

Selection of the Best Lecturers using the AHP (Analytical Hierarchy Process) and TOPSIS (The Technique for Order of Preference by Similarity to Ideal Solution): Case Study of STMIK Insan Pembangunan

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Abstract

STMIK Insan Pembangunan is a College that was established in 1990, located in Tangerang Regency. Supported by 41 Lecturer staff. Lecturers have the position as professional staff at the higher education level who are appointed in accordance with the laws and regulations. Lecturers are educators who provide a number of knowledge to students in universities or universities. The best lecturer selection system is used to support learning and teaching activities in the campus so that students are competent in the field of concentration taken. So it is needed teaching staff or lecturers who are competent in their fields, in this case to meet the criteria of the competent lecturer is needed a system that supports in this case deciding which lecturers are considered the best. The process of selecting the Best Lecturers in the current system is that there is a shortage that takes a long time to process the results of the questionnaire data and only uses one of the criteria of the Tridarma of Higher Education, namely Education and Teaching. So that the resulting decision is not yet valid. In this study a Decision Support System (DSS) will be made where the decision support system can help a person in making accurate and well-targeted decisions. The method used is AHP to calculate the weight of each criterion and TOPSIS to rank each alternative based on each criterion. The results obtained in this study are a system that is able to produce the best rank of lecturers in STMIK Insan Pembangunan.

I. INTRODUCTION

Lecturers are professional educators and scientists with the main task of transforming, developing, and disseminating science, technology and art through education, research and community service. (Law of the Republic of Indonesia No. 14 of 2005 concerning Teachers and Lecturers). In article 51 Paragraph (1) point b, that lecturers have the right to get promotions and awards according to their academic performance. [14]

Every year STMIK Insan Pembangunan always chooses one of the best lecturers, because it refers to the thoughts above. And it is appropriate to give awards to lecturers who have achievements in the field of university tridarma. The awarding will encourage lecturers to perform more productively, so as to encourage the achievement of the goals of developing the higher education system in particular, and national development in general.

The purpose of the study:

1. Determine the selection of the Best Lecturers based on the criteria that have been weighted by the Analytic Hierarchy Process (AHP) method after which they are ranked Decision Results with the Technique for Other Refresh by Similarity to Ideal Solution (TOPSIS).
2. Helping STMIK Development Personnel in making decisions on choosing the Best Lecturers. So that it can facilitate the Chairperson of STMIK Insan Pembangunan in choosing the Best Lecturer

II. RELATED WORKS

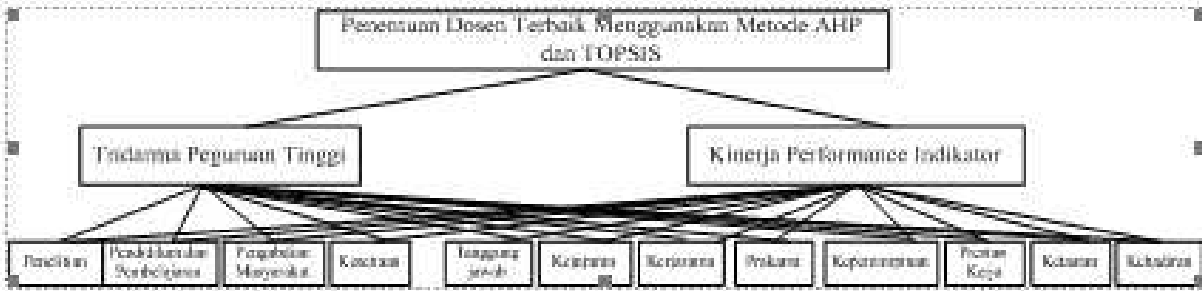
Table 1. Research Overview

No	Name and Year Of Research	Title and Research Location	Method	Result
1	Sofhian dkk. (2016)	Decision Support System for the Best Lecturer Selection Using Promethee Method (Case Study: Information Engineering of Tanjungpura University)	Promethee	The system built using the Promethee method can work well in determining the ranking of Lecturers.
2	Kholidani (2017)	Decision Support System for Lecturer Performance Assessment with AHP and SAW methods (Case study: At the Faculty of Information Technology Islamic University of Kalimantan MAB Banjarmasin)	AHP dan SAW	This study succeeded in ranking alternatives from the results of calculating the value of the performance of the MAB University Information Technology Faculty Banjarmasin lecturers.
3	Puspitasari, dan Ilmi, (2016)	Decision Support System for the Selection of Achieving Lecturers Using the Analytical Hierarchy Process (AHP) Method.	AHP	Research shows good results and the system is as expected.
4	Sumiati dan Nuryadin, 2013	Decision Support System in Determining Lecturer Performance Assessment with Mamdani Model Fuzzy Database Method	Metoda Mamdani dimana diterapkan logika fuzzy <i>Inteferece System</i>	The results of this study help and provide an alternative in assessing each lecturer, making changes to criteria, making decisions related to the problem of lecturer performance evaluation.
5	Minghui dan Yan, 2015	<i>A Comprehensive College Coaches Evaluation Model Based on AHP and Grey Correlation Theory.</i>	AHP dan Teori <i>Grey Correlation</i>	The results obtained by the 5 (five) best trainers ranked from the Gray Correlation Theory and AHP are far more accurate.
6	Rasim dkk. 2017	Decision Support System For Performance and Evaluation of Teacher in General –English Course by Using the SMARTER and TOPSIS Methods. (UPI)	SMARTER dan TOPSIS	The results of this study are Methods of SMARTER and TOPSIS decision support systems can be used as an alternative to measure teacher performance and rank best teachers.

III. METHODS

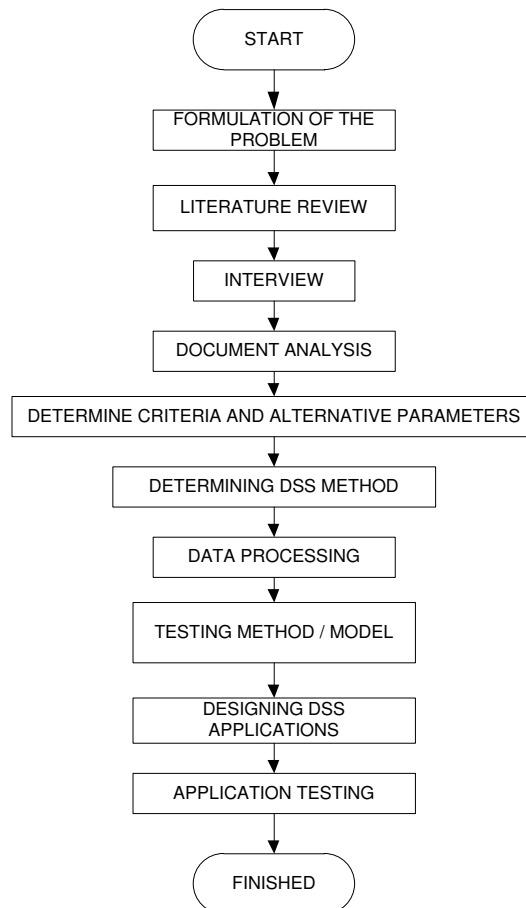
The research used is applied research (Applied Research). In this study, the data sample used is the Bidder Participant data with the following column details: Company Name, Business Field, Experience. Data collection is carried out by primary and secondary data collection methods. In the primary data collection method that is by conducting data collection directly to the data source owned by STMIK Insan Pembangunan also data collection is done by the method of observation, interviews and questionnaires for secondary data collection method is done by reading, observing and studying data from sources related to this research.

3.1 Model of Determining the Best Lecturer Performance with the AHP method



Picture 1. Hierarki Model Determination ff The Best Lecturer With AHP

3.2 Research Steps



Picture 2. Research Steps

The following step is the sequence of steps in the BI lifecycle method:

A. Justification

This stage explains at a glance information about PDDIKTI which become a driving factor in the development of BI applications and analyze the problems found such as college management needs a report that precise and fast which makes it easy to make strategic decisions and in order to improve the quality of education, requires a tool that can monitor, evaluate and measure performance in universities and there is a large amount of academic data stored but to present it in reports when evaluating academic activities becomes difficult and takes a long time. Also Risk Assessment that has been found is in the Feeder PDDIKTI there is no graph with measurement components such as KPI (Key Performance Indicator) so that is difficult to see information in order to making strategic decision process.

B. Planning

Planning process related to BI infrastructure that used and BI project development planning.

C. Business Analysis

The stage of determining KPI (Key Performance Indicator) as the basis for performance measurement in college and information needed by college management. This KPI is obtained from published journal reviews relating to academic activities contained in the Feeder PDDIKTI and refers to BAN-PT Undergraduate Accreditation Assessment (S1) Matrix with elements of assessment Standard 3 (Student and Graduates) and Standard 4 (Human Resources), analyzing the data source, i.e. data on the Feeder PDDIKTI and designing an application workflow with the use case diagram and activity diagram as well as designing the user interface by making a screen design also analyzing the meta data on the data source that is Feeder PDDIKTI. This Meta data is analyzed based on data analysis.

D. Design

The phase of multidimensional schema design in data mart using Star Schema. Star schema design based on the needs in the Project Requirement Definition and the data contained in this star schema design will be used to display reports. Extract Transform Load Design which is the phase of designing ETL (Extract Transform Load) process from data source into data mart. In this ETL design process, uses mapping data source tables to data mart tables. The tables selected in the data source, only those related to academic activities contained in the Feeder PDDIKTI only. Meta Data Repository Design is Architectural selection stage in the meta data warehouse and design the meta data warehouse using Entity-Relationship Design or Object-Oriented Design.

E. Construction

The implementation stage of the ETL process from the tables contained in the data source such as Feeder PDDIKTI into tables on data mart. Using PHP (PHP: Hypertext Preprocessor) script in performing ETL processes from Feeder PDDIKTI into data mart through intermediary web service. This ETL Development stage is a continuation of the ETL design stage. The Application development stage is carried out by development user interface display in which there are graphical reports and the testing phase of functionality in the application that has been built using the black box testing method. After the application development is complete, then proceed with the Release Evaluation stage using a Research Questionnaire to measure assessments of applications that have been built. Questionnaire questions are made based on aspects of information needed by the user, aspects of UI (User Interface) design, aspects of UX (User Experience) design and technical aspects.

IV. RESULTS

In this study discuss the results of AHP calculation as weighting criteria and TOPSIS method as a ranking:

4.1 Weighting Process with AHP

In this study the expert will be given a questionnaire to determine the weight of the criteria to be used by the AHP method.

Table 2. Interests Criteria According to Experts

Sub Kriteria	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTJ	KHD
PLT	1.00	0.31	2.33	2.33	2.00	1.67	2.33	2.33	2.33	1.83	2.33	2.00
PDP	3.27	1.00	3.33	3.33	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
PMS	0.43	0.30	1.00	0.67	0.67	0.67	1.00	1.00	1.17	0.67	1.00	2.00
KST	0.43	0.30	1.50	1.00	1.33	1.00	1.67	1.33	1.67	0.83	1.33	2.00
TGJ	0.50	0.33	1.50	0.75	1.00	0.80	2.00	1.67	2.33	1.50	1.33	1.00
KJJ	0.60	0.33	1.50	1.00	1.67	1.00	1.50	1.33	1.67	1.00	1.67	1.00
KRS	0.43	0.33	1.00	0.60	0.50	0.67	1.00	2.00	2.00	0.94	1.00	0.50
PKR	0.43	0.33	1.00	0.75	0.60	0.75	0.50	1.00	1.00	0.44	0.61	2.00
KPP	0.43	0.33	0.86	0.60	0.43	0.60	0.50	1.00	1.00	0.39	0.50	2.00
PKJ	0.55	0.33	1.50	1.20	0.67	1.00	1.06	2.25	2.57	1.00	2.00	1.00
KTJ	0.43	0.33	1.00	0.75	0.75	0.80	1.00	2.00	2.00	0.50	1.00	1.00
KHD	0.50	1.00	0.50	0.50	1.00	1.00	2.00	0.50	0.50	1.00	1.00	1.00
Total Nilai	8.49	4.24	16.82	12.95	12.61	11.88	16.86	16.92	20.74	12.11	16.78	16.80

- Then matrix normalization is carried out where each result of pairwise comparison is divided by the SUM results from the criteria. After that the value is added to the right divided by the number of criteria to calculate the priority weight. The priority weight value will then be tested for its consequences before being used in ranking with the TOPSIS method.

$$\text{Initial Element Value} = \frac{\text{the value of each initial matrix element}}{\text{number of initial columns}} \quad (4.1)$$

Example calculation of matrix Normalization First line:

a. Addition of Research Column:

Research: $1.000 + 3.2727 + 0.4286 + 0.4286 + 0.5000 + 0.6000 + 0.4286 + 0.4286 + 0.4286 + 0.5455 + 0.4286 + 0.5000 = 8.4896$

b. $(\text{research} / \text{research}) / \text{SUM} = 1.0000 / 8.4896 = 0.1178$

Then each line is divided by the Total Value per Criteria.

Table 3. Normalization

Sub Kriteria	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTJ	KHD
PLT	0.12	0.07	0.14	0.18	0.16	0.14	0.15	0.12	0.11	0.15	0.15	0.12
PDP	0.39	0.24	0.20	0.26	0.24	0.26	0.19	0.16	0.14	0.25	0.19	0.06
PMS	0.05	0.07	0.06	0.05	0.05	0.06	0.06	0.05	0.06	0.06	0.06	0.12
KST	0.05	0.07	0.09	0.08	0.11	0.09	0.11	0.07	0.08	0.07	0.08	0.12
TGJ	0.06	0.08	0.09	0.06	0.08	0.05	0.13	0.09	0.11	0.12	0.08	0.06
KJJ	0.07	0.08	0.09	0.08	0.13	0.09	0.10	0.07	0.08	0.08	0.11	0.06
KRS	0.05	0.08	0.06	0.05	0.04	0.06	0.06	0.11	0.10	0.08	0.06	0.03
PKR	0.05	0.08	0.06	0.06	0.05	0.06	0.03	0.05	0.05	0.04	0.04	0.12
KPP	0.05	0.08	0.05	0.05	0.03	0.05	0.03	0.05	0.05	0.03	0.03	0.12
PKJ	0.06	0.08	0.09	0.09	0.05	0.09	0.07	0.12	0.12	0.08	0.13	0.06
KTJ	0.05	0.08	0.06	0.06	0.06	0.05	0.06	0.11	0.10	0.04	0.06	0.06
KHD	0.06	0.24	0.01	0.04	0.08	0.09	0.13	0.03	0.03	0.08	0.06	0.06
Total Nilai	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

- If the value has been normalized the priority weight is searched by adding the first row and the next row.

$$\text{Priority Weight} = \frac{\text{Number of Rows}}{\text{Number of Criteria}} \quad (4.2)$$

Example of calculating Research Priority Weight
Research Priority Weight:
 $0.1178 + 0.0721 + 0.1412 + 0.1797 + 0.1586 + 0.1443 + 0.1500 + 0.1233 + 0.1125 + 0.15114 + 0.1479 + 0.1200 = 0.1363$
- The next step is to calculate lambda max. To calculate lambda max, that is by 2 steps: the first step is the value of the importance of each criterion multiplied by the weight of each criterion then summed up then divided by each weight. The second step is to add the value in the first step divided by the number of criteria.

$$\lambda = \begin{bmatrix} \Sigma \text{baris K1} \\ \vdots \\ \Sigma \text{baris Kn} \end{bmatrix} \times \begin{bmatrix} \text{BP1} \\ \vdots \\ \text{BPn} \end{bmatrix} = \begin{bmatrix} \lambda \text{max K1} \\ \vdots \\ \lambda \text{max Kn} \end{bmatrix} \quad (4.3)$$

Information:

BP = Priority Weight K = Column

The example of calculating lambda max uses data from the previous step.

The first step:

Research: $((1.000 * 0.1363) + (0.3056 * 0.2283) + (2.3333 * 0.0578) + (2.3333 * 0.0811) + (2.000 * 0.0868) + (1.6667 * 0.0883) + (2.3333 * 0.0674) + (2.3333 * 0.0517) + (2.3333 * 0.0464) + (1.8333 * 0.0896) + (2.3333 * 0.0664) + (2.0000 * 0.0800)) / 0.1363 = 12.8200$

Education and Teaching:

$$((3.2727 * 0.1363) + (1.0000 * 0.2283) + (3.3333 * 0.0578) + (3.3333 * 0.0811) + (3.0000 * 0.0868) + (3.0000 * 0.0883) + (3.0000 * 0.0674) + (3.0000 * 0.0517) + (3.0000 * 0.0464) + (3.0000 * 0.0896) + (3.0000 * 0.0664) + (1.0000 * 0.0800)) / 0.2283 = 12.6800$$

Community service:

$$((0.4286 * 0.1363) + (0.3000 * 0.2283) + (1.0000 * 0.0578) + (0.6667 * 0.0811) + (0.6667 * 0.0868) + (0.6667 * 0.0883) + (1.0000 * 0.0674) + (1.0000 * 0.0517) + (1.1667 * 0.0464) + (0.6667 * 0.0896) + (1.0000 * 0.0664) + (2.0000 * 0.0800)) / 0.0578 = 12.9200$$

Loyalty:

$$((0.4286 * 0.1363) + (0.3000 * 0.2283) + (1.5000 * 0.0578) + (1.0000 * 0.0811) + (1.3333 * 0.0868) + (1.0000 * 0.0883) + (1.6667 * 0.0674) + (1.3333 * 0.0517) + (1.6667 * 0.0464) + (0.8333 * 0.0896) + (1.3333 * 0.0664) + (2.0000 * 0.0800)) / 0.0811 = 12.8400$$

Responsible:

$$((0.5000 * 0.1363) + (0.3333 * 0.2283) + (1.5000 * 0.0578) + (0.7500 * 0.0811) + (1.0000 * 0.0868) + (0.6000 * 0.0883) + (2.0000 * 0.0674) + (1.6667 * 0.0517) + (2.3333 * 0.0464) + (1.5000 * 0.0896) + (1.3333 * 0.0664) + (1.0000 * 0.0800)) / 0.0868 = 12.7100$$

Honesty:

$$((0.6000 * 0.1363) + (0.3333 * 0.2283) + (1.5000 * 0.0578) + (1.0000 * 0.0811) + (1.6667 * 0.0868) + (1.0000 * 0.0883) + (1.5000 * 0.0674) + (1.3333 * 0.0517) + (1.6667 * 0.0464) + (1.6667 * 0.0896) + (1.0000 * 0.0664) + (1.0000 * 0.0800)) / 0.0883 = 12.7100$$

Cooperation:

$$((0.4286 * 0.1363) + (0.3333 * 0.2283) + (1.0000 * 0.0578) + (0.6000 * 0.0811) + (0.5000 * 0.0868) + (0.6667 * 0.0883) + (1.0000 * 0.0674) + (2.0000 * 0.0517) + (2.0000 * 0.0464) + (0.9444 * 0.0896) + (1.0000 * 0.0664) + (0.5000 * 0.0800)) / 0.0674 = 12.6600$$

Initiative:

$$((0.4286 * 0.1363) + (0.3333 * 0.2283) + (1.0000 * 0.0578) + (0.7500 * 0.0811) + (0.6000 * 0.0868) + (0.7500 * 0.0883) + (1.5000 * 0.0674) + (1.0000 * 0.0517) + (1.0000 * 0.0464) + (0.4444 * 0.0896) + (0.6111 * 0.0664) + (2.0000 * 0.0800)) / 0.0517 = 12.9600$$

Leadership:

$$((0.4286 * 0.1363) + (0.3333 * 0.2283) + (0.8571 * 0.0578) + (0.6000 * 0.0811) + (0.4286 * 0.0868) + (0.6000 * 0.0883) + (0.5000 * 0.0674) + (1.0000 * 0.0517) + (1.0000 * 0.0464) + (0.3889 * 0.0896) + (0.5000 * 0.0664) + (2.0000 * 0.0800)) / 0.0464 = 12.9900$$

Work performance:

$$((0.5455 * 0.1363) + (0.3333 * 0.2283) + (1.5000 * 0.0578) + (1.2000 * 0.0811) + (0.6667 * 0.0868) + (1.0000 * 0.0883) + (1.0588 * 0.0674) + (2.2500 * 0.0517) + (2.5714 * 0.0464) + (1.0000 * 0.0896) + (2.0000 * 0.0664) + (1.0000 * 0.0800)) / 0.0896 = 12.7400$$

Obedience:

$$((0.4286 * 0.1363) + (0.3333 * 0.2283) + (1.0000 * 0.0578) + (0.7500 * 0.0811) + (0.7500 * 0.0868) + (0.6000 * 0.0883) + (1.0000 * 0.0674) + (2.0000 * 0.0517) + (2.0000 * 0.0464) + (0.5000 * 0.0896) + (1.0000 * 0.0664) + (1.0000 * 0.0800)) / 0.0664 = 12.7700$$

Presence:

$$((0.5000 * 0.1363) + (1.0000 * 0.2283) + (0.5000 * 0.0578) + (0.5000 * 0.0811) + (1.0000 * 0.0868) + (1.0000 * 0.0883) + (2.0000 * 0.0674) + (0.5000 * 0.0517) + (0.5000 * 0.0464) + (1.0000 * 0.0896) + (1.0000 * 0.0664) + (1.0000 * 0.0800)) / 0.0664 = 12.3200$$

Second step:

Looking for Lamda Max with a formula.

$$\lambda = \frac{\text{Number of elements in the matrix}}{m} \quad (4.4)$$

Information:

m = Number of criteria

$$(12.82 + 12.68 + 12.92 + 12.84 + 12.71 + 12.71 + 12.66 + 12.96 + 12.99 + 12.74 + 12.77 + 12.32) / 12 = 12.7500$$

Then the Lambda Max value is 12.7500

- The final step is to calculate the consistency index value (CI) used to calculate the consistency ratio value that will determine whether the pairwise comparison matrix to be obtained from the results of the questionnaire has a consistent or not. The purpose of the consistency test is to determine the consistency of the answers that have been filled in by the respondents which will affect the stability of the results. By being declared consistent, the data can be used and processed to the next stage

$$\text{Formula for calculating CI: } CI = \frac{\lambda_{max} - m}{m - 1} \quad (4.5)$$

$$CI = (11.3311 - 11) / 10 = 0.0331$$

Next looking for the ratio consistency value (CR), this CR value is obtained with the formula $CR = CI / RI$. The Random Index (RI) value, obtained from the L. Saaty table.

The random index value will be used to calculate ratio consistency (CR), this CR value will determine whether the paired comparison matrix obtained from the questionnaire results has a consistent or not. The index random value can be seen from the Random Index Table II-2.

Consistency ratio (CR) will be valid or consistent if the value of $CR < 0.1$ or worth $< 10\%$, and vice versa CR will be invalid or inconsistent if the value is greater ≥ 0.1 , with the formulation of the consistency ratio value (CR) :

$$CR = \frac{CI}{RI} \quad (4.6)$$

$$CR = 0.0331 / 1.51 = 0.021930121$$

In the two tables above the consistency ratio (CR) obtained a value of 0. This means that the ratio is considered consistent ($CR < 0.1$) so that the assessment given by the respondents in the questionnaire is considered feasible.

4.2 Ranking with TOPSIS method

Ranking by using the TOPSIS method, where the results of weighting with the AHP method will be included as part of the calculation in the steps of ranking with this topsis method, the steps of the topsis method:

- Make a normalized decision matrix weighted (Y)

Table 4 Alternative Weight Value

Nama Dosen	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTT	KHD
YOSUA NOVEMBRIANTO	4	5	5	4	4	4	3	3	3	4	5	3
SIMORANGKIR	4	4	3	4	5	5	5	3	4	3	4	4
HARDY BENRY SIMBOLON	5	5	3	4	5	4	5	3	4	5	5	3
GAZALI	5	5	4	3	5	4	4	3	4	5	4	4
RASLIM	5	4	5	4	5	5	5	4	4	5	4	5
ADIYANTO	4	4	4	5	5	4	5	3	3	4	4	3
ASAT CHOLID	5	5	4	3	4	5	4	3	3	4	4	3
UMI RUKAYAH	5	5	4	4	4	4	4	4	5	5	5	3
NURASIAH	4	4	5	4	4	5	3	4	5	5	4	4
BAMBANG SUHARTONO	5	4	5	3	4	5	5	4	4	4	3	3
NGADIYONO	5	4	3	5	5	4	5	3	5	5	4	4
FEIMILIA	5	4	3	5	5	4	5	3	5	5	4	4

- Normalization Decision Matrix, the decision matrix is done by lifting each cell value from each column in the Alternative Weight Value. then add up each column, then add the square root to get the normalized decision table.

Table 5 Alternative Data Squares Matrix

NAMA DOSEN	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTT	KHD
YOSUA NOVEMBRIANTO	16	25	25	16	16	16	9	9	9	16	25	9
SIMORANGKIR	16	16	9	16	25	25	25	9	16	9	16	16
HARDY BENRY SIMBOLON	25	25	9	16	25	16	25	9	16	25	25	9
GAZALI	25	25	16	9	25	16	16	9	16	25	16	16
RASLIM	25	16	25	16	25	25	25	16	16	25	16	25
ADIYANTO	16	16	16	25	25	16	25	9	9	16	16	9
ASAT CHOLID	25	25	16	9	16	25	16	9	9	16	16	9
UMI RUKAYAH	25	25	16	9	16	25	16	9	9	16	16	9

- Making Normalization Data, Normalization data is done using the following formula:

$$N = \frac{\text{Data}}{\text{Root results per criteria}} \quad (4.7)$$

Table 6. Normalization Data

Nama Dosen	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTJ	KHD
YOSUA NOVENBRIANTO	0.1417	0.1822	0.1961	0.1499	0.1413	0.1453	0.1145	0.1244	0.1143	0.1506	0.1785	0.1313
SIMORANGKIR	0.1417	0.1458	0.1177	0.1499	0.1767	0.1816	0.1809	0.1244	0.1524	0.1130	0.1428	0.1751
HARDY BENRY	0.1771	0.1822	0.1177	0.1499	0.1767	0.1453	0.1909	0.1244	0.1524	0.1883	0.1785	0.1313
SIMBOLON	0.1771	0.1822	0.1569	0.1124	0.1767	0.1453	0.1527	0.1244	0.1524	0.1883	0.1428	0.1751
GAZALI	0.1771	0.1458	0.1961	0.1499	0.1767	0.1816	0.1909	0.1658	0.1524	0.1883	0.1428	0.2188
RASLIM	0.1417	0.1458	0.1569	0.1874	0.1767	0.1453	0.1909	0.1244	0.1143	0.1506	0.1428	0.1313
ADIYANTO	0.1771	0.1822	0.1569	0.1124	0.1413	0.1816	0.1527	0.1244	0.1143	0.1506	0.1428	0.1313
ASAT CHOLID	0.1771	0.1822	0.1569	0.1499	0.1413	0.1453	0.1527	0.1658	0.1905	0.1883	0.1785	0.1313
UMI RUKAYAH	0.1417	0.1458	0.1961	0.1499	0.1413	0.1816	0.1145	0.1658	0.1905	0.1883	0.1428	0.1751
NURASIAH	0.1771	0.1458	0.1961	0.1124	0.1413	0.1816	0.1909	0.1658	0.1524	0.1506	0.1071	0.1313
BAMBANG SUHARTONO	0.1771	0.1458	0.1177	0.1874	0.1767	0.1453	0.1909	0.1244	0.1905	0.1883	0.1428	0.1751
NGADIYONO	0.1417	0.1458	0.1961	0.1499	0.1413	0.1816	0.1145	0.1658	0.1905	0.1883	0.1428	0.1751
FEIMILIA	0.1771	0.1822	0.1569	0.1124	0.1413	0.1453	0.1527	0.1658	0.1905	0.1883	0.1785	0.1313
DEDI SOPYAN	0.1417	0.1458	0.1961	0.1499	0.1413	0.1816	0.1145	0.1658	0.1905	0.1883	0.1428	0.1751
SUWARTO	0.1771	0.1822	0.1569	0.1124	0.1413	0.1816	0.1909	0.1244	0.1905	0.1506	0.1428	0.1751

4. Calculating Weighted Normalization, by multiplying normalization data by weighting criteria. Weighted Normalization Formula:

$$\text{Weighted normalization} = \text{Normalization data} \times \text{Weight of Criteria} \quad (4.8)$$

Table 7 Weighted normalization

Nama Dosen	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTJ	KHD
Bobot	0.1350	0.2143	0.0631	0.0845	0.0846	0.0860	0.0643	0.0875	0.0826	0.0872	0.0659	0.0763
YOSUA NOVENBRIANTO	0.0191	0.0391	0.0124	0.0127	0.0120	0.0125	0.0074	0.0071	0.0060	0.0131	0.0118	0.0100
SIMORANGKIR	0.0191	0.0312	0.0074	0.0127	0.0149	0.0156	0.0123	0.0071	0.0080	0.0099	0.0094	0.0134
HARDY BENRY	0.0239	0.0391	0.0074	0.0127	0.0149	0.0125	0.0123	0.0071	0.0080	0.0164	0.0118	0.0100
SIMBOLON	0.0239	0.0391	0.0099	0.0095	0.0149	0.0125	0.0098	0.0071	0.0080	0.0164	0.0094	0.0124
GAZALI	0.0239	0.0312	0.0124	0.0127	0.0149	0.0156	0.0123	0.0085	0.0080	0.0164	0.0094	0.0167
RASLIM	0.0191	0.0312	0.0099	0.0158	0.0149	0.0125	0.0123	0.0071	0.0080	0.0131	0.0094	0.0100
ADIYANTO	0.0239	0.0391	0.0099	0.0095	0.0149	0.0125	0.0098	0.0071	0.0080	0.0131	0.0094	0.0100
ASAT CHOLID	0.0239	0.0391	0.0099	0.0127	0.0120	0.0125	0.0089	0.0085	0.0100	0.0164	0.0118	0.0100
UMI RUKAYAH	0.0239	0.0391	0.0099	0.0095	0.0149	0.0125	0.0098	0.0071	0.0080	0.0131	0.0094	0.0100
NURASIAH	0.0239	0.0391	0.0099	0.0127	0.0120	0.0125	0.0089	0.0085	0.0100	0.0164	0.0118	0.0100
BAMBANG SUHARTONO	0.0191	0.0312	0.0124	0.0127	0.0120	0.0156	0.0074	0.0085	0.0100	0.0164	0.0094	0.0134
NGADIYONO	0.0239	0.0312	0.0124	0.0095	0.0120	0.0156	0.0123	0.0085	0.0080	0.0131	0.0071	0.0100
FEIMILIA	0.0239	0.0312	0.0074	0.0158	0.0149	0.0125	0.0123	0.0071	0.0100	0.0164	0.0094	0.0124
DEDI SOPYAN	0.0191	0.0312	0.0074	0.0158	0.0149	0.0156	0.0089	0.0071	0.0080	0.0164	0.0094	0.0100
SUWARTO	0.0239	0.0391	0.0099	0.0095	0.0120	0.0156	0.0123	0.0071	0.0100	0.0131	0.0094	0.0134
DEDI INDRA WIJAYA	0.0191	0.0312	0.0124	0.0158	0.0149	0.0125	0.0074	0.0085	0.0100	0.0164	0.0071	0.0134

5. Value Max and Min

Looking for the max and min values of weighted normalization can be done with the formulation:

Criteria are benefit (the greater the better) then: $Y^+ = \max$ and $Y^- = \min$ (4.9)

The criteria are cost (the smaller the better) then: $Y^+ = \min$ and $Y^- = \max$ (4.10)

Table 8. Tables of Max and Min of Weighted Normalization

Nama Dosen	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTJ	KHD
Bobot	0.1350	0.2143	0.0631	0.0845	0.0846	0.0860	0.0643	0.0875	0.0826	0.0872	0.0659	0.0763
YOSUA NOVENBRIANTO	0.0191	0.0391	0.0124	0.0127	0.0120	0.0125	0.0074	0.0071	0.0060	0.0131	0.0118	0.0100
SIMORANGKIR	0.0191	0.0312	0.0074	0.0127	0.0149	0.0156	0.0123	0.0071	0.0080	0.0099	0.0094	0.0134
HARDY BENRY	0.0239	0.0391	0.0074	0.0127	0.0149	0.0125	0.0123	0.0071	0.0080	0.0164	0.0118	0.0100
SIMBOLON	0.0239	0.0391	0.0099	0.0095	0.0149	0.0125	0.0098	0.0071	0.0080	0.0164	0.0094	0.0134
GAZALI	0.0239	0.0312	0.0124	0.0127	0.0149	0.0156	0.0123	0.0085	0.0080	0.0164	0.0094	0.0167
RASLIM	0.0191	0.0312	0.0099	0.0158	0.0149	0.0125	0.0123	0.0071	0.0080	0.0131	0.0094	0.0100
ADIYANTO	0.0239	0.0391	0.0099	0.0095	0.0149	0.0125	0.0098	0.0071	0.0080	0.0131	0.0094	0.0100
ASAT CHOLID	0.0239	0.0391	0.0099	0.0127	0.0120	0.0125	0.0089	0.0085	0.0100	0.0164	0.0118	0.0100
UMI RUKAYAH	0.0239	0.0391	0.0099	0.0095	0.0149	0.0125	0.0098	0.0071	0.0080	0.0131	0.0094	0.0100

6. Determine the ideal postifier's solution matrix (A +) and negative ideal solution (A -)

With the formulation are:

$$Dx^+ = \sqrt{(Ax_1 - Y_1^+)^2 + (Ax_2 - Y_2^+)^2 + \dots + (Ax_n - Y_n^+)^2} \quad (4.11)$$

$$Dx^- = \sqrt{(Ax_1 - Y_1^-)^2 + (Ax_2 - Y_2^-)^2 + \dots + (Ax_n - Y_n^-)^2} \quad (4.12)$$

Table 9 Ideal Solution Table

Atribut	Benefit	Benefit	Benefit	Benefit	Benefit	Benefit	Benefit	Cost	Cost	Benefit	Benefit	Benefit
Positif	0.0239	0.0391	0.0124	0.0158	0.0149	0.0156	0.0123	0.0071	0.0060	0.0164	0.0118	0.0167
Negatif	0.0143	0.0234	0.0074	0.0095	0.0090	0.0094	0.0074	0.0119	0.0100	0.0099	0.0071	0.0100

7. Then determine the distance between the values of each alternative with the positive ideal solution matrix and the negative ideal solution matrix. Distance between alternatives with positive ideal solutions (D_i^+).

Table 10 Table of Positive Ideal Solutions

Nama Dosen	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTT	KHD
YOSUA NOVEMBRIANTO SIMORANGKIR	0.00002	0.00000	0.00000	0.00001	0.00001	0.00001	0.00002	0.00000	0.00000	0.00001	0.00000	0.00004
HARDY BENRY SIMBOLON	0.00002	0.00006	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004	0.00001	0.00001
GAZALI	0.00000	0.00000	0.00002	0.00001	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
RASLIM	0.00000	0.00000	0.00001	0.00004	0.00000	0.00001	0.00001	0.00000	0.00000	0.00000	0.00001	0.00001
ADIYANTO	0.00000	0.00006	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00001	0.00000
ASAT CHOLID	0.00002	0.00006	0.00001	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00001	0.00001	0.00004
UMI RUKAYAH	0.00000	0.00000	0.00001	0.00004	0.00001	0.00000	0.00001	0.00000	0.00000	0.00001	0.00001	0.00004
NURASIAH	0.00000	0.00000	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00000	0.00000	0.00004
BAMBANG SUHARTONO	0.00002	0.00006	0.00000	0.00001	0.00001	0.00000	0.00002	0.00001	0.00002	0.00000	0.00001	0.00001

Table 11 Table of Negative Ideal Solution

Nama Dosen	PLT	PDP	PMS	KST	TGJ	KJJ	KRS	PKR	KPP	PKJ	KTT	KHD
YOSUA NOVEMBRIANTO SIMORANGKIR	0.00002	0.00024	0.00002	0.00001	0.00001	0.00001	0.00000	0.00002	0.00002	0.00001	0.00002	0.00000
HARDY BENRY SIMBOLON	0.00002	0.00006	0.00000	0.00001	0.00004	0.00004	0.00002	0.00002	0.00000	0.00000	0.00001	0.00001
GAZALI	0.00009	0.00024	0.00000	0.00001	0.00004	0.00001	0.00002	0.00002	0.00000	0.00004	0.00002	0.00000
RASLIM	0.00009	0.00024	0.00001	0.00000	0.00004	0.00001	0.00001	0.00002	0.00000	0.00004	0.00001	0.00001
ADIYANTO	0.00009	0.00006	0.00002	0.00001	0.00004	0.00004	0.00002	0.00001	0.00000	0.00004	0.00001	0.00004
ASAT CHOLID	0.00002	0.00006	0.00001	0.00004	0.00004	0.00001	0.00002	0.00002	0.00002	0.00001	0.00001	0.00000
UMI RUKAYAH	0.00009	0.00024	0.00001	0.00000	0.00001	0.00004	0.00001	0.00002	0.00002	0.00001	0.00001	0.00000
NURASIAH	0.00009	0.00024	0.00001	0.00000	0.00001	0.00004	0.00001	0.00002	0.00002	0.00001	0.00001	0.00000

8. Determine the preference value for each alternative. By using formulations:

$$Vx = \frac{Dx-}{(Dx-)+(Dx+)} \quad (4.13)$$

Table 12. Value of Alternative Preferences

No	Nama	Positif	Negatif	Preferensi	Rangking
1	RASLIM	0.0091	0.0219	0.7066	1
2	GAZALI	0.0096	0.0225	0.7004	2
3	SUWARTO	0.0099	0.0215	0.6843	3
4	ADIYANTO	0.0093	0.0197	0.6798	4
5	NURASIAH	0.0104	0.0211	0.6714	5
6	MASDUKI ASBARI	0.0107	0.0214	0.6664	6
7	UMI RUKAYAH	0.0110	0.0212	0.6577	7
8	GRACE NOVA IMELDA	0.0111	0.0211	0.6541	8
9	MURTAR AMAN	0.0110	0.0202	0.6470	9
10	HERA FAIZAL RACHMAT	0.0121	0.0212	0.6363	10

V. CONCLUSIONS

After analyzing, designing and testing it can be concluded as follows:

1. The system of supporting decision models for determining the best lecturers built can help STMIK Insan Pembangunan, as an illustration for corporate decision making in order to get the best lecturers. The system of decision models supporting the determination of the best lecturers built can accelerate the process of selecting the best lecturers.

2. The system of decision models supporting the determination of the best lecturers is able to handle the processing and management of data.
3. The AHP and TOPSIS systems help get calculations that are in accordance with the needs of determining the best lecturers among the lecturers in the STMIK Insan Pembangunan campus. Where the biggest value is the first rank, which was obtained by Mr. Raslim of 0.7066 the second position was obtained by Mr. Gazali for 0.7004. Third place to Mr. Suwanto 0.6843.

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