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IMPLEMENTATION OF SIMPLE ADDITIVE WEIGHTING METHOD IN THE DETERMINATION SYSTEM OF THESIS SUPERVISOR

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Abstract : *Majors are part of higher education institutions that a very important role determining the thesis student supervisor . At the Department of Information Systems, Faculty of Mathematics and Natural Sciences (MIPA) the determination of the thesis supervisor is carried out through a lecturer meeting based on its title in accordance with the competence of the lecturer who will guide, regardless of the number of lecturers' workload or the number of students being supervised. The results of the decision of the meeting to determine the supervisors will be announced to students after the meeting is held. This flow inefficient and may lead to ineffective determination of the supervisor . The final result of the system shows that the Simple Additive Weighting (SAW) method can be applied to determine the weight value of each attribute so as to produce a ranking of each alternative lecture who will be selected as a student supervisor for the thesis according to the result of computerized and accurate calculations.*

Keywords: *SAW, Supervisor, Thesis*

Abstrak : *Jurusan merupakan bagian dari perguruan tinggi yang memiliki peran sangat penting sebagai pintu gerbang utama kelulusan mahasiswa dalam menentukan dosen pembimbing tugas akhir. Pada Jurusan Sistem Informasi Fakultas Matematika dan Ilmu Pengetahuan alam (MIPA) penentuan dosen pembimbing tugas akhir dilakukan melalui rapat dosen berdasarkan dengan judul tugas akhir mahasiswa yang sesuai dengan kompetensi dosen yang akan membimbing, tanpa memperhatikan jumlah beban kerja dosen maupun jumlah mahasiswa yang sedang dibimbing. Sedangkan untuk mengetahui hasil keputusan rapat penentuan dosen pembimbing yang akan di umumkan kepada mahasiswa memerlukan waktu setelah dilaksanakan rapat. Hal itu sangat tidak efisien serta dapat mengakibatkan penentuan dosen pembimbing yang kurang efektif karena dapat membebankan dosen yang terpilih jika beban kerjanya serta jumlah mahasiswa bimbingan yang sudah terlalu banyak. Hasil akhir sistem menunjukkan metode Simple Additive Weighting (SAW) dapat diterapkan untuk menentukan nilai bobot setiap atribut sehingga menghasilkan perangkingan dari setiap alternatif dosen yang akan terpilih menjadi dosen pembimbing tugas akhir mahasiswa sesuai dengan hasil perhitungan yang terkomputerisasi dan akurat.*

Kata kunci*: SAW, Dosen Pembimbing, Tugas Akhir*

1. INTRODUCTION

Bachelor of Computer Science is one of the degrees awarded by the Department of Information Systems, Tanjungpura University. The Information Systems Study Program teaches the foundation of science and the application of information technology in an organization. Related to this, the curriculum of the Information Systems Study Program is unique because it is built on 3 (three) fields, namely: Computer Science, Management and Business. During lectures, students will be equipped with various competencies in these three fields in order to be able to provide solutions related to information systems that suit the needs of the organization.

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The Information Systems Study Program has 3 study groups, namely Smart Business, Information System Management, Software Management & Development. Each lecturer is grouped into certain skills and is responsible for guiding the student's thesis proposal. As stated in the academic Manual[1].

Towards the end of the study period, a student is required to complete a thesis which is one of the graduation requirements. To help students complete their final assignments, students are guided by a team of supervisors who are tasked with providing direction and input to students so that the process of completing the preparation of the thesis can be completed on time. Each student is guided by two or more supervisors[2].

Determination of the wrong supervisor, can hinder the process of guidance and student thesis work. For this reason, it is necessary to have a system that can display thesis supervisor recommendations for students effectively so that it is expected to minimize errors that may occur in determining thesis supervisors. The recommendations given are not based on personal knowledge, but consider the research that has been done by the lecturer[3].

Majors in a faculty is part of a university that has a very important role as the main gateway of students' graduation when determining the supervisor. At the Department of Information Systems, Faculty of Mathematics and Natural Sciences (MIPA) to determine the thesis supervisor, it is decided directly through closed meetings of the lecturers based on the subject / title of the student's thesis according to the competence of the lecturer who will guide, regardless of the number of lecturers' workloads and the number of students being supervised and who have been supervised. Meanwhile, the results of the decision of the meeting to determine the supervisor takes time after the meeting is held and be announced to students afterwards. This is considered very inefficient and may lead to ineffective determination of supervisors due to burden the selected lecturer if the workload and the number of supervised students are too large.

Based on the problems that have been stated above, one solution that be able to minimize the process of determining the supervisor lecturer at the Department of Information Systems (MIPA) is that by making a computerized system. A comprehensive calculation will provided is not only seen from the competence factor of each lecturer but also observes other criteria that can support determination of the supervisor correctly and accurately. The method used to calculate the final result in determining the supervisor and examiner is a comparison of Simple Additive Weighting (SAW). The methods to be used as of the results are the MADM (Multi-Attribute Decision Making) model, which is when calculating requires a decision matrix of each criterion and a weight value[4]. SAW method is a simple weighting method or weighted addition by looking for the performance rating (priority scale) on each alternative in all attributes[5]. The criteria used in the case of determining supervisors and examiners do not only pay attention to the competence of the lecturers, but

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also other aspects such as lecturer credits workload (SKS), education background, status, supervisor's experience, consulting services, average guidance time per student, as well as the number of completed thesis guidance. In addition, the calculation in this system also considers the ratio of the number of lecturers to the number of students being supervised so that the guidance process for each student will be better optimized.

Considering various literature references, generally in the form of research journals, the system for determining the thesis supervisor has been done by previous research. Among them were conducted by Ainul Yaqin, et al with the title Decision Support System for Determination of Thesis Supervisor Using Fuzzy Logic Method. The criteria used in this assessment include the competence of lecturers, student GPA, the burden of lecturer guidance, the value of students' thesis that has advanced in thesis trial and the duration of students in completing theses. The purpose of building this system is to facilitate decision making related to the determination of supervisors, in order to create optimal guidance and optimal final project or thesis results[6]**.** In other studies The Implementation of SAW and BORDA Method in different cases specifically to determine the Eligibility of Students' Final Project Topic made by dwiny, et al. In this study the simple Additive Weighting (SAW) method was used to rank the final project proposal, and BORDA method was used to Accumulate the assessment score of the expert team. The research revealed the recommendation on students' final topics[[7]**.**

In another study at Sam Ratulangi University Manado conducted by Iwan et al about the Decision Support System for determining Thesis Supervisor lecturers using the simple Additive Weighting (SAW) method, in general this research was conducted to provide convenience for the head of the Informatics Engineering study program at Sam Ratulangi University Manado to determine the thesis supervisor, so that the thesis submitted by students is in accordance with the competence of the thesis supervisor candidate and the selected lecturer does not have too much guidance. As for the criteria used, namely the education of the lecturer, the rank or functional of the lecturer, the competence or area of expertise of the lecturer and the number of thesis guidance that is still active[8].

From some of the journal references above, by considering the problems and the various methods used, a system for determining the thesis supervisor was created. The difference between the current research and the previous research is thr criteria used to determine the supervisor.The results of this study shows the order of comparison of the supervisor rankings with the SAW.

2. RESEARCH METHOD

A research framework to describe the research environment using the Hevner framework. The phases carried out in this research are determining the Environment, which explains the research environment, the IS Research Phase, which explains the phases

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traversed in the study, and finally the Knowledge base phase explains the knowledge base used in research[9]. The research framework can be seen in Figure 1 below:

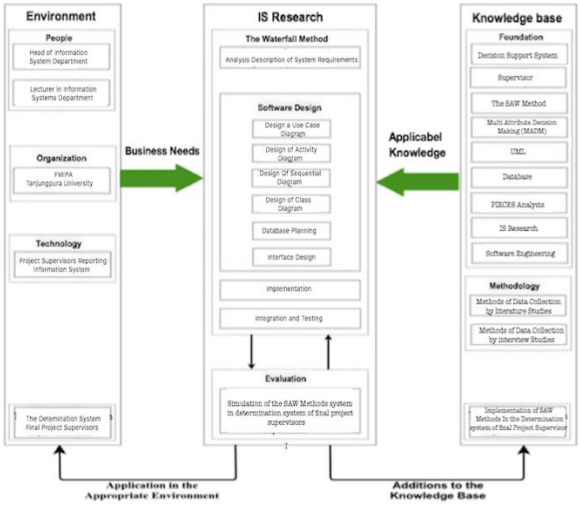

Figure 1. Hevner framework.

2.1 *Simple Additive Weighting (SAW)*

The SAW method is called the weighted sum method because the basic concept is to find the weighted sum of performance ratings for each alternative on all attributes[10]. The work process of the SAW method: (a) Determine the criteria that will be used as a reference in making decisions, namely Cj. (b) Give the value of each alternative to each predefined criterion, where the value is obtained based on the value of Crips. (c) Determine the suitability rating value of each alternative on each criterion and then model it into fuzzy numbers and after that convert to Crips. (d) Define the weight of preference or level of importance (W) on each criterion. (e) Make a decision matrix (X) formed by the match rating table of each alternative for each criterion. (f) Normalize the decision matrix by steps in calculating the value of the nominal performance rating (rij) from Ai alternatives on the Cj criteria [11].

$$r_{ij} = X_{ij} / (\text{Max } X_{ij}) \quad (1)$$

if j is a profit attribute(benefit)

$$r_{ij} = (\text{Min } X_{ij}) / X_{ij} \quad (2)$$

if j is the profit attribute (cost)

(g) The results of the normalized performance rating value (rij) form a normalized matrix (R) and the final result of the preference value (Vi) is obtained from the sum of the multiplications of the work elements of a normalized matrix with preference weights (W) corresponding to the matrix column elements (W).

$$V_i = \sum_{j=1}^{n} W_j r_{ij} \quad (3)$$

2.2 *Final Assessment and Supervisor*

The thesis is a scientific work that is compiled by students to complete their studies through a scientific, creative, integrative, and disciplined thinking process that is designed to meet the study roundness requirements in the program and education level in the study environment [10]. A research report in the form of a scientific paper is called an undergraduate thesis, thesis or dissertation [12].

Supervisors are lecturers who supervise students in completing thesiss, examining concepts, frameworks and providing guiandce to students. Supervisors must be in accorandce with the field of knowledge in the title of the thesis purposed by students[13].

3. RESULTS AND DISCUSSION

3.1 System Design And Implementations

The design process uses the Unified Modeling Language (UML) which begins with

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making Use case diagrams to explain users who are entitled to use the functions on the system and define the functions contained in the system[14]. In designing this system, there are two actors, namely the operator, and the decision maker, namely the head of the Information Systems department. To see as a whole the functions along with the actors who are responsible for each function of the designed system elements and one of the functions carried out by the admin is managing lecturer data in Figure 2.

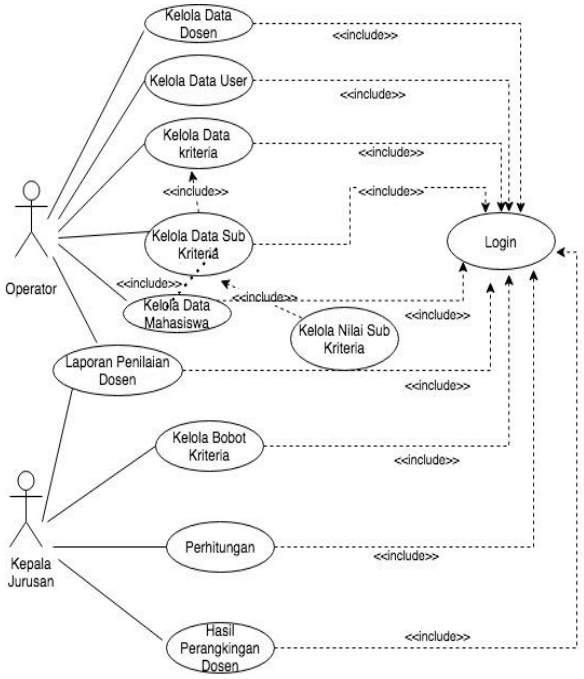

Figure 2. Usecase Diagram

The next step is to create an Entity Relationship Diagram (ERD) as a form of database design that displays diagrams or images that show the business systems used related to the creation, storage and use . For more details, the ERD can be seen in Figure 3.

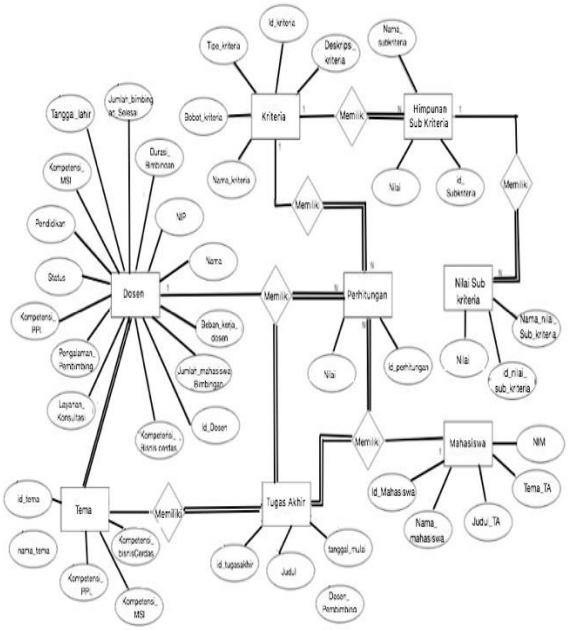

Figure 3. Entity Relation Diagram (ERD)

The next stage of implementing the system that has been made in the form of a website is shown from Figure 4 to Figure 12 below

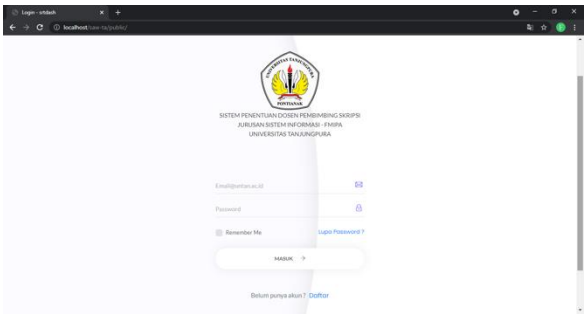

Figure 4. Login Interface Implementation

Figure 4 is used by the user to log into the system by inputting a username and password then pressing the login button, the system checks user data, if there is an error, the system will give an error message and if it is, the user will be given access rights to enter the system.

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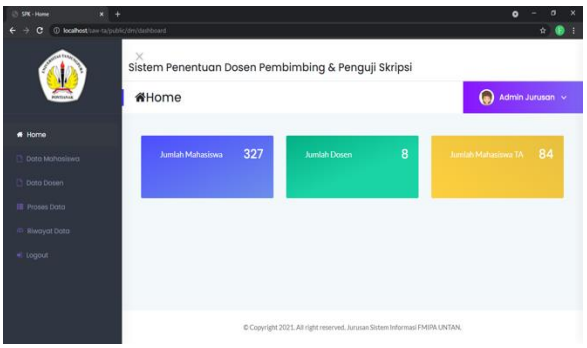

Figure 5. Implementation of Admin Main Page

Figure 5 is the result of the implementation of the calculation result history interface design, which displays information about the calculation results that can be selected, one of which is using the SAW method. In this interface information displays the supervisors' data based on criteria, criterion value conversion data, criterion value normalization data, and variance value data from supervisors that are ranked based on the highest value to the lowest value.

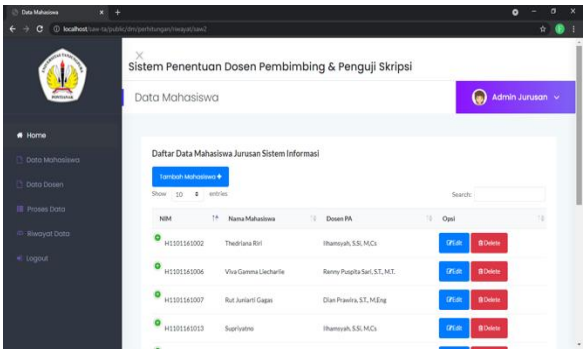

Figure 6. Implementation of Student Data Management

Figure 6 is used by admins to manage student data, admins can input data, edit data, delete data. To enter the data itself, the admin needs to click the create button, while to edit, delete, and the admin must first select the student data to be processed.

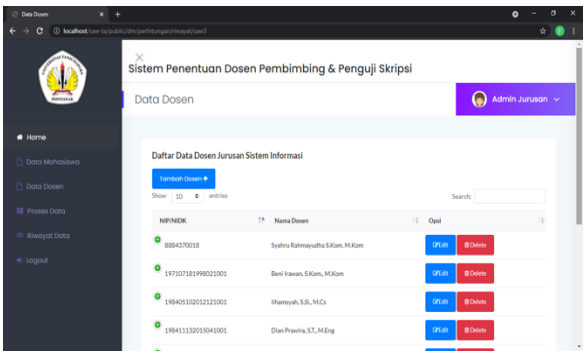

Figure 7. Implementation of Supervisor Data Management

Figure 7 is used by admins to manage supervisor data, admins can input data, edit data, delete data and make assessments for supervisor who have not been assessed.

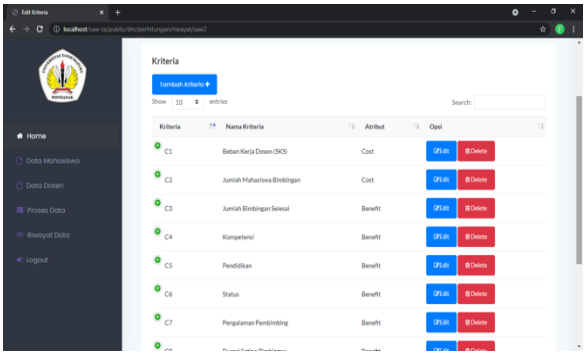

Figure 8. Implementation of Data Criteria Management

Figure 8 is used by admins to manage Data Criteria, admins can input data, edit data, delete data. To enter the data itself, the admin needs to click the create button, while to edit, delete, and the admin must first select the data criteri to be processed.

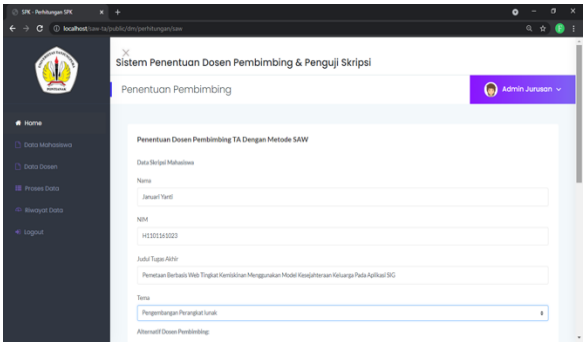

Figure 9. The Process determining Supervisor

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Figure 9 is process of determining the supervising lecturer is carried out by the department admin by filling in the thesis student data based on the proposed thesis theme. Furthermore, the department admin will provide an assessment of the criteria of each supervisor.

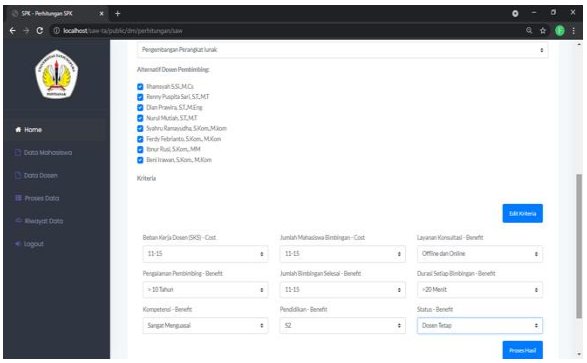

Figure 10. SAW Method Calculation

Figure 10 is interface is used by the head of the department to calculate the thesis supervisor using the SAW method, the head of the department presses the Count process button, the calculation data will automatically appear.

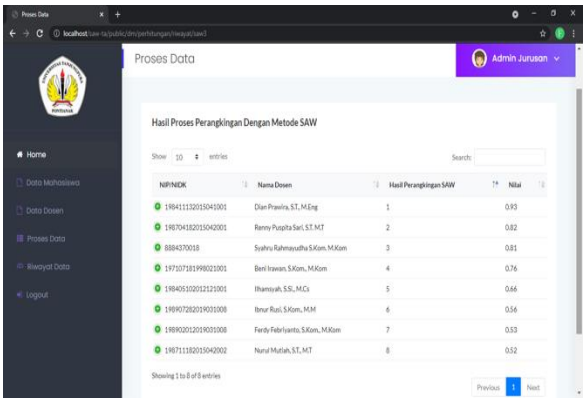

Figure 11. Ranking Result

Figure 11 is used by the admin to see the results of the ranking process using the SAW method. The results of the calculation process that have been carried out previously not only produce rankings but also display the value of each lecturer.

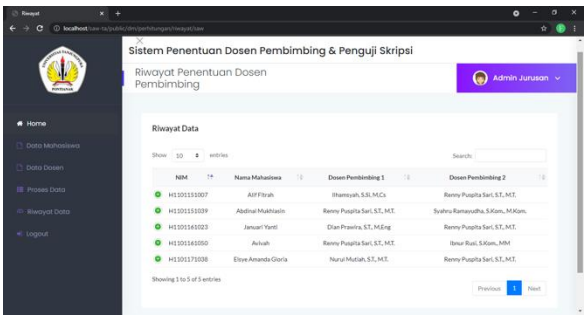

Figure 12. Calculation History Report

Figure 12 is interface is used by the department head and admin to view the results of the history of determining the entire student mentoring lecturer. The Head of Department and the admin determine how much data the thesis student wants to see, then the system will display the student data and the thesis supervisor, both supervisor 1 and supervisor 2.

3.2 Discussion Manual Calculation SAW Method.

At this stage, calculations are done manually to determine the supervisor using the SAW method. The initial step is based on table 1 above where the criteria data from each alternative is converted into an assessment with weight of importance based on table 1. Then the calculation of the normalization of the vector matrix (rij) is by calculating the performance rating value of each alternative and the criterion value. Normalization is done by using equation (1). The results of normalization can be seen in table 2 below:

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Table 1. Data Of Criteria And Weight Of Assessment

Code	*Criteria*	*Cost/Benefit*	*Weight of Assessment*
K1	Credits Workload (SKS)	Cost	0,1
K2	Total of Supervised Students	Cost	0,1
K3	Total of Completed Supervision	Benefit	0,15
K4	Competence	Benefit	0,18
K5	Education	Benefit	0,05
K6	Work Status	Benefit	0,1
K7	Supervisor's Experience	Benefit	0,12
K8	Duration on Each Supervision	Benefit	0,11
K9	Consultation Service	Benefit	0,09

The manual calculation process uses a sample of data from a lecturer majoring in Information Systems who will be the selected supervisor for the thesis. The following is a sample of supervisor data based on the value criteria and the suitable rating criteria in Table 1.

At this stage, calculations are done manually to determine the supervisor using the SAW method. Then the calculation of the normalization of the vector matrix (rij) is by calculating the performance rating value of each alternative and the criterion value. Normalization is done by using equation (1) and (2). The results of normalization can be seen in table 2 below:

Table 2
Normalization Result

Alternative Names	*K1*	*K2*	*K3*	*K4*	*K5*	*K6*	*K7*	*K8*	*K9*
Arul	0,50	1,00	0,60	0,80	1,00	1,00	1,00	0,60	1,00
Dian	0,67	0,67	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Nurul	0,50	0,50	0,40	0,60	1,00	1,00	0,20	0,40	0,20
Reny	0,50	0,50	0,80	1,00	1,00	1,00	0,60	1,00	1,00
Ilham	0,67	0,67	0,60	0,80	1,00	1,00	0,60	0,20	0,60
Ferdy	0,50	0,50	0,20	0,60	1,00	1,00	0,20	0,60	0,60
ibnu	0,50	0,50	0,20	0,60	1,00	1,00	0,20	0,60	1,00
Beni	1,00	0,50	0,60	0,80	1,00	1,00	0,60	0,60	1,00

After the normalization results are obtained, then a multiplication matrix (preference) will be completed using equation (3) to get a ranking of all the alternatives which can be seen in table 3 below:

Table 3
Preference Value

Alternative Names	*Preference Value (V)*	*Ranking*
Dian	0,93	1
Reny	0,82	2
Arul	0,81	3
Beni	0,76	4
Ilham	0,66	5
Ibnur	0,56	6
Ferdy	0,53	7
Nurul	0,52	8

4. CONCLUSION

The conclusions that can be drawn from the system for determining supervisors using a comparison of the WP and SAW methods are as follows:

1. The SAW methods can be applied to the calculation of a computerized supervisor

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determination system where the final result in the form of a ranking of the name of the supervisor.

2. The System for Determining thesis Supervisors for the Department of Information Systems, Faculty of Mathematics and Natural Sciences, Tanjungpura University can provide a comprehensive assessment related to the selection of supervisors so that the mentoring process will be more optimal and not encounter many obstacles.

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