JURNAL SYNTAX ADMIRATION

Volume 4, No. 9, September 2023
p-ISSN 2722-7782 | e-ISSN 2722-5356
doi: https://doi.org/ 10.46799/jsa.v4i9.700

DESIGN OF ENGINE DECISION SUPPORT SYSTEM FORPHARMACEUTICAL APPLICATIONS WITH THE USE OF ANALYTICAL HIERARCHY PROCESS METHOD

Adi Fitrianto, Carli Apriansyah
Media Nusantara Citra University
adi.fitrianto@mncu.ac.id, carli.apriansyah@mncu.ac.id

Abstract : *This study aims to increase effectiveness in the selection of drug suppliers in the Tangerang public hospital pharmacy. Tangerang General Hospital is an agency engaged in the health and pharmaceutical services sector. This pharmaceutical division has an internal pharmaceutical application that has been implemented with various features used for recording transaction data both drug sales and drug purchases. Currently there is more than one supplier that supplies the same drug. Therefore, the main focus of this research is to design an engine to feature a decision support system by utilizing the analytical hierarchy process approach for selecting the best specific medicine supplier. A decision support system (DSS) is an information system designed to assist decision makers in processing complex information and providing relevant data to support these decisions. The approach that used in this research is analytical hierarchy process with the criteria as needed. The conclusion of this research is to design a prototype engine that is able to provide information and recommendations about the best drug suppliers.*

Keyword *: Decision Support System, E-Pharmacy, Analytical Hierarchy Process, Internal Application, Supplier.*

INTRODUCTION

The implementation of information systems has become one of the important needs for business (Hariyanto et al., 2021). The implementation of a correct and feasible information system can increase the accuracy and amount of data recording from various sides of business needs (Zamzami et al., 2021). Tangerang General Hospital is one of the government agencies involved in the area of health services and pharmaceuticals. This agency has several information system-based applications that have been implemented and running for several years. One of these applications is implemented in the pharmacy section which is devoted to recording data on sales, purchases, bookkeeping, and drug payments. But over time there is more than one supplier who supplies drugs with the same brand and type. Some suppliers offer cheaper prices, have good quality from many shipments, late in

delivery, and some do not meet the quantity needs. From the various characteristics of these suppliers, the pharmacy of the Tangerang general hospital is confused in determining the best supplier.

Referring to these problems, we would like to propose a prototype in the form of an engine decision support system using the Analytical Hierarchy Process method to help determine the best supplier. The AHP method was chosen because according to [4], AHP is one approach that is devoted to solving complex and unstructured problems, especially in taking extinction which in the process is made several groups of criteria and then arranged into a hierarchy.

Based on research Wang, (Wang, 2020) analytical hierarchy process is used in teching quality system applications. Using 9 criteria to determine the best learning method that can later be a suggestion for future teaching staff. Analytical Hierarchy Process is implemented on the server side using ASP.Net. Criteria data is already available in databases in the form of assessment information, techer base information, and others. As a result of this study, College English System has an engine evaluation system using AHP to improve the quality of teachers.

Turning to research Fathoni et al., (Fathoni et al., 2018), the author proposes a system to provide the nearest and best daycare using decision support systemm technology with the use of an analytical hierarchy process approach. In this study, it was explained that AHP was chosen because it is a decision-making method with multi-criteria as its consideration. Applications are built on mobile and web platforms that both use Google API for open Map facilities. The use of web services is also used in this design, because this design is built in 2 different applications. The criteria used in this study aredistance, *budget*, max hour, activity variation, cleanliness, and secutiry. Engine decision support system using AHP is designed in the recommendation feature

The design of the decision support system was also discussed in the study (Sari et al., 2017). In this study, the application was designed for an employee performance appraisal system that uses criteria and calculations of the weight of education, course, grade, experience, status, and age. With calculations using the AHP method, the application has a teacher placement feature. The AHP will explain how decision-making is made in difficult, unprogrammed decisions by categorizing options based on their level of complexity. This study applies 5 stages in the calculation of AHP, namely problem determination, developing models, permorming a model analysis, showing profiles as the result, performing amalysis and evaluation. In stage five, the evaluation is carried out based on the resulting score and then ranks the candidates from highest to lowest. In stage 5 the results in the form of rank order will be displayed in the decision support system feature

The analytical hierarchy process method is also utilized and implemented for employee selection applications (Sari et al., 2017); (Mutholib & Febrina, 2017); (Kurnia, 2021). In this study, 4 criteria were used, namely education background, work experience, age, and marital status. The first stage is carried out Pairwise comparison based on predetermined criteria, then an alternative pairwise comparison matrix is made, then AHP results are made. The result will be a list of candidates who are most suitable for employee recreation. This method is applied to super decision applications. From the results of the calculations that have been done, the lowest accuracy is 80% and the highest is 95%.

The use of Analytical Hierarchy Process (AHP) is also studied to determine the best supplier selection based on given criteria to support complex decision making (Hariyanto et al., 2021). The supplier selection criteria in question are: warranty, quality, price , product, and delivery. Quality criteria come first, for warranty criteria in second priority, price criteria in third priority, for delivery criteria in fourth priority and fifth product criteria. The final result of weighting the value of supplier selection is that there are suppliers who rank first, second, and third.

Based on the results of the study, it was concluded that the Analytical Hierarchy Process method or model can be an effective solution to design an engine decision support system for selecting the best drug suppliers in pharmaceutical applications at Tangerang public hospitals

METHODOLOGY

The systematic literature review method is used in this study in order to prove theory and determine solutions. We use the SLR method with the aim and consideration that this case study must be reviewed first before further processing is carried out. On the other hand, SLR is conducted to seek and gain knowledge from previous studies related to benefits, proposed concepts, implementation challenges, technology utilization, to the distribution of similar research. The following steps or workflow of systematic literature review can be seen in figure 1.

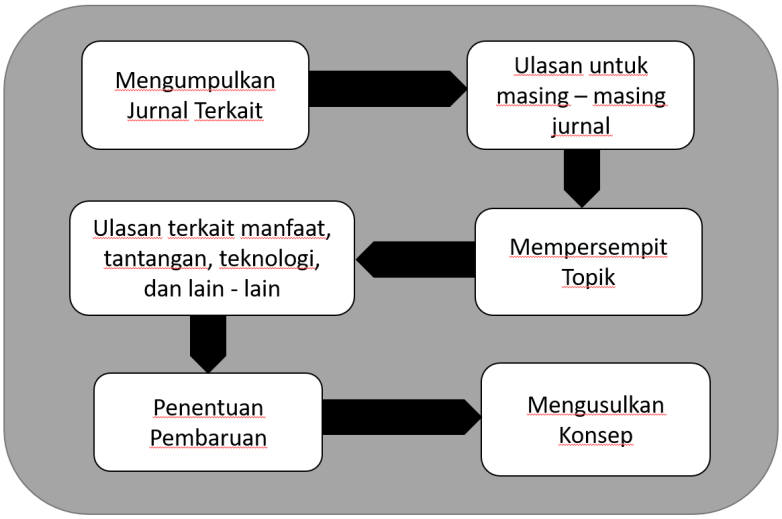


Figure 1. Systematic Literature Review

Stages of Research

The stages of this study began with an interview in the pharmacy department of the Tangerang general hospital. This interview was conducted in order to collect information related to the criteria to be used in the calculation of AHP, problems that occur in pharmaceutical applications, and business processes from the decision support system feature to be designed. After that, a literature study was conducted to test the feasibility of using the AHP method. Then simulations and calculations are carried out manually based on predetermined data and criteria. Then the algorithm is written related to the formula or calculation of AHP. After that, coding is done to build a prototype engine decision support system with algorithms that have been compiled. Then testing is carried out using data as needed. For the stages of research can be seen in figure 4 below.

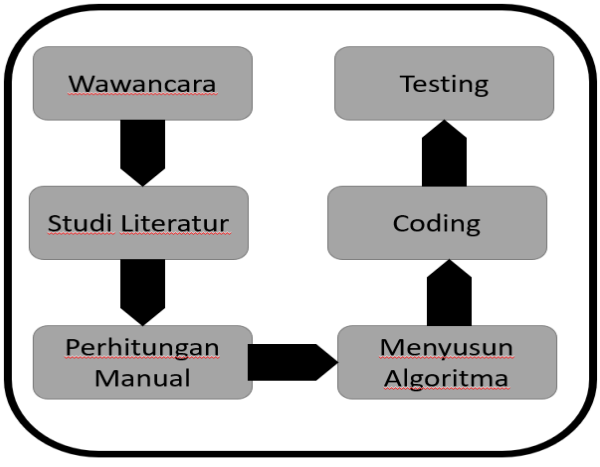


Figure 2. Stages of Research

RESULTS AND DISCUSSION

Calculation using AHP Method

Table 1. Arrangement of hierarchical structure:

	Price	Quality	Service
Price	1/1	1/2	3/1
Quality	2/1	1/1	4/1
Service	1/3	¼	1/1

Table 2. Pairwise comparison matrix:

	Price	Quality	Service
Price	1.0	0.5	3
Quality	2	1	4
Service	0,333	0,25	1
Sum	3,333	1,75	8

Table 3. Criterion Value Matrix (Normalization):

	Price	Quality	Service	Sum	Priority
Price	0,30003	0,285	0,375	0,96003	0,32001
Quality	0,60006	0,571	0,5	1,67106	0,55702
Service	0,999	0,142	0,125	1,266	0.422

Paired comparison matrix x Criterion Value Matrix (Normalization)

	Price	Quality	Service	Sum
Price	1.0 x 0.32001 = 0.32001	0.5 x 0.55702 = 0.27851	3 x 0.422 = 1.266	1,86452
Quality	2 x 0.32001 = 0.64002	1 x 0.55702 = 0.55702	4 x 0.422 = 1.688	2,88504
Service	0.333 x 0.32001 = 0.1065	0.25 x 0.55702 = 0.1392	1 x 0.422 = 0.422	0,6677

Table 4. Eigenvalue Calculation:

	Sum	Priority	Eigen value
Price	1,86452	0,32001	2,18453

Quality	2,88504	0,55702	3,44206
Service	0,6677	0.422	1,0897

Consistency Ratio Calculation:
Number of Results = 6.71629
N = 3
aMax = Number of results / n = 2.23
CI = (aMax – n) / (n-1) = (2.23 - 3) / (2) = -0.77 / 2 = -0.385
CR = CI / RI = -0.385 / 0.58 = -0.663. Because CR <= 0.1, this calculation is consistent.

Sub Criteria (Price) Calculation:
By doing the same calculation using the AHP method, EigenValue is obtained as follows:

Table 5. Sub Criteria (Price) Calculation:

	Sum	Priority	Eigen value
Cheap	1,9623	0,33101	2,29331
Usual	2,688	0,44502	3,13302
Expensive	0,556	0.611	1,167

Sub Criteria Calculation (Quality):
By doing the same calculation using the AHP method, EigenValue is obtained as follows:

Table 6. Sub Criteria Calculation (Quality):

	Sum	Priority	Eigen value
Good	1,7889	0,22001	2,00891
Usual	1,4454	0,11901	1,56441
Not Worth It	0,4711	0,511	0,9821

Sub Criteria Calculation (Service) :
By doing the same calculation using the AHP method, EigenValue is obtained as follows:

Table 7. Sub Criteria Calculation (Service) :

	Sum	Priority	Eigen value
Good	1,4554	0,31786	1,77326
Usual	2,99101	0,34667	3,33768
Bad	0,2333	0.867	1,0933

Table 8. Implementation in each supplier:

		Price	Quality	Service	Sum Results	Rank
Supplier (PT C)	3	Usual	Usual	Usual	7,1244	1
Supplier (PT D)	4	Cheap	Usual	Usual	6,398	2
Supplier (PT B)	2	Cheap	Good	Good	5,2066	3
Supplier (PT A)	1	Expensive	Good	Good	3,8003	4

System Flow

The process in this system starts from login then user data is validated if valid user data will enter the main menu, namely: Ahp Detail Agent Value, Ahp Criteria Value Input / AHP simulation, Ahp Input per Supplier, Suppliers Ranking, and Suppliers List. If the user selects the AHP detail agent value menu, the detailed eigenvalue of each criterion and sub-criteria will appear. If you select the simulation menu, a feature will appear for input value and then the results of the AHP calculation simulation and the supperli rank will appear. For the AHP input menu per supplier, users can update the value or reset the sub-criteria value of each supplier. For the supplier list menu, users can process CRUD in the supplier repository. The flow chart of the system flow can be seen in the picture below.

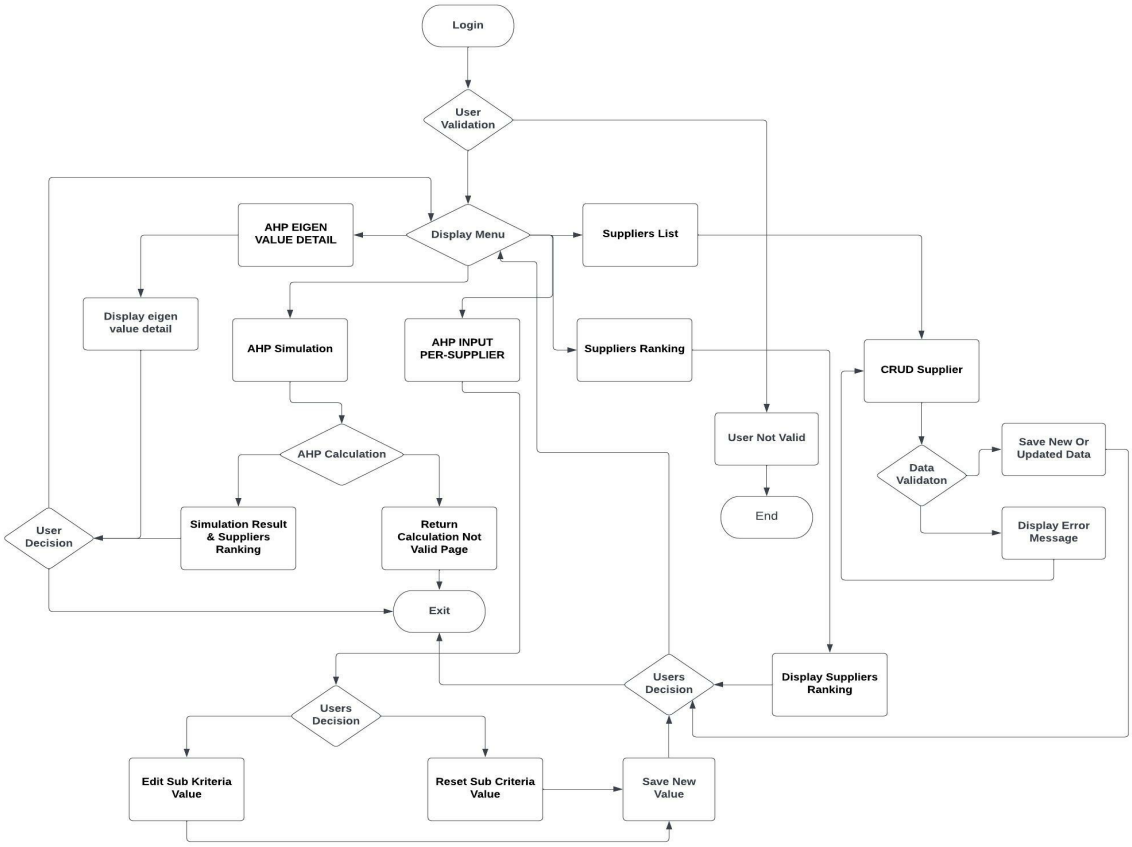


Figure 3. System flow

Application Results and Feature List

1. Login

   This feature is used for the main access door to enter the application. The user enters the username and password that has been registered then the system will check according to the input.

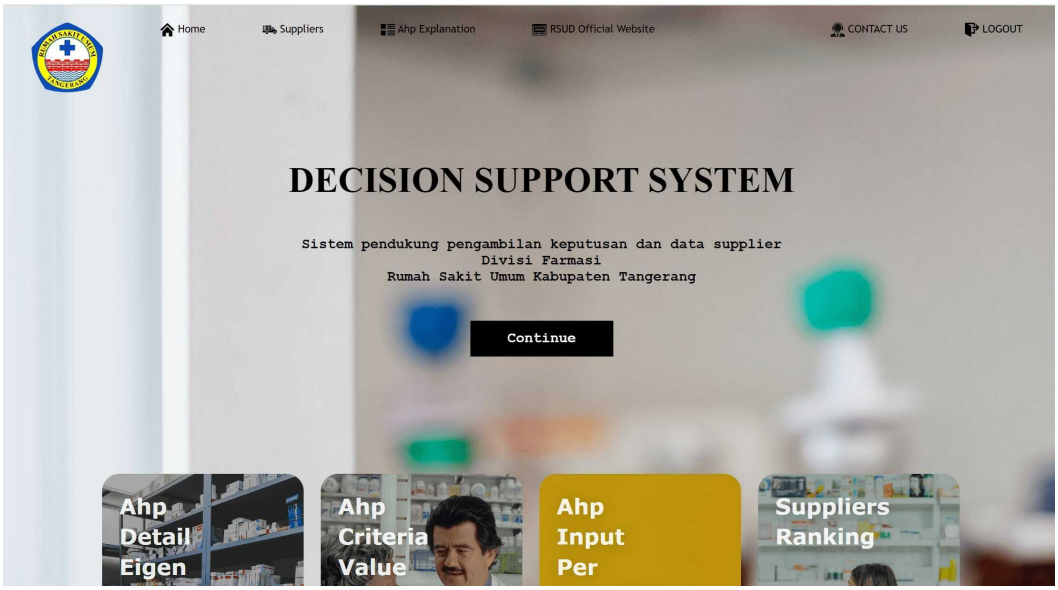


Figure 4. Main page

2. AHP Detail Eigen Value

This feature will display the eigenvalue of each criterion and sub-criteria. Eigen value is obtained from the calculation results using the Analytical Hierarchy Process method in accordance with the steps carried out above. If the calculation result is invalid, a *calculation not valid* message will appear.

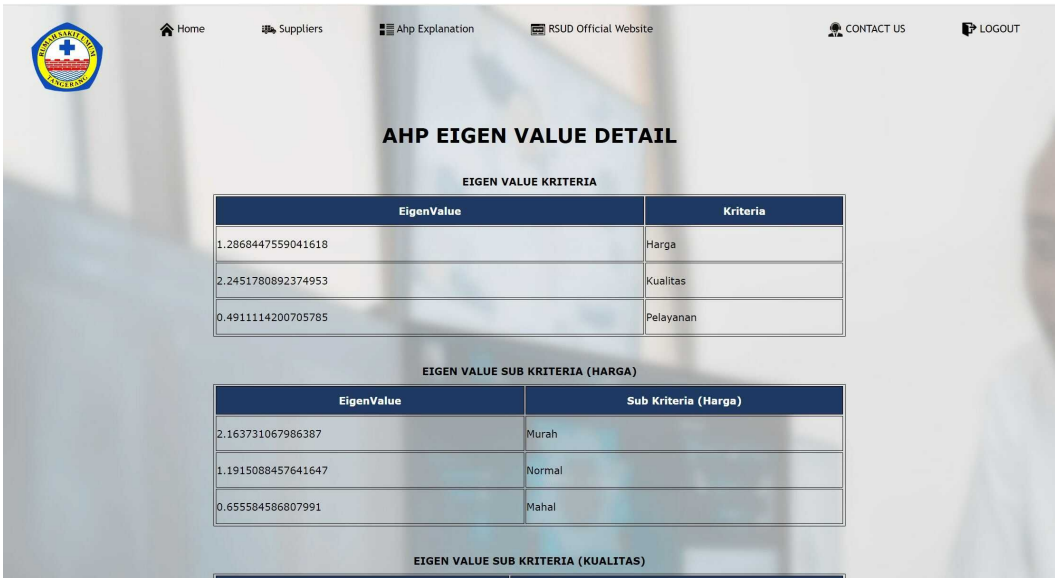


Figure 5. Eigen Value Details

3. Criteria and Sub Criteria Value Input

This feature is a simulation feature for selecting the best supplier in the form of ranking using analytical hierarcy process calculations. The system will ask for input for the formation of a hierarchical structure and then the system will check if the input entered is valid or not. If the input and calculation are valid, eigenvalue criteria, eigenvalue sub-criteria, and supplier ranking will appear.

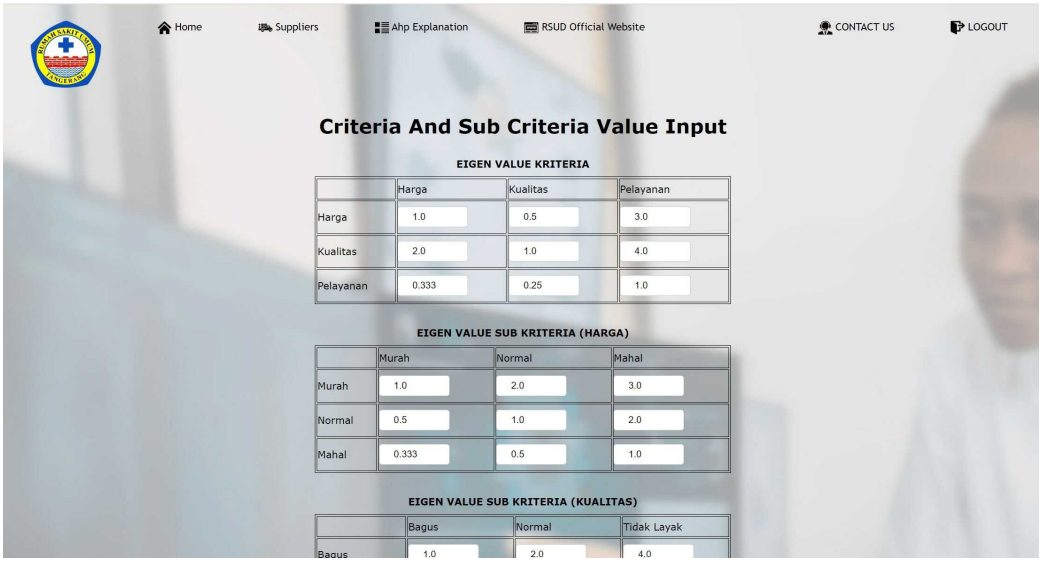


Figure 6. Input for AHP Simulation

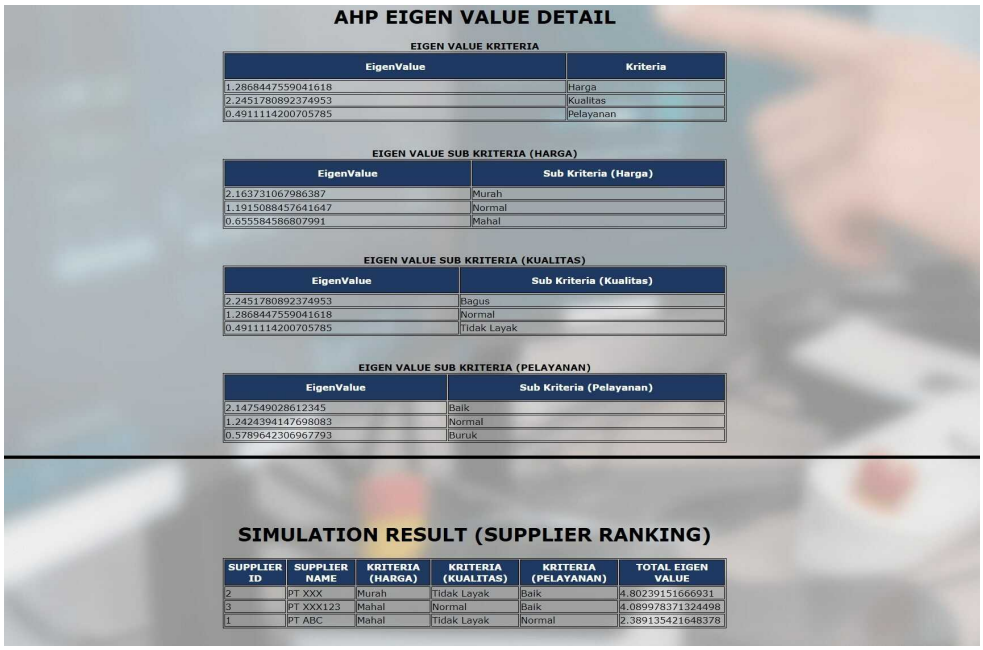


Figure 7. AHP Simulation Result

4. Criteria and Sub Criteria Value Input

This feature has 2 sub-features, namely edit the value sub-criteria of each supplier and reset the value criteria of each supplier. If the user chooses reset, then the sub-criteria value of the selected supplier will return to the default and can still be run on the AHP calculation with the default value. This feature is also connected to the add supplier feature where users can add suppliers as needed.

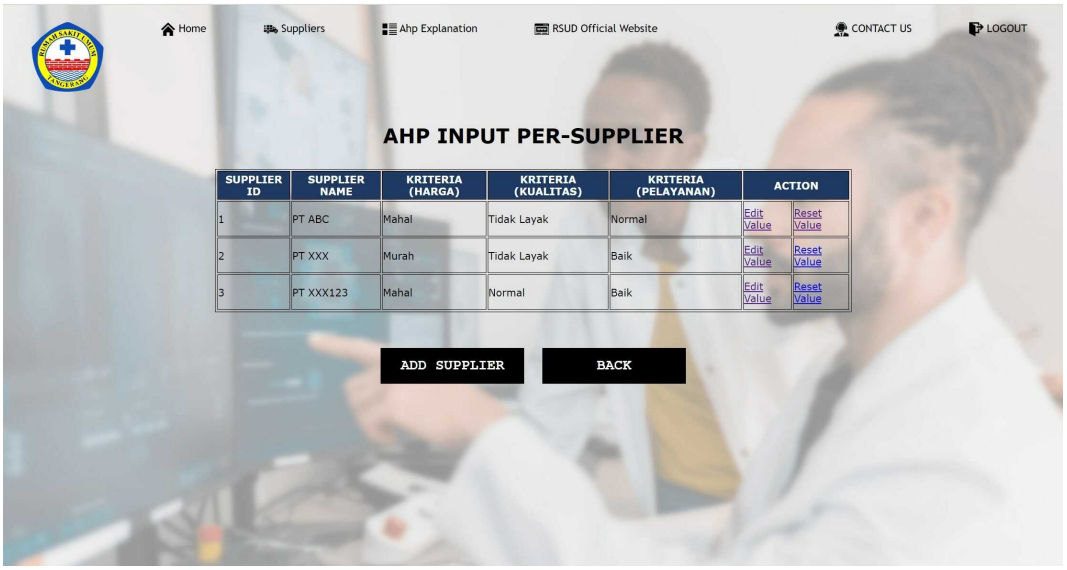


Figure 8. Input AHP Sub Criteria value per supplier

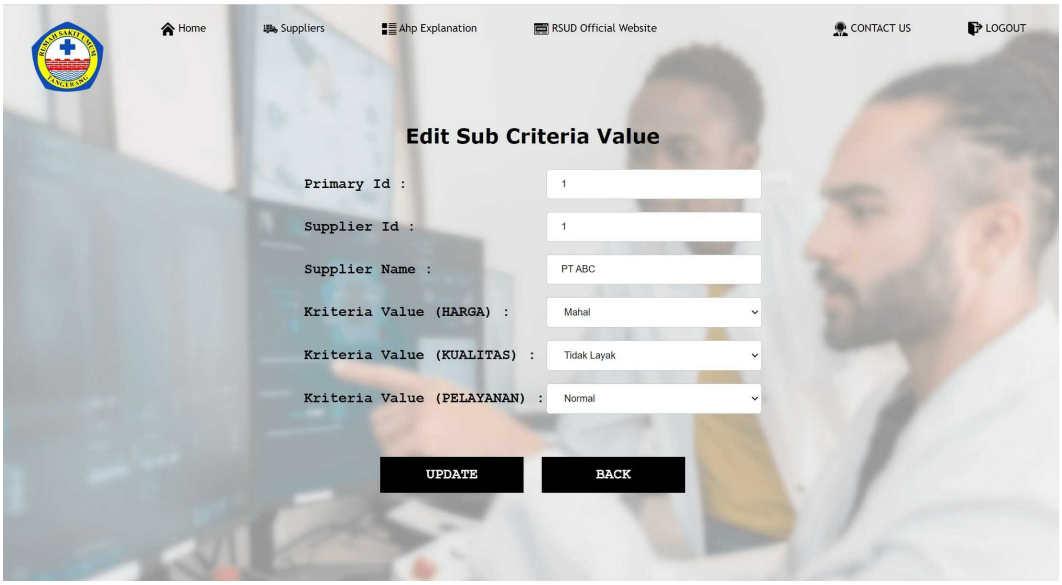
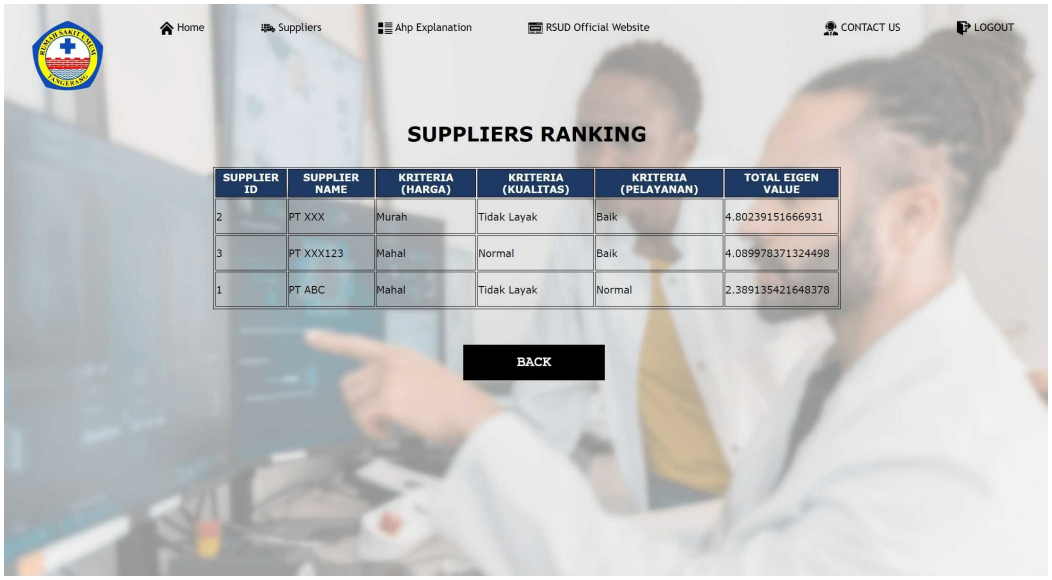


Figure 9. Edit value of Sub Criteria

5. Suppliers Ranking

This feature is used to display a list of suppliers that have been sorted based on the calculation results using the Analytical Hierarchy Process method. The sorted supplier list data is displayed according to the eigenvalue results and will be used as the main basis for determining the best supplier.



SUPPLIER ID	SUPPLIER NAME	KRITERIA (HARGA)	KRITERIA (KUALITAS)	KRITERIA (PELAYANAN)	TOTAL EIGEN VALUE
2	PT XXX	Murah	Tidak Layak	Baik	4.80239151666931
3	PT XXX123	Mahal	Normal	Baik	4.089978371324498
1	PT ABC	Mahal	Tidak Layak	Normal	2.389135421648378

Figure 10. Suppliers Ranking / AHP Result

6. Repo Suppliers

This feature is used to add, edit, and delete supplier data. The system will check for input data from the user. If valid, new supplier data or updates will be saved. If the data entered is invalid, the system will display an error message and the user can repeat the process of input/updating supplier data.

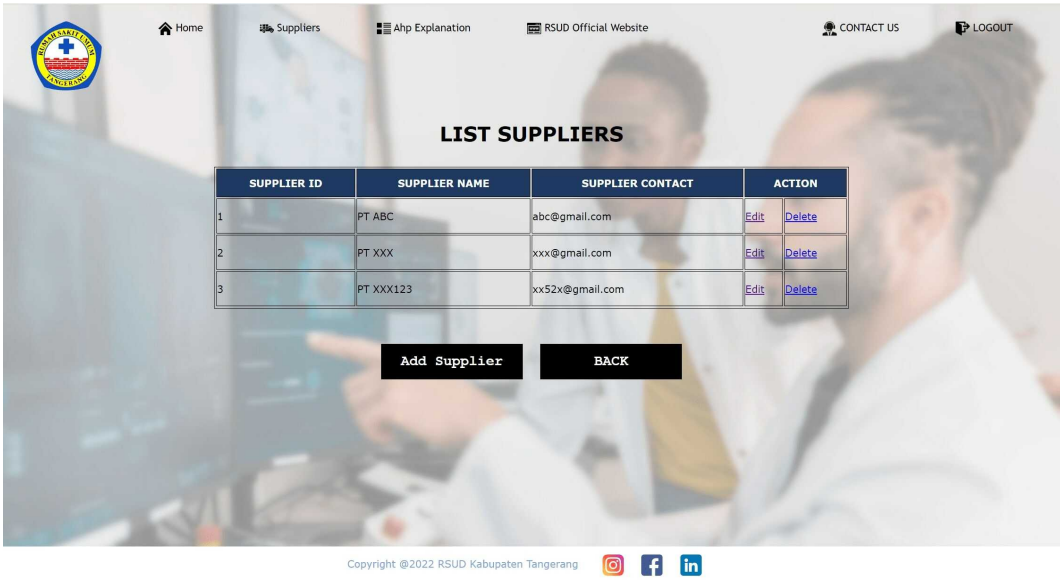


Figure 11. Suppliers Repository

From the explanation of the application above, it can be concluded that this application is expected to be used to support decisions in determining the best supplier in accordance with eigenvalue data that has been calculated using the Analytical Hierarchy Process approach.

CONCLUSION

This study discusses the decision support system by utilizing the Analytical Hierarchy Process method or approach involving 3 criteria and 3 sub-criteria. This concept is used based on the problem that supplier selection has not been efficient at the Tangerang general hospital pharmacy. This system is made in accordance with the objectives and problems that are expected in the future to be used for decision making in accordance with the needs.

BIBLIOGRAPHY

Fathoni, K., Prasetyaningrum, I., & Hariyati, C. L. (2018). Decision Support System for Choosing Daycare in Surabaya City Using Analytical Hierarchy Process (AHP). *2018 International Conference on Applied Science and Technology (ICAST)*, 544–550.

Hariyanto, D., Sastra, R., & Putri, F. E. P. E. P. (2021). Implementasi Metode Rapid Application Development Pada Sistem Informasi Perpustakaan. *JUPITER (Jurnal Penelitian Ilmu Dan Teknik Komputer)*, *13*(1), 110–117.

Kurnia, D. (2021). Rekrutmen Karyawan Baru Berbasis Metode Analytical Hierarchy Process (Ahp). *Jurnal Teknoif Teknik Informatika Institut Teknologi Padang*, *9*(2), 64–72.

Mutholib, A., & Febrina, S. (2017). Penerapan Metode Analytical Hierarchy Process (AHP) Pada Aplikasi Pendukung Keputusan Seleksi Karyawan Unicharm Indonesia. *JUST IT: Jurnal Sistem Informasi, Teknologi Informasi Dan Komputer*, *7*(2), 21–27.

Sari, R. E., Meizar, A., Tanjung, D. H., & Nugroho, A. Y. (2017). Decision making with AHP for selection of employee. *2017 5th International Conference on Cyber and IT Service Management (CITSM)*, 1–5.

Wang, X. (2020). Design and Implementation of College English Teaching Quality Evaluation System Based on Analytic Hierarchy Process. *2020 International Conference on Computers, Information Processing and Advanced Education (CIPAE)*, 213–216.

Zamzami, F., Nusa, N. D., & Faiz, I. A. (2021). *Sistem Informasi Akuntansi*. Ugm Press.

Alianto, H., (2019)., "Deicision Support System for Badan Ekonomi Kreatif Indonesia", IEEE Explore

Heryana, A., (2022)., "PENGGUNAAN Decision Support System Selama Pandemi Covid-19", IEEE Explore

Rinawati, (2021)., "Sistem Pendukung Keputusan Pemilihan Supplier Produk Ritel dengan Metode Analytical Hierarchy Process", SISTEMASI

Yasir, F., (2019)., "Sistem Pendukung Keputusan Pemilihan Supplier Produk Menggunakan Metode AnalyticalHierarchy Process(AHP)", FASILKOM.