



Laptop Selection Decision Support System Using Analytical Hierarchy Process Method

Muhammad Iqbal¹, Agustina Simangunsong²

^{1,2}Informatics Engineering Study Program, STMIK Pelita Nusantara, Medan, Indonesia

Article Info

Article history:

Received, Oct 12, 2020

Revised, Nov 29, 2020

Accepted, Dec 29, 2020

Keywords:

Decision support system,
Selection of Laptops,
Analytical Hierarchy Process.

ABSTRACT

Decision Support System (DSS) Determination The selection of this laptop is needed by consumers as a consideration before buying a laptop. Making this decision support system aims to assist consumers in determining the selection of laptops that are worth buying for consumer needs. The method used in completing this research is the Analytical Hierarchy Process, the Analytical Hierarchy Process method is one of the methods in the decision support system which is unique compared to the others. This is because, in the weighting of criteria, the weight of each criterion is not determined at the beginning but is determined using the formula of this method based on the priority scale (level of importance). For the development of a decision support system, the determination of the selection of this laptop uses the analysis stage, the Analytical Hierarchy Process method, system design, and system implementation. In the Analytical Hierarchy Process, the cellphone laptop is the best with a value of 0.342.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Muhammad Iqbal,
Informatics Engineering Study Program,
STMIK Pelita Nusantara, Medan, Indonesia,
Jl. Iskandar Muda No.1, Merdeka, Kec. Medan Baru, Kota Medan, Sumatera Utara 20154.
Email: iqbalvira@gmail.com

1. INTRODUCTION

The development of computer technology is currently experiencing rapid progress since it was created. And computer technology has been widely used by humans in various fields to help work. Because with the help of computers, work is completed faster and the results have a higher level of accuracy and can minimize errors that occur. Currently, computers are not only created in the form of personal computers but in smaller forms called laptops. The creation of this computer form is more efficient and supports the mobility of today's users who want to be able to complete work anywhere.

Many companies produce laptops with various specifications and their respective advantages. The advantages and specifications of the laptop will affect the price of the laptop. The higher the quality of the laptop, the more expensive the price offered (Yunita and Ridunjuk, 2017). The number of brands triggers the growth of competition between vendors in meeting consumer needs. Based on the number of products presented to consumers, starting from the brand, hardware specifications, types of laptops, and the functionality of the laptop, it makes consumers confused when deciding which laptop to buy (Perdhana, Laksito Ys and Siswanti, 2013). So many consumers want to buy laptops with high specifications, well-known brands, and prices that are so expensive, but in the end, it doesn't suit its use. Or vice versa, choosing a low price, but ultimately unable to

meet the needs he wants. It would be better before choosing a laptop, you must pay attention to existing needs and budgets so that consumers do not choose the wrong choice (Anggaradana, 2016).

Regarding the selection of a laptop, it should be adjusted to the work needs of its users. So that consumers are not wrong in choosing a laptop, various studies have been carried out such as that conducted by Sanyoto and Handayani (2017) to create a decision support system for choosing a laptop for operational needs[1]–[3]. This system is implemented in the Ministry of Education and Culture's Directorate of Training and Training. Researchers used the brand, hard disk capacity, RAM, processor, and screen size as criteria. Other researchers Arianovi and Novitasari (2018) also use the brand, hard disk capacity, RAM, and processor as criteria for selecting laptops implemented in Global Computer.

Other researchers also use artificial intelligence methods in selecting laptops, as done by Prayogo (2018) to create a decision support system for choosing a laptop using the Simple Additive Weighting (SAW) method[4]. Researchers conclude that by using SAW, the system can help laptop developers according to usability by 77.5% and for consumers by 79.66%. Asnita S Nadeak, Butar-Butar, and Simamora (2018) used the WASPAS method with criteria for price, type of processor, RAM capacity, product completeness, and type of graphics card[5]–[7]. Anggaradana (2016) uses the Decision Tree method in determining which laptops consumers will buy, while Kurniasih (2013) uses the TOPSIS method in the decision support system for choosing a laptop that is designed. All the methods used by the researchers above, the goal is to get more accurate results in the case of selecting a laptop as needed[8].

2. RESEARCH METHOD

The AHP method is one of the methods in the decision support system which is unique compared to the others. This is because in weighting the criteria, the weight of each criterion is not determined at the beginning but is determined using the formula of this method based on the priority scale (level of importance) (Lita Asyariati Lutfi, Mohammad Jamil and Sidi Hi Abbas, 2018: 43)[9].

According to Saaty in M. Nurfalah Setiawan (2017: 75), AHP is, in essence, a comprehensive decision-making model by taking into account qualitative and quantitative matters. The decision-making model with AHP is trying to cover all the shortcomings of the system and environment into interacting components and then unifying them by measuring and managing the impact of the system error components[10]–[12].

3. RESULTS AND DISCUSSION

The criteria used in this decision support system are the price of the laptop, the type of processor, the RAM capacity and the screen size as shown in Table 1 above and the level of importance of each criterion, the pairwise comparison matrix is as follows:

Table 1. Matrix paired criteria

Kriteria	C ₀₁	C ₀₂	C ₀₃	C ₀₄	C ₀₅
C ₀₁	1	3	5	7	5
C ₀₂	0.333	1	3	5	7
C ₀₃	0.2	0.333	1	3	5
C ₀₄	0.143	0.2	0.333	1	2
C ₀₅	0.2	0.143	0.2	0.5	1

Number 1 in column C₀₁ row C₀₁ describes the same level of importance between C₀₁ and C₀₁, while number 3 in column C₀₂ row C₀₁ shows that C₀₁ is slightly more important than C₀₂ and so on. The number 0.333 in column C₀₁ row C₀₂ is the result of the calculation 1 / value in column C₀₂ row C₀₁. The other figures are obtained in the same way.

All pairwise comparison results were synthesized (simplified) to obtain a matrix as in the following table:

Table 2. Simplified criteria matrix

Kriteria	C ₀₁	C ₀₂	C ₀₃	C ₀₄	C ₀₅
C ₀₁	1	3	5	7	5

C ₀₂	0.3333	1	3	5	7
C ₀₃	0.2	0.3333	1	3	5
C ₀₄	0.1429	0.2	0.3333	1	2
C ₀₅	0.2	0.1429	0.2	0.5	1
Σ	1.8762	4.6762	9.5333	16.5	20

In matrix simplification, the data for each criterion is taken from the paired criteria matrix (Criteria paired matrix table) then each column will be searched for the number of each column as in the simplified criteria matrix table above, where column C01 has a total value of 1.8762, column C02 with a value of 4, 6762, column C03 with a value of 9.5333, column C04 with a value of column 16.5 and column C05 with a value of 20.

Performing matrix calculations can be done with the following formula:

Table 3. Criteria priority weighting matrix

Kriteria	C ₀₁	C ₀₂	C ₀₃	C ₀₄	C ₀₅	Bobot Prioritas/ Vektor Eigen
C ₀₁	0.533	0.6415	0.5245	0.4242	0.25	0.475
C ₀₂	0.1777	0.2138	0.3147	0.303	0.35	0.272
C ₀₃	0.1066	0.0713	0.1049	0.1818	0.25	0.143
C ₀₄	0.0761	0.0428	0.035	0.0606	0.1	0.063
C ₀₅	0.1066	0.0305	0.021	0.0303	0.05	0.048

The value of 0.533 in column C01 row C01 Table priority weight matrix criteria obtained from the value of column C01 row C01 Table simplified criteria matrix divided by the number of columns C01 Table simplified criteria matrix While the priority weight or eigenvector is obtained from the value in the column number divided by the number of criteria.

To find out the consistency of the comparison matrix, multiply the entire contents of the matrix column A comparison with the priority weight of criterion A, fill in column B the comparison matrix with the priority weight of criterion B, and so on. Then add each row and divide by the sum of the rows with the corresponding priority weight as shown in the following table.

Table 4. Criteria Consistency Value Matrix

Kriteria	C ₀₁	C ₀₂	C ₀₃	C ₀₄	C ₀₅	Konsistensi
C ₀₁	0.533	0.6415	0.5245	0.4242	0.25	5.654
C ₀₂	0.1777	0.2138	0.3147	0.303	0.35	5.544
C ₀₃	0.1066	0.0713	0.1049	0.1818	0.25	5.287
C ₀₄	0.0761	0.0428	0.035	0.0606	0.1	5.216
C ₀₅	0.1066	0.0305	0.021	0.0303	0.05	5.064

The consistency value in row C01 (5,654) is the result of multiplying the simplified Criteria Matrix table matrix multiplied by the matrix in the Priority weight column of the Criteria priority weight matrix table then divided by row C01 in the criteria priority weight matrix table (0.475) in the following manner (1 * 0.475) + (3 * 0.272) + (5 * 0.143) + (7 * 0.063) + (5 * 0.048) / 0.475. And so on until a consistency value for each row is obtained.

The implementation of the decision support system for choosing a laptop using the analytical hierarchy process method can be seen in the screenshot (print screen) as follows.

1. Login page

Users who are allowed to use the system that has been built are administrators. If you want to enter the system, the user must enter a username and password. The system will validate the login when the user selects the Enter button. If the login is valid, the system will display the main page. Meanwhile, if the status is invalid, the system will display a login error message.

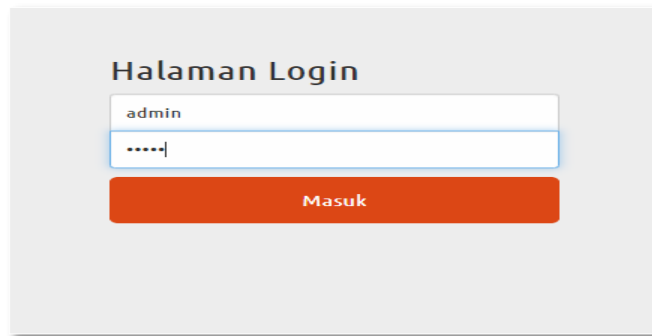


Figure 1. Login Page

2. Main page

The main page of the system that has been built is a page that contains menus that function to call the data processing page. The menus consist of the Alternative menu, the Criteria menu, the Criteria Weight Value menu, the Alternative Weight Value menu, the Calculation menu, the Ranking Results menu, and the Logout menu.

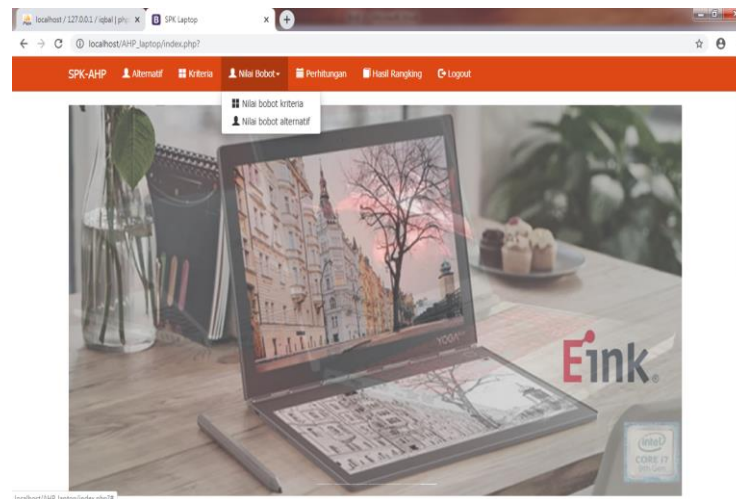


Figure 2. Main Page

3. Calculation page

The calculation page will display the results of calculations using the AHP method based on the previously entered criteria and alternative weight values.

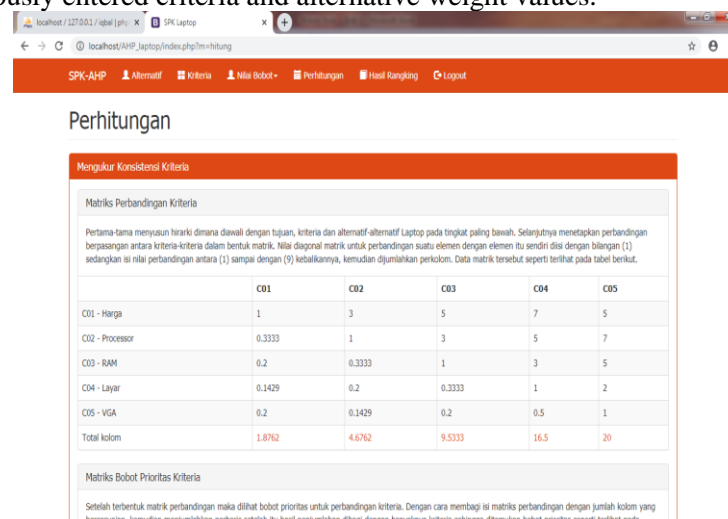


Figure 3. Calculation Page

4. Ranking Results

After the calculation is carried out as on the calculation page, the ranking results of the calculation can be printed in a form like the following image:

Rank	Kode Alternatif	Nama Alternatif	Nilai
1	A01	HP	0.342
2	A02	Dell	0.238
3	A03	Lenovo	0.153
4	A04	Asus	0.142
5	A05	Acer	0.124

Berdasarkan Hasil Perhitungan metode Analytical hierarchy process dalam Sistem Penunjang Keputusan Pemilihan Laptop, maka laptop yang direkomendasikan untuk dipilih adalah A01 - HP dengan nilai 0.342

Figure 4. Rangking Result

4. CONCLUSION

Designing and making a decision support system application for the selection of a laptop the author conducts a direct review of the Family Computer Store and conducts interviews with consumers. Based on data processing and analysis, the Analytical Hierarchy Process method makes it easy for consumers to choose a laptop to buy based on price, processor, memory, screen, and VGA criteria. Based on research conducted by the author using the Analytical Hierarchy Process Method that the best cellphone laptop with a value of 0.342. Designing and making a decision support system application for choosing a laptop at the Family Computer Store using the AHP method with UML (Unified Method language) design, namely use case diagrams, activity diagrams, class diagrams. Php programming language, Database, and Mysql, as a method in making student satisfaction level analysis systems. And it can make it easier for the Family Computer store to provide information and fulfill consumer demand according to the desired laptop.

REFERENCES

- [1] Hambali *et al.*, "Networking Components and Devices Objectives," *J. Pengabd. Kpd. Masy.*, 2015.
- [2] Zona Referensi, "Pengertian Pasar Menurut Para Ahli dan Definisinya Secara Umum," *Zona Referensi*, 2016. .
- [3] Zakky, "Pengertian Negara Menurut Para Ahli dan Definisinya Secara Umum," *28 September 2018*, 2018. .
- [4] H. W. A. Prayogo, L. Muflikhah, and S. H. Wijoyo, "Implementasi Metode Simple Additive Weighting (SAW) Untuk Penentuan Penerima Zakat," *J. Pengemb. Teknol. Inf. dan Ilmu Komput. Univ. Brawijaya*, 2018.
- [5] M. Handayani and N. Marpaung, "Implementasi Metode Weight Aggregated Sum Product Assesment (Waspas) Dalam Pemilihan Kepala Laboratorium," *Semin. Nas. R. 2018 ISSN 2622-9986 STMIK R. R. ISSN 2622-6510*, 2018.
- [6] D. Febrina, D. M. Nst, and N. K. Dewi, "Penerapan Metode MOORA Dan WASPAS Dalam Mendukung Keputusan Pemilihan Susu Formula Terbaik," *Semin. Nas. Sains Teknol. Inf.*, 2018.
- [7] E. S. Nabila, R. Rahmawati, and T. Widiari, "IMPLEMENTASI METODE SAW DAN WASPAS DENGAN PEMBOBOTAN ROC DALAM SELEKSI PENERIMAAN PESERTA DIDIK BARU (Studi Kasus: Madrasah Tsanawiyah (MTs) Negeri Kisaran Kabupaten Asahan Provinsi Sumatera Utara Tahun Ajaran 2018/2019)," *J. Gaussian*, 2019, doi: 10.14710/j.gauss.v8i4.26723.
- [8] D. Anggaradana, "RANCANG BANGUN SISTEM PENDUKUNG KEPUTUSAN UNTUK PEMILIHAN LAPTOP DENGAN METODE DECISION TREE," *J. Teknol. Inf. dan Komput.*, 2017, doi: 10.36002/jutik.v2i1.225.

-
- [9] A. Setiyadi and R. D. Agustia, "Penerapan Metode AHP Dalam Memilih Marketplace E-Commerce Berdasarkan Software Quality and Evaluation ISO/IEC 9126-4 Untuk UMKM," *J. IKRA-ITH Inform.*, 2018.
 - [10] Tsabit Rahman dkk., "Analisis Model Pengambil Keputusan AHP dan TOPSIS Untuk memilih Software Berbasis Open Source Digital Library pada Universitas Janabadra," *Semin. Nas. Inov. Teknol. UN PGRI Kediri, 22 Februari 2017*, 2017.
 - [11] R. U. Yuminah, Abdul Fadlil, "ANALISIS METODE AHP DAN PROMETHEE PADA SISTEM PENDUKUNG KEPUTUSAN PENILAIAN SOFT SKILLS," *Semin. Nas. Teknol. Inf. dan Komun. - Semant. 2017*, 2017.
 - [12] D. N. Izzhati, H. Mastriswadi, and T. Talitha, "Analisis Keputusan Pemilihan Kemasan Ikan Asap Tradisional Untuk Meningkatkan Nilai Penjualan," in *SEMINAR NASIONAL TEKNIK INDUSTRI UNIVERSITAS GADJAH MADA 2017*, 2017.