Journal of Sisfotek Global
ISSN (Online): 2721 - 3161, ISSN (Print): 2088 – 1762
DOI: http://dx.doi.org/10.38101/sisfotek.v12i1.451
Vol. 12, No. 1, March 2022, pp. 32-37

Selection of the Best Computer Laboratory Assistant using AHP and Smart Methods

Ari Amir Alkodri[1], Supardi[2], Burham Isnanto[3], Kiswanto[4]

[1,2,3,4] Institut Sains dan Bisnis Atma Luhur, Pangkalpinang, Indonesia, 33117
e-mail: *[1]arie_a3@atmaluhur.ac.id, [2]supardi@atmaluhur.ac.id, [3]burham@atmaluhur.ac.id, [4]kiswanto@atmaluhur.ac.id.

ARTICLE HISTORY

Received : 9 February, 2022
Revised : 7 March, 2022
Accepted : 21 March, 2022

KEYWORDS

Computer Laboratory Assistant
Best
AHP Method
SMART Method

ABSTRACT

Computer Laboratory Assistant, abbreviated as ASLAB, includes a Lab Assistant in a Computer Laboratory. ASLAB helps improve service performance in the Computer Laboratory, such as assisting Lecturers when teaching practicum at the Computer Laboratory and assisting in installing software on Student laptops so that the performance of Computer Laboratory services is always good. Problems The Head of the Computer Laboratory has difficulty assessing the comparison of ASLAB with other ASLABs to determine the best or not good performance. The calculation of the final value uses the mean value method so that all criteria are considered to be of equal importance, so we cannot know which criterion is more important. The research objective is to apply the AHP and SMART methods for selecting the best Computer Laboratory Assistant so that it can determine the criteria and ranking weights for the best Computer Laboratory Assistant so that it can be used as a basis for decision making and applied by the Head of the Computer Laboratory in selecting the best Computer Laboratory Assistant.

1. Introduction

Computer Laboratory Assistant, which is abbreviated as ASLAB, includes a Laboratory Assistant in the Computer Laboratory. ASLAB helps improve service performance in the Computer Laboratory, such as assisting Lecturers when teaching practicum in the Computer Laboratory and assisting in installing software on student laptops so that the performance of Computer Laboratory services is always good. Problems The Head of the Computer Laboratory has difficulty assessing the comparison of one ASLAB with another to determine whether the performance is the best or not. The final value calculation uses the average value method (mean) so that all criteria are considered to have the same weight of importance so that it is not possible to know which criteria weight is more important.

Research [1] with the title Implementation of the AHP & SMART Method on the Android-Based PBK Admission SPK. It was found that by implementing the AHP and SMART methods, a SPK acceptance of training participants in UPTD BLK Kolaka with android based system can assist in quickly recommending the most eligible participants for PBK.

Research [2] with the title collaboration of SAW and AHP methods for a laboratory assistant performance appraisal decision support system. With calculations using the SAW and AHP methods, there is a system that automatically calculates the criteria values for all laboratory assistants, with the SAW and AHP concepts, namely comparing the values of one laboratory assistant with another laboratory, then calculating the difference so that the data really matches the comparison. desired. With the collaboration of the SAW and AHP methods, the standard value for each laboratory assistant is achieved as needed. This makes it easier to know the performance of laboratory assistants and makes it easier for decision makers to make the required decisions.

Research [3] with the title decision support system for determining the best employees using the AHP and TOPSIS methods. The results of the research that has been done is a decision support system that can recommend the best employees at PT South Pacific Viscose based on predetermined criteria, namely: knowledge, abilities, attitudes, attendance, and cooperation using the AHP and TOPSIS methods.

Research [4] based on condition-based maintenance (CBM) with an emphasis on maintenance of key strategic and managerial

requirements using the analytical hierarchy process (AHP) is hardly available in the literature.

Based on the background of the implementation of several previous studies as the basis and comparison of the renewal of the implementation of this research, a research will be carried out on the selection of the best laboratory assistant as one of the improvements in service performance in the laboratory. So the author chose the research with the Selection of the Best Computer Laboratory Assistant by Using Analytical Hierarchy Process (AHP) and Simple Multi Attribute Rating Technique (SMART) at ISB Atma Luhur Pangkalpinang.

2. Research Methods

In carrying out the research, there are several stages or steps to choose the best computer laboratory assistant using the Analytical Hierarchy Process (AHP) [5] and the Simple Multi Attribute Rating Technique (SMART) [6]. The stages are as follows can be seen in the figure 1.

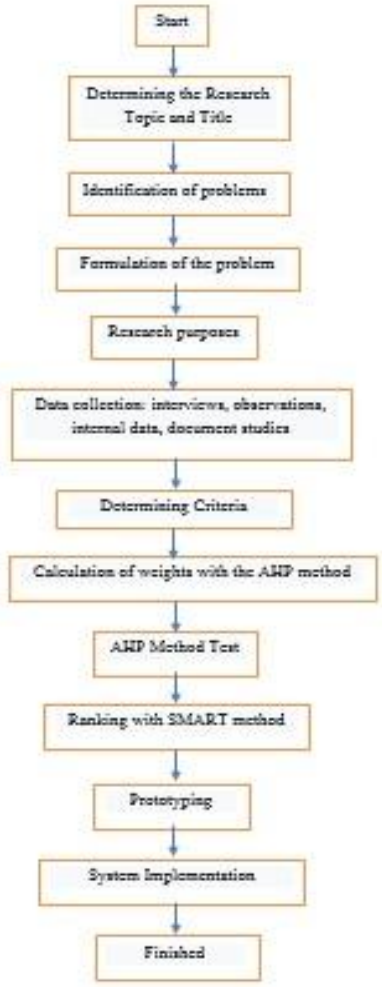

Figure 1. Research Steps

2.1 Determining the Research Topic and Title

The stage of determining the research topic is the activity of choosing what will be the subject of research. The research topic will point to a particular science. The topic can be said to be different from the title. The topic shows the scope of the research study that distinguishes it from other scopes. The research title is part or one point of view of a topic.

2.2 Identification of problems

It is one of the most important research processes among other processes. The research problem will determine the quality of the research. Research problems in general can be found through literature study by conducting a review study of books, literatures, notes, and reports that have to do with the

implementation of research or by studying and analyzing the condition of the company, so that researchers can identify problems- the problem being faced.

a. Formulation of the problem

Problem formulation is an elaboration of problem identification and problem limitation. In other words, problem formulation is a complete and detailed question regarding the scope of the problem to be studied based on problem identification and problem limitations.

b. Research purposes

Formulation of the direction and targets to be achieved from the problem solving process in research. The research objective is related to the formulation of the problem. If you pay attention to the research objectives, actually the content is the same as the desired answer in the problem formulation.

c. Data collection

Data collection was carried out to obtain the information needed in order to achieve the research objectives through interviews, observations, internal data and document studies. The objectives expressed in the form of hypotheses are temporary answers to research questions.

d. Determining Criteria

The criteria used are based on criteria that have been set by the Head of the Computer Laboratory, namely: Grade Point Average (GPA), Training with Lecturers, Service to students, Certifications, and Practicum Test scores. Weight Calculation with AHP Method Calculates the weight value of each element (eigenvector) by calculating the Consistency Index (CI) [7].

e. Testing AHP Method: Consistency Ratio (CR)

Check hierarchy consistency. If the value is more than 10%, then the judgment data assessment must be corrected. However, if the consistency ratio (CI/IR) is less or equal to 0.1 then the calculation results can be declared correct [8].

f. Ranking using the SMART Method

Determine the utility value by converting the criterion value for each criterion into the standard data criteria value. After that, determine the final value of each criterion by transferring the value obtained from the normalization of the standard data criteria values

with the normalized value of the criteria weights. Then add up the values of the multiplication [9].

2.3 Prototyping

Some of the things that will be done at this stage are as follows:

a. System planning

System design can be defined as the drawing, planning, and sketching or arrangement of several separate elements into a unified and functioning whole. At this stage, the basic framework of the decision support system that will be used will be designed [10].

b. Database Design

At this stage, a database system will be designed that will be used as decision support. Starting with the creation of Entity Relationship Diagrams (ERD) and Logical Record Structures (LRS) to be able to understand the pattern of relationships between data more clearly [11].

c. Decision Model Design

In this stage, the research will be directed to model a decision system that is tailored to the needs of the decision-making parties by analyzing the results of the identification of needs as a step in determining what information is needed according to the needs of related parties [12].

d. User Interface Design

At this stage, the system interface is designed with the concept of easy to use, so that users can take advantage of the DSS easily. As a final step, all components of the Decision Support System were integrated, so that the system could be used [13].

e. System Implementation

System implementation is carried out if the system is approved, including programs that have been made at the system design stage so that it is ready to operate [14].

3. Results and Discussion

3.1 Criteria

To get the criteria, the writer conducted an interview with the Head of the Computer Laboratory. The criteria for selecting the best computer laboratory assistant can be seen in table 1.

Table 1. Criteria for Selection of the Best Computer Laboratory Assistant

No	Criteria	Criteria Name	Category
1	C1	Grade Point Average (IPK)	Benefit
2	C2	Training with Lecturers	Benefit
3	C3	Service to students	Benefit
4	C4	Certifications held	Benefit
5	C5	Certifications held	Benefit

3.2 Alternative

To get an alternative, the writer takes internal data from the Computer Laboratory Assistant ISB Atma Luhur for the even semester 2019/2020 academic year, then the author uses a simple random sampling technique to take a random sample, which can be seen in table 2.

Table 2. Alternatives for Selection of the Best Computer Laboratory Assistant

No	Alternative	Alternative Name
1	A1	Ray Dian Cahya
2	A2	Yunita Yani
3	A3	Afra Maulana Syafika
4	A4	Muhammad Dafi Mahendra
5	A5	Hanny Istiqomah

3.3 AHP Hierarchy Structure

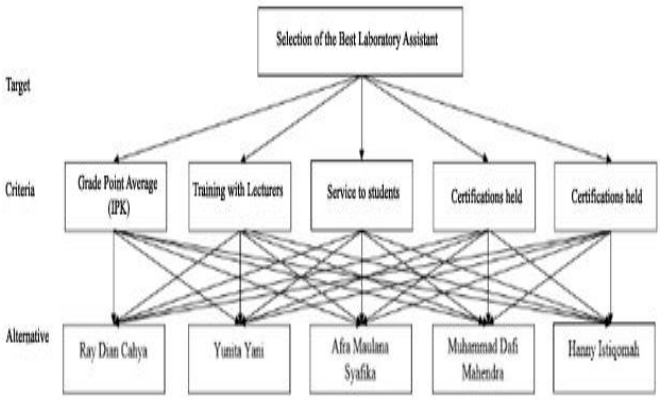

Figure 2. AHP Hierarchy Structure

3.4 Compiling a Pairwise Comparison Matrix

The pairwise comparison matrix was taken from the results of the pairwise comparison questionnaire between criteria that had been filled out by the Head of the Computer Laboratory of ISB Atma Luhur Pangkalpinang, Mr. Ari Amir Alkodri, M.Kom. From the results of the criterion weight questionnaire, a pairwise comparison matrix was made which can be seen in table 3.

Table 3. Pairwise Comparison Matrix

	C1	C2	C3	C4	C5
C1	**1**	1/6	1/5	1/4	1/3
C2	6/1	**1**	3/1	2/1	4/1
C3	5/1	1/3	**1**	3/1	3/1
*C*4	4/1	1/2	1/3	**1**	2/1
C5	3/1	1/4	1/3	1/2	**1**

Criteria Weighting and Rounding off The value and rounding of the criteria weights can be seen in Table 4.

Table 4. Values and Rounding Criteria Weights

No	Criteria	Criteria Name	Criteria Weight	Rounding
1.	C1	Grade Point Average (IPK)	**0,0465**	**0,05**
2.	C2	Training with Lecturers	**0,4243**	**0,42**
3.	C3	Service to students	**0,2702**	**0,27**
4.	C4	Certifications held	**0,1610**	**0,16**
5.	C5	Certifications held	**0,0979**	**0,10**

3.5 AHP Method Test

Testing the Analytical Hierarchy Process (AHP) model is done by calculating the Consistency Index (CI) and Consistency Ratio (CR) values.

$$CI = \frac{\lambda \text{ maks} - \text{n}}{\text{n} - 1} \qquad \text{n : the number of criteria}$$

$$CI$$

$$CI$$

$$CR$$

$$CR$$

$$CR$$

3.6 Alternative Value

The following is an alternative value that can be seen in the table 5.

Table 5.Table of Alternative Values

Alternative	Criteria				
	C1	C2	C3	C4	C5
A1	3,64	4	100	0	4
A2	3,91	0	5	1	7
A3	3,88	1	88	0	5
A4	3,97	0	100	1	15
A5	4,00	2	50	1	15
MAX	4	4	100	1	15
MIN	3,64	0	5	0	4

3.7 Utility Value

The following is a utility value that can be seen in the table 6.

Table 6. Table of Utility Values

Alternative	Criteria				
	C1	C2	C3	C4	C5
A1	0,00	1,0	1,00	0,00	0,00
A2	0,75	0,0	0,00	1,00	0,27
A3	0,67	0,25	0,87	0,00	0,09
A4	0,92	0,0	1,00	1,00	1,00
A5	1,00	0,5	0,47	1,00	1,00
Criteria Weights	0,05	0,42	0,27	0,16	0,10

3.8 Final score

The following is the final value can be seen in the table 7.

Table 7. Final Value Table

Alternative	Criteria					Final Score	Rank
	C1	C2	C3	C4	C5		
A1	0,00	0,42	0,27	0,00	0,00	0,69	1
A2	0,04	0,00	0,00	0,16	0,03	0,22	5
A3	0,03	0,11	0,24	0,00	0,01	0,38	4
A4	0,05	0,00	0,27	0,16	0,10	0,58	3
A5	0,05	0,21	0,13	0,16	0,10	0,65	2

3.9 Use Case Diagrams

Use Case Diagram is a type of Unified Modeling Language (UML) which describes the interaction between the system and actors [15]. The following is a use case diagram in the study which can be seen in the picture:

Figure 3. Use Case Diagram Login

3.10 Implementation

The following is the menu of the decision support system for the Selection of the Best Computer Laboratory Assistant at ISB Atma Luhur Pangkalpinang.

a. Login Menu

In this menu, you are required to enter your username and password to enter the main menu can be seen in figure 4.

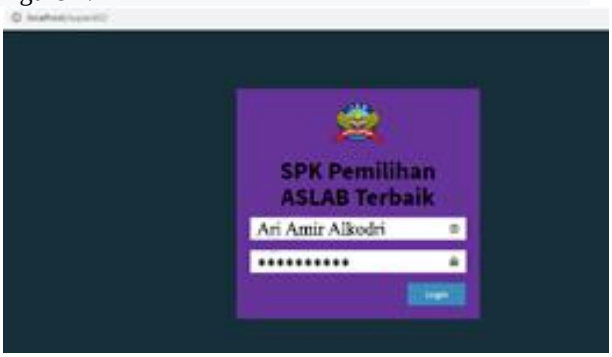

Figure 4. Login Menu

b. Criteria Comparison Value Menu

The following is a display of the Comparison Value Criteria, which can be seen in Figure 5.

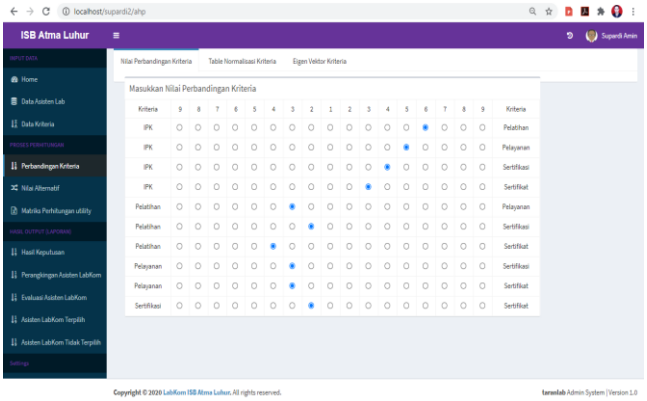

Figure 5. Criteria Comparison Value Menu

c. Final Value Menu

The following is the Final Value Menu, which can be seen in Figure 6

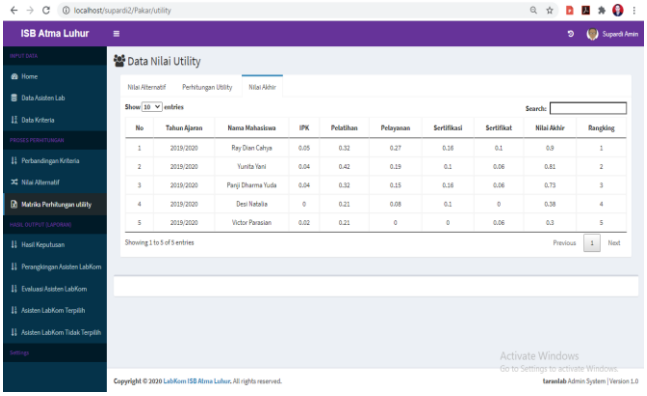

Figure 6. Final Value Menu

4. Conclusions And Suggestions

The following are conclusions. Based on the results after conducting research on the Selection of the Best Computer Laboratory Assistant using the Analytical Hierarchy Process (AHP) and Simple Multi Attribute Rating Technique (SMART) methods, they are as follows:

1. The AHP-SMART method can be applied to support decision making on the selection of the best assistant from several computer laboratory assistants.
2. The selection of the best assistants is carried out with details that can determine the value of the criteria for the Grade Point Average (GPA) 0.05, Training with Lecturers 0.42, Service to students 0.27, Certification 0.16, Certificate 0.10 with Consistency Ratio Values (CR) of 0.06 which is adjusted to the abilities and needs of decision makers.
3. From the results of tests carried out, aspects of lecturer training to assistants greatly affect laboratory services.

5. Acknowledgement

Thank you to the employees, administrators and laboratory assistants at the Computer Laboratory of the Atma Luhur Institute of Science and Business, Pangkalpiang, Bangka Belitung Islands. Who have supported and facilitated this research.

References

[1] S. Ramadandi, R. Adawiyah, and A. T. Sumpala, "Implementasi Metode AHP & SMART pada SPK Penerimaan Peserta PBK Berbasis Android," *J. Sains dan Inform.*, vol. 7, no. 2, pp. 182–191, 2021, doi: 10.34128/jsi.v7i2.312.

[2] E. Lestari Ruskan, "Kolaborasi Metode SAW dan AHP untuk Sistem Pendukung Keputusan Penilaian Kinerja Asisten Laboratorium," *J. Sist. Inf.*, vol. 9, no. 1, pp. 1204–1215, 2017.

[3] I. G. A. F. R. Herman Firdaus, "SISTEM PENDUKUNG KEPUTUSAN PENENTUAN KARYAWAN TERBAIK MENGGUNAKAN METODE AHP DAN TOPSIS," *Semin. Nas. Teknol. Inf. dan Komun. 2016 (SENTIKA 2016)*, pp. 18–19, 2016.

[4] R. Baidya and S. K. Ghosh, "Model for a predictive maintenance system effectiveness using the analytical hierarchy process as analytical tool," *IFAC-PapersOnLine*, vol. 28, no. 3, pp. 1463–1468, 2015, doi: 10.1016/j.ifacol.2015.06.293.

[5] M. Awaludin, "APPLICATION OF ANALYTICAL HIERARCHY PROCESS METHOD FOR EMPLOYEE PERFORMANCE EVALUATION AT PT XYZ," *JSI (Jurnal Sist. Informasi)*, vol. 7, no. 1, pp. 137–150, 2020.

[6] I. R. Rahadjeng, "Application of the Simple Multi Attribute Rating Technique (SMART) Method on the Selection of Anti Mosquito Lotion based on the Consumer," *Int. J. Inf. Syst. Technol.*, vol. 3, no. 2, pp. 152–158, 2020.

[7] A. Wanto and E. Kurniawan, "Seleksi Penerimaan Asisten Laboratorium Menggunakan Algoritma Ahp Pada Amik-Stikom Tunas Bangsa Pematangsiantar," *JIKO (Jurnal Inform. dan Komputer)*, vol. 3, no. 1, p. 11, 2018, doi: 10.26798/jiko.2018.v3i1.106.

[8] Dedi, A. Sidik, L. Sakuroh, and D. Dariatno, "Sistem Pendukung Keputusan Pemberian Beasiswa Untuk Menentukan Mahasiswa Berprestasi Berbasis Web Dengan Metode AHP," *J. Sisfotek Glob. Issn*, vol. 5, no. 2, pp. 1–7, 2015.

[9] D. Novianti, I. F. Astuti, and D. M. Khairina, "Sistem Pendukung Keputusan Berbasis Web Untuk Pemilihan Café Menggunakan Metode SMART (Simple Multi-Attribute Rating Technique) (Studi Kasus : Kota Samarinda)," *Pros. Semin. Sains dan Teknol. FMIPA Unmul*, vol. 1, no. 3, p. 464, 2016.

[10] M. Hayaty and R. F. Irawan, "Perancangan Sistem Penunjang Keputusan untuk Menentukan Jabatan Pengurus Organisasi Menggunakan Kombinasi Algoritma Simple Multi Attribute Rating Technique (SMART) dan Forward Chaining," *Khazanah Inform. J. Ilmu Komput. dan Inform.*, vol. 4, no. 2, p. 104, 2018, doi: 10.23917/khif.v4i2.7034.

[11] M. N. A. Lemantara Julianto , Noor Akhmad Setiawan, "Rancang Bangun Sistem Pendukung Keputusan Pemilihan Mahasiswa Berprestasi Menggunakan Metode AHP dan Promethee," *Jnteti*, vol. 2, no. 4, pp. 20–28, 2013.

[12] T. Mardiana, "Sistem Pendukung Keputusan Penerimaan Asisten Laboratorium Komputer Menggunakan Metode Ahp-Topsis," *J. Ilmu Pengetah. dan Teknol. Komput.*, vol. 3, no. 2, pp. 159–166, 2018.

[13] P. Painem and H. Soetanto, "Sistem Pendukung Keputusan Penerimaan Asisten Laboratorium Menggunakan Metode Multi Factor Evaluation Process (Mfep)," *J. Ris. Inform.*, vol. 1, no. 3, pp. 119–126, 2019, doi: 10.34288/jri.v1i3.34.

[14] S. R. Andani, "Metode Simple Multi Attribute rating Technique (SMART) Dalam Menentukan Penerima Dana Bantuan Yayasan AMIK Tunas Bangsa," *J-SAKTI (Jurnal Sains Komput. dan Inform.*, vol. 3, no. 2, p. 160, 2019, doi: 10.30645/j-sakti.v3i2.135.

[15] H. L. H. S. Warnars, "Pemodelan Elearning Perguruan Tinggi Dengan Menggunakan Framework Learning Technology System Architecture (Ltsa) Dan Unified Modeling Language (Uml)," *JUTI J. Ilm. Teknol. Inf.*, vol. 15, no. 1, p. 43, 2017, doi: 10.12962/j24068535.v15i1.a634.