

Decision Support System for Selection of Thesis Advisors Supervisors Thesis Advisors according to the Field of Science Using the AHP Method

Jelita Sari Simanungkalit¹, Hengki Tamando Sihotang²

^{1,2}Informatics Engineering, STMIK Pelita Nusantara, Jl. Iskandar Muda No.1, Medan, North Sumatra, Indonesia

Email: ¹jelitasarisimanungkalit@gmail.com*, ²hengki_tamando@yahoo.com

* Author correspondence

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ABSTRACT

This is a scientific work and a condition that must be taken in order to achieve a bachelor's degree. Thesis supervisors play an important role because they have the responsibility and ensure that students are able to compile the thesis properly so that it is ready for testing and quality. In higher education, a system is needed that can help and ease a job, especially in the selection of thesis supervisors. In selecting the thesis supervisor, it is still based on subjectivity, which causes the title submitted by students to not match the field of science of the thesis supervisor so that the lecturer appointed to guide the topic of the title submitted by students has a different field of expertise from the student's title. In this determination, there are sometimes less than optimal decisions where the appointed lecturer is not in accordance with the thesis topic proposed by the student. This system is made using the AHP method so that the programmed system can be carried out more effectively. AHP method is one of the methods used in decision support systems with the calculation process by comparing each criterion.

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1. Introduction

The development of technology is currently very rapid, this development is not only from the technology system of hardware and software. Thesis is a scientific work and a requirement that must be taken in order to achieve a bachelor's degree. Thesis supervisors play an important role because they have responsibilities and ensure that students are able to compile a thesis properly so that it is ready to be tested and qualified. In higher education, a system is needed that can help and ease a job, especially in the selection of thesis supervisors. In the selection of thesis supervisors, it is still based on subjectivity, causing the title submitted by students to not match the field of science of the thesis supervisor.

Previously, there have been several researchers who have conducted research related to decision support systems regarding the selection of journal supervisors entitled "Decision support systems in determining thesis supervisors of informatics engineering faculty at Islamic University of North Sumatra using the weighted product method" [10]. There are still shortcomings because the author directly discusses the system design and does not include manual calculations. "Decision support system for determining supervisors using the Fuzzy Logic method" [11] in the test results using ordinary statistical percentages from historical data, and maybe this is less accurate.

However, for the selection of thesis supervisors in accordance with the field of science, no researcher has done this research. Therefore, I want to develop more research on the selection of thesis supervisors according to the field of science at STMIK Pelita Nusantara Medan using the AHP method. With this research, the researcher will create a system that can help the Head of Study Program in mentoring according to the field of science, and can reduce the mismatch of the thesis supervisor with the title proposed by the student.



AHP is a concept for decision-making based on multicriteria (multiple criteria) several criteria compared to one another (importance level) is AHP's main emphasis (Nugeraha 2017: 114), hierarchy is defined as a representation of a complex problem in a structure multi level where the first level is the goal, which is complex in a multi-level structure where is the goal, which is followed by the level of factors, criteria, sub criteria, and so on down to the last level of alternatives [5].

2. Research methods

2.1 Research Framework

The research carried out can be described in a research work activity flow as follows:

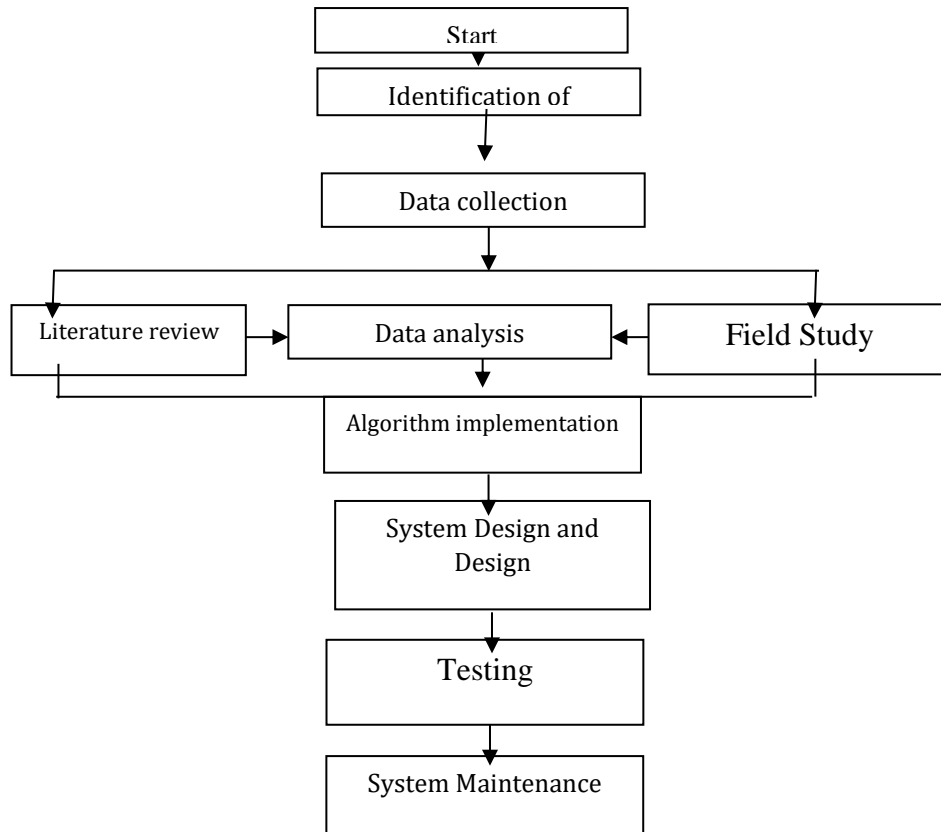


Figure 1. Research Framework

2.2 Data collection

In the data collection stage, the research was carried out in two ways, namely:

- 1) Literature Study (Secondary Data) is done by reading and studying books related to research titles and other literatures that support research implementation.
- 2) Field Study (Primary Data) is direct observation to the place of the research object in order to physically see the object of research and to find the data and information needed.

2.3 AHP Method Analysis

AHP is a concept for decision-making based on multicriteria (multiple criteria) several criteria compared to one another (importance level) is AHP's main emphasis (Nugeraha 2017: 114), hierarchy is defined as a representation of a complex problem in a structure multi-level where the first level is the goal, which is complex in a multi-level structure where it is the goal, followed by the factor level, criteria, sub-criteria, and so on down to the last level of the alternative (Syaifulah: 2010).

The stages using the AHP method are as follows;

- 1) Defining the problem and determining the desired solution, then arranging a hierarchy of the problems at hand. Hierarchical arrangement is to set goals which are the overall system targets at the top level.
- 2) Specifies element priority



- a. The first step in determining element priority is making pair comparisons, that is, comparing elements in pairs according to given criteria.
 - b. Pairwise comparative matrix is filled using numbers to represent the relative importance of one element to another.
 - c. Synthesis
Considerations for comparison are synthesized to obtain overall priority. The things that are done in this step are;
 - a) Add up the values from each column on the matrix
 - b) Divide each value from the column by the total for the column in question to get the normalized matrix.
 - c) Add up the values from each row and divide by the number of elements to get the average value.
- 3) Set Consistency
In making decisions, it is important to know how good the consistency is because we don't want judgmental decisions with low consistency. The things that are done in this step are;
- a. Multiply each value in the first column, the value in the second column by the relative priority of the second element, and so on.
 - b. Add up each row
 - c. The result of the sum of the rows divided by the corresponding relative priority element.
 - d. Add the quotient above with the number of elements, the result is called λ max.
- 4) Calculate the Consistency Index (CI) with the formula:
 $CI = (\lambda \max - n) / n$
Where n = number of elements.
- 5) Calculate the consistency ratio (CR) with the formula:
 $CR = CI / IR$
Where :
CR = Consistency Ratio
CI = Consistency Index
IR = Random Consistency Index
- 6) Checking Hierarchy Consistency

Table 1

List of Consistency Random Indices.

N	1	2	3	4	5	6	7	8	9	10	11
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51

Table 2

Values and Definitions

Intensity of Interest	Information
1	The two elements are equally important
3	One element is slightly more important than the other
5	One element is more important than the other elements
7	One element is clearly more important than the other
9	One element is absolutely more important than any other
2,4,6,8	The values between two adjacent consideration values
The opposite	If for activity I gets one number compared to activity j, then j has the opposite value i.

Source: Kusrini 2017: 134

3. Results and Discussion

3.1 Analysis with the AHP Method

System analysis activity is the decomposition of the information system as a whole into computer parts aimed at identifying problems that arise. Constraints that may occur and the desired needs in order to provide solutions in development to make it better and in accordance with the needs of technological development. In developing the system, it requires maximum results in testing and application accuracy and solving problems for the selection of Thesis Advisors in accordance with the field of science using the AHP Method.



Table 3
Intensity of interest

No.	Criteria	Criteria Code	Intensity of interest	Information
1	Lecturer Status	K1	1	These two elements are very important
2	Guiding Experience	K2	3	One element is slightly more important than the other
3	Level of education	K3	3	One element is slightly more important than the other
4	Functional	K4	3	One element is slightly more important than the other.
5	Educational background	K5	5	One element is slightly more important than the other
6	Areas of expertise	K6	5	One is absolutely more important.

Table 4
Criteria Comparison Matrix

	K1	K2	K3	K4	K5
K1	1	3/1	3/1	3/1	5/1
K2	1/3	1	3/1	3/1	5/1
K3	1/3	1/3	1	3/1	5/1
K4	1/3	1/3	1/3	1	5/1
K5	1/5	1/5	1/5	5/3	1

Table 5
Results of the distribution of the number of element values

	Total	WeightPriority
	2.01	0.4
	1.29	0.26
	0.88	0.18
	0.6	0.12
	0.23	0.05

Table 6
Criteria Consistency Matrix

	K1	K2	K3	K4	K5	Weight Consistency
K1	0.49	0.62	0.4	0.29	0.24	0.3
K2	0.15	0.21	0.4	0.29	0.24	0.909
K3	0.15	0.07	0.13	0.29	0.24	0.909
K4	0.15	0.07	0.04	0.1	0.24	0.909
K5	0.9	0.04	0.03	0.02	0.5	2,185

After getting the priority weight values for each criterion, then check the consistency of the ratio (CR) of the comparison between these criteria by multiplying all the contents of the criteria comparison matrix column with the following criteria priority weights;

- a) Then calculate λ max
 $(2.19 * 0.4) + (4.86 * 0.26) + (7.53 * 0.18) + (10.2 * 0.12) + (21 * 0.05)$
 $= 5,769$
- b) Calculating the Consistency Index (CI)
 $CI = (\lambda_{maks} - n) / n - 1 = (5,769 - 5) / 4 = 0.192$
- c) Then calculate the CR (Consistency ratio)
 Calculate CR = CI / RI
 $= 0.192 / 1.121$
 $= 0.171$

Because $CR > 0.1$, the consistency ratio is 100% and acceptable.



Table 7
The weighted value of each criterion can be seen

Criteria	Sub criteria	Weight
Lecturer status	Permanent lecturer	85
	Non-permanent lecturer	80
Experience guiding	Lecturers remain free	70
	More than 3 years	80
	2 years	70
Level of education	Less than 1 year	65
	S3	80
Functional	S2	68
	Lector	85
Educational background	Expert Assistant	80
	Teacher	70
	S.Kom., M.Kom	80
	S.Si., M.Kom	70
	Data mining	90
Research	Expert system	88
	SPK	85
	Mobile	70

Table 8
The following is the weighted result for each criterion

No.	Alternative	Lecturer status	Experience guiding	Level of education	Functional	Educational background	Research
1	A1	80	80	80	80	80	70
2	A2	70	65	80	80	80	85
3	A3	80	70	80	70	70	90
4	A4	85	80	68	85	80	88

Table 9
The weight of the criteria and alternatives that have been calculated

Criteria	K1	K2	K3	K4	K5	K6
Criteria weights	0.3	0.909	0.909	0.909	2,185	2,185
A1	0.253	0.271	0.255	0.253	0.258	0.210
A2	0.222	0.220	0.238	0.253	0.258	0.255
A3	0.253	0.220	0.273	0.222	0.225	0.270
A4	0.270	0.271	0.232	0.269	0.258	0.264

Table 10
Analytical Hierarchy Process Case Ranking.

Alternative	Final score	Information
A1	1.5	Rank 2
A2	1,446	Rank 4
A3	1,463	Rank 3
A4	1,564	Rank 1

3.2 System Design and Implementation

a. Use Case

The system procedure will be described using UML. Actors or actors seen in the system are as follows, in the picture the steps to use a system to be built.



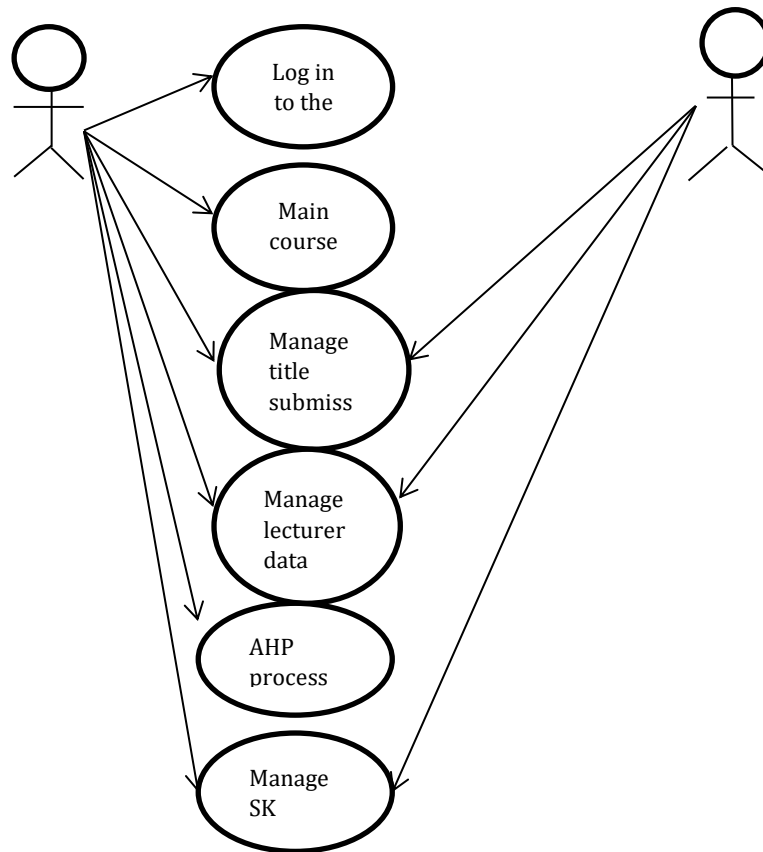


Figure 2. Use Case

After implementing the AHP method, a system implementation is carried out which functions to present the program results from research on the selection of thesis supervisors according to the field of science at STMIK Pelita Nusantara Using the AHP Method. The output display is a display of the results of the AHP process. On the output display page, we can see the output of the data that we input previously.

MAHASISWA YANG PERNAH DISIBING	HENOKI TAMANDO SHOTANG, S.Kom	SULINDAWATY, S.Kom, M.Kom	PASKA MARTO HASUGAN, S.Kom, M	MURNI MARBUN, S.Si, M.M, M.Ko	ERWIN FANGGABEAN, S.T, M.Kom	PWeight	CR
HENOKI TAMANDO SHOTANG, S.Kom	1	3	5	1	3	0.365	
SULINDAWATY, S.Kom, M.Kom	0.333	1	2	4	3	0.236	
PASKA MARTO HASUGAN, S.Kom, M	0.2	0.5	1	3	3	0.162	0.268
MURNI MARBUN, S.Si, M.M, M.Ko	1	0.25	0.333	1	5	0.176	
ERWIN FANGGABEAN, S.T, M.Kom	0.333	0.333	0.333	0.2	1	0.062	

Atribut	ATTRIBUTE					Ail. Weight Evaluation
	Status Dosen	Pengalaman Membimbing	Tingkat Pendidikan	Jabatan Fungsional	Bidang Keahlian	
Attribute Weight	0.4	0.26	0.18	0.12	0.05	
Alternatif						
HENOKI TAMANDO SHOTANG, S.Kom	0.418	0.284	0.319	0.43	0.365	0.368
SULINDAWATY, S.Kom, M.Kom	0.139	0.31	0.212	0.189	0.236	0.209
PASKA MARTO HASUGAN, S.Kom, M	0.188	0.199	0.194	0.173	0.162	0.191
MURNI MARBUN, S.Si, M.M, M.Ko	0.145	0.128	0.211	0.109	0.176	0.151
ERWIN FANGGABEAN, S.T, M.Kom	0.109	0.079	0.063	0.096	0.062	0.09

Figure 3. Output result

After getting the final ranking score, it can be concluded that the lecturer who has the right to guide students on behalf of Dani with the title "Application of Data Mining with the C45 algorithm, in determining data mismatch factors in the Kozero cooperative", namely A4 gets rank 1 with a value of 1.564.

4. Conclusion

Based on the results of the analysis of data discussion, the authors draw conclusions that can be drawn from the research from the selection of thesis supervisors according to the field of science at STMIK Pelita Nusantara using the AHP method as follows;

1. The decision support system for selecting thesis supervisors according to the field of science at STMIK Pelita Nusantara uses the computerized AHP method and testing the results of



selecting thesis supervisors according to the field of science will be easier and can help the study program heads in selecting supervisors according to the field of science.

2. The AHP method can help and solve problems in selecting thesis supervisors according to the field of science at STMIK Pelita Nusantara.

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