well as having a strong commitment to education and research progress in Indonesia.		graphic design, and web development, combined with organizational and professional experience, he is committed to contributing to the advancement of technology and communication in both government and society.
	Afdal Zikri is a graduate of Informatics Engineering from Universitas Putra Indonesia YPTK Padang, with a concentration in Artificial Intelligence. Since his undergraduate years, he has shown a strong interest and ability in the field of technology, particularly in graphic design, web development, and the use of various computer software. His formal education began at SMAN 4 Padang from 2016 to 2019 in the Science program, before continuing his studies at UPI YPTK Padang from 2019 to 2023. In addition to his academic focus, Afdal was also active in student organizations, including serving in the Informatics Engineering Student Association (2019–2022) and UKMK Al-Furqon UPI YPTK Padang (2019–2023), which enriched his experience in leadership, coordination, and teamwork. Currently, Afdal Zikri works at the Department of Communication and Informatics of Padang City, where he continues to apply his academic background and technical skills to support digital development and public service innovation. With a strong foundation in Artificial Intelligence,		