

# APPLICATION AND EVALUATION OF AHP-ELECTER PERFORMANCE IN THE DETERMINATION OF THE THESIS SUPERVISOR

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**Abstract** – Thesis is part of a student's study journey. Universitas Muhammadiyah Kalimantan Timur (UMKT) has a scheme for organizing a thesis that is different from other universities. This Lecturer and Student Collaboration Scheme (KDM) has the concept that thesis work is carried out in groups under the guidance of one lecturer. The role of the supervising lecturer then becomes very important because the determination of the research theme is carried out by the lecturer and students only need to work on the sub-section of the research as their thesis. The selection of supervisors then becomes important and study programs with a very large number of students in one batch as well as study programs with very few students will be overwhelmed by this scheme. The determination of the thesis supervisor is usually done by considering certain criteria. This study uses a combination of AHP and ELECTRE to analyze how the performance of the two methods when faced with the case of determining a supervisor with a different scheme from the thesis in general. The study programs selected as samples were taken from each faculty at UMKT, namely Informatics Study Program, Management Study Program, English Education Study Program, Public Health Study Program and International Relations Study Program. From the five study programs, the most widely used criteria were the functional position of the lecturer, quota, suitability of research with the lecturer roadmap, and student concentration. The results show that AHP-ELECTR can be used to determine supervisors with this KDM scheme with an average accuracy value of 83%. ELECTRE as an alternative removal method is able to eliminate prospective lecturers who do not meet the criteria.

**Keywords:** AHP, ELECTRE, Determination of Supervisors, Recommendations

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## 1. Introduction

Students will be faced with a final project as a requirement for graduation in various levels of education. In the undergraduate education level, a student will be accompanied by 1-2 supervisors who will guide students in doing their final project or what is called a thesis.

Universitas Muhammadiyah Kalimantan Timur, provide a scheme that can be said to be a distinguishing feature from other universities, namely the KDM (Lecturer and Student Collaboration) scheme where thesis work will be guided by one lecturer to 2-5 students [1]. In this scheme, the role of the supervising lecturer becomes very important because it is the supervisor who will determine the title to make the final report or in other words, this scheme adapts the form of research for S2/S3 students

where postgraduate students work on one component of the supervisor's research project as their research.

. There are many optimization methods or decision-making methods that can be used to provide recommendations for supervisors. One of the decision-making methods that can be used is the ELECTRE method. The ELECTRE method is a multi-criteria decision-making method based on the concept of outranking by comparing pairs of alternatives based on each appropriate criterion [2]. The ELECTRE method is used to recommend the best choice of many criteria by ranking through pairwise comparisons between alternatives on the criteria [3][4].

## 2. Research Stages

This research is a causal type of research using a quantitative approach. Data was collected in several ways, namely interviews and questionnaires. The data analysis methods used are AHP and ELECTRE, where AHP is used to weight the criteria used as preference values, then followed by the ELECTRE method as the elimination of alternatives that do not meet the criteria and then ranking using the aggregate value of concordance and discordance.

Testing is done by looking for the value of accuracy, this is done to see whether the method used is able to provide recommendations for supervisors to one student in a group. This research stages are shown in figure 1.

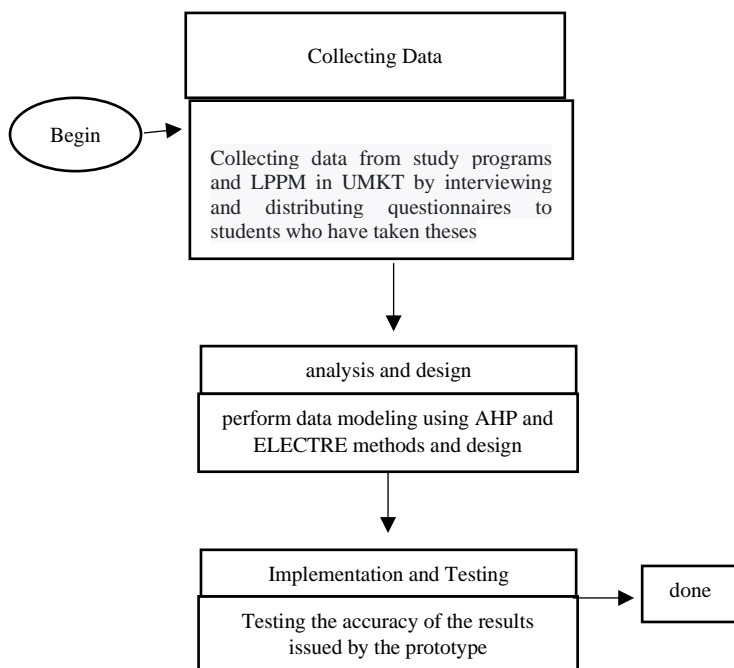


Figure 1. Research Stages

## 3. Collecting Data

The researcher conducted interviews with five heads of study programs selected based on the faculties at UMKT and 12 related parties, namely ten KDM committee coordinators who also came from the five study programs and two LPPM UMKT parties who understood the KDM scheme. Questionnaires were not carried out because all relevant parties could be met personally to be asked for information regarding the selection of thesis supervisors using the KDM scheme.

## 4. Results and Merging

The AHP method with the ELECTRE method aims to get the best ranking and alternative. The AHP method is used to determine the weight of the criteria and sub-criteria

that will be used for the ELECTRE method in obtaining the best ranking and alternative. The AHP method is also used for scoring unstructured data with data input in the form of text in order to obtain a value that will be used in pairwise comparisons of each parameter to obtain an aggregate dominance matrix in the ELECTRE method so that a sequence of choices is obtained from each alternative which in this case is the supervisor for the group. student. This study also aims at the suitability of the AHP-ELECTRE method in the case of determining the thesis supervisor using the KDM scheme.

## 5. Discussion

The academic years taken as samples in this study are the 2020-2021 and 2021-2022 academic years. These two academic years were chosen because there are new study programs that have just carried out thesis activities in the 2020-2021 academic year. New study programs with many students such as S1 Informatics Engineering will add criteria in the 2021-2022 academic year because the number of lecturers as supervisors with AA positions is very small [5].

The new study program chosen is a study program with a fairly varied number of students with a study program with a very unequal number of students such as the Informatics Engineering Undergraduate study program which in 2020-2021, only eight students take thesis courses, while in the following academic year the number of students who took was 78 students with a very small number of Instructor degree. Other study programs such as English Education program which has a very small number of students taking thesis in both academic years and other study programs that have a lesser increase in the number of students, namely the International Relations study program.

The researcher also conducted interviews with the head of the study program and the KDM Coordinator to find out the criteria used. The criteria for each study program are shown in table 1.

Table 1. Criteria for each study program during two years

Study Program	Academic Year Criteria 2020-2021	Academic Year Criteria 2021-2022
Management Program	Quotas, similarities with lecturer roadmaps, willingness of lecturers to guide.	Quotas, similarities with lecturer roadmaps, willingness of lecturers to guide.
Public Health Program	Quotas, history of student mentoring, similarities with the lecturer roadmap	Quotas, history of student mentoring, similarities with the lecturer roadmap.
Informatics Engineering Program	Functional degree, the similarity with the lecturer's research roadmap	similarities with the lecturer's research roadmap, quota, student concentration, functional degree.



English Education Program	Functional degree, the similarities with the lecturer's research roadmap, quotas, the emotional relationship between lecturers and students, the similarity of concentration between the research and the students doing the research.	Functional degree the similarities with the lecturer's research roadmap, quotas, the emotional relationship between lecturers and students, the similarity of concentration between the research and the students doing the research.
International Relations Program	similarities with the lecturer's research roadmap, student concentration.	similarities with the lecturer's research roadmap, quota, student concentration, functional degree

The criteria for the old study program were stable and fewer because the number of lecturers with Instructor positions and Assistant Professor had met the number of students taking theses. New study programs such as Bachelor of Informatics Engineering and International Relations added criteria, while other new study programs such as English Education Program did not change the criteria, but in this study program there is one unique criterion that the researcher wrote as an emotional relationship between lecturers and students. This criterion is a criterion that is determined from the background of students and lecturers who may have problems in the learning process so that if they are used as supervisors, they will hinder the graduation of their guidance students.

Researchers who also conducted interviews with the LPPM found standards in the implementation of KDM, including the ideal criteria for a thesis supervisor according to the LPPM such as the similarity of student research with the roadmap of the supervisor, the head of the supervisor, the number of mentors in one semester, duration of mentoring and research history of the supervisor. Interviews with the LPPM made the researcher take the criteria used in general in determining the KDM examiner lecturers in the UMKT environment, namely functional degree supervising lecturer (C1), guiding quota (C2), similarity of roadmap (C3) and student concentration (C4). The general criteria that have been collected and determined are then continued with the determination of the value of each criterion as shown in the following table.2.

Table.2. Data Criteria

No	Criteria	Quality	Description
C1	Functional Degree of Lecturer	1	Lecturer
		2	Instructor
		3	Assistant Professor
		4	Associate Professor
		5	Professor

C2	Guide quota	1	Guiding $\geq 8$
		2	Guiding $\leq 7$
		3	Guiding $\leq 5$
		4	Guiding $\leq 3$
		5	Guiding $< 2$
C3	Roadmap similarities	1	Not in line with the supervisor's roadmap
		5	in line with the roadmap of the supervising lecturer
C4	Student concentration	1	Concentration does not match the thesis taken
		5	Concentration according to the thesis taken

After obtaining the weighting of the criteria, then the calculation for each academic year study program is carried out. Table. 3 shows the comparison results of the Informatics Engineering S1 study program in the 2021-2022 academic year, totaling 10 lecturers for the KDM group who have the same big theme with the same concentration of students, namely 3 groups of students.

Table.3. Data on the comparison of supervisors

alternative	Score	Rank	Description
Lecturer 1	5	1	appropriate
Lecturer 2	4	2	appropriate
Lecturer 3	3	3	
Lecturer 4	3	3	
Lecturer 5	3	3	
Lecturer 6	2	4	
Lecturer 7	1	5	
Lecturer 8	1	5	
Lecturer 9	0	<i>elimination</i>	<i>error</i>
Lecturer 10	0	<i>elimination</i>	

The lecturer's name is not displayed due to data privacy. Table.3 shows that the AHP-ELECTRE method is able to rank and eliminate prospective supervisors who do not meet the criteria. In this section the 9th and 10th lecturers are lecturers who do not meet the criteria and are eliminated, but from the Informatics Engineering study program, these lecturers are still included in the prospective lecturers who meet the criteria. The table of accuracy results from each study program is shown in table.4



Table.4. average accuracy results

Study Program	Hasil rata-rata akurasi pada TA 2020-2021	Hasil rata-rata akurasi pada TA 2021-2022
Management Program	78 %	82 %
Public Health Program	80 %	79.23%
Informatics Engineering Program	90 %	93 %
English Education Program	81 %	84.11 %
International Relations Program	86 %	81%

## 6. Conclusions

In this study, several conclusions were obtained as follows:

- a. AHP and ELECTRE can be combined to provide recommendations to study programs in selecting supervisors. AHP is used to determine the weight of the criteria and ELECTRE is used to eliminate alternatives and provide recommendations for supervisors who meet the specified criteria.
- b. Criteria for supervising lecturers are obtained by looking for general criteria from 5 study programs that are used as research objects, namely functional lecturer positions, quotas, research suitability with lecturer roadmaps, student concentration.
- c. The average accuracy results from the combination of these two MCDM methods are 83% in Academic Year 2020-2021 and 83.68% in Academic Year 2021-2022. Meanwhile, for the use of AHP alone, the results were 77.21% in the 2020-2021 FY and 79% in the 2021-2022 Academic year. And ELECTRE alone gets 81.25% results in FY 2020-2021 and 84.97% in academic year 2021-2022.

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