Analytical Hierarchy Process: a method for Determining the Assessment of Soft Skill Competence

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Abstract
Analytical Hierarchy Process (AHP) is a method that is often used to determine decisions in system making. To determine the soft skill competence (SKC) possessed by a person, a more in-depth analysis needs to be carried out based upon the criteria used. The purpose of this study is to produce a decision support system to assess the SKC of employed using the AHP method. This system is made based on the stages of the waterfall model which consists of analysis, design, implementation and testing. The collection technique used observation and interviews, and the amount of data was 18 people who were analyzed using the AHP method. System testing is done with a black box which aims to see the functionality to the system. Our findings are in the form of a web-based decision support system. In addition, this system managed to show the best employee with a score of 0.622, and all components run as expected, without any errors. So that this system can be used as a reference to determine the soft skill competencies of employees in this place.

Keywords*: analytical hierarchy process; decision support system; soft skills competence

INTRODUCTION

Implementing a series of activities in the organization is carried out by humans who act as actors or participants in the organization concerned, then by itself, the performance of the organization concerned depends mostly on human behaviour contained in the organization. Soft skills that should be possessed by employees or employees are communication skills, learning ability, ability to manage information, organizational ability, ability to work in teams and professionals, morale, and self-confidence ability (Umar et al., 2018).

Soft Skill competence is so important because many organizations not only need a smart workforce and are able to do the tasks given (Suarjana, 2022; Sunita et al., 2020). In addition, this is supposed to be done by providing an assessment sheet of a subjective nature. One of the employees with the superior often produces a different decision than it should be, so the resulting decision is often missed or incorrect. To overcome this, it is necessary to have a system that provides information and models based upon existing data, namely an expert system.

The expert system is a computerized system that provides information, capitalization and data manipulation that can evaluate quickly, measurably and consistently in providing decisions (Lutfianda, 2020; Ramadhan & Santika, 2020; Yusron & Huda, 2021). The expert system helps to produce various alternative decisions to assist management in dealing with various problems using data and models (Sari et al., 2021; Wahono & Ali, 2021). The expert system has 4 phases in making decisions, namely: intelligence, design, choice, and implementation (Almadhoun & Abu Naser, 2018; Alvarez et al., 2021; Bangun, 2021; Petersen

et al., 2019; Sitorus, 2021). Each phase is interrelated with each other to produce a logical decision based on predetermined criteria.

Expert systems not only provide data storage and retrieval but also enhance traditional access to information with support for model-based decision-making and reasoning model-based modelling (Liang et al., 2020; Yu et al., 2021). Basically, the expert system is designed to support all stages of decision making from identifying problems, selecting relevant data, determining the approach used in the decision-making process to evaluating the selection of alternatives (Baumann et al., 2019; Chen et al., 2021; Yannis et al., 2020).

Determining decisions based on data processed in the expert system, it is necessary to have a method used, namely the Analytic Hierarchy Process (AHP). AHP is a decision support model that focuses on deciphering complex multi-factor or multi-criteria problems into a hierarchy (Alturk et al., 2022; Inti & Tandon, 2021; Raco, 2020; Zhao et al., 2022). A number of researchers have created expert systems using the AHP method in different fields. (Andriyani & Hafiz, 2018; Raco, 2020).

The findings made by several previous researchers show that AHP can provide solutions to the process of selecting outstanding students in a computerized manner to be more effective and efficient and precise and accurate, in addition, it can provide decisions regarding the most prioritized road repairs (Putra et al., 2020). This method can also be used to determine the placement of automated teller machines with an accuracy rate of 84.21% (Mahendra & Indrawan, 2020), and can determine employee promotion, select products to a mini market (Anggoro & Supriyanti, 2019; Septilia et al., 2020; Yanto, 2021).

Previously, they have built decision support systems by applying AHP methods to different objects and fields. In this study, it aims to build a system using the AHP method to assess the soft skills competence possessed by employees so that they are based on predetermined criteria

METHOD

A decision support system to determine the employee soft skill was built using the AHP method through the waterfall model with the stages of analysis, design, implementation, and testing (Kusuma & Rahayu, 2021; Nasution et al., 2021; Suprapto et al., 2020). The analysis was carried out to find the data needed to be used for this system by interviews and observations (Mahmud et al., 2022). The method used to calculate the data whose results will be used as a decision is AHP. The criteria used for this study were five of them: communication skills, collaboration, motivation, organizational skills, and self-confidence (see table 1). The design stage consists of class diagrams, flowcharts, and use cases. System testing uses the black box to determine the functionality to the system that has been made.

Tabel 1. Criteria data

No	Code	Criteria
1	K01	Communication skills
2	K02	Ability to cooperate
3	K03	Motivation/initiative
4	K04	Organizational ability
5	K05	Confidence

RESULTS AND DISCUSSION
Results

The organization in this study has dozens of employees who are divided according to their respective fields of work. Evaluation and assessment activities are carried out every few

months. The system that initially still uses conventional procedures will be replaced with a computerized system in the form of an expert system using the AHP method.

There are six classes shown in Figure 1, namely user classes, criteria, alternatives, criteria rails, and alternative-rails and values. The user class has a one-to-many relationships in the criteria data class, meaning that one user processes many criteria. Likewise, the user class has a one-to-many relationships to data classes, meaning that one user processes many-alternatives. And the criteria class has a-to-one relation, meaning that many criteria belong to one alternative. Meanwhile, the result value is a dependency relation to the alternative-class. Meanwhile, the results from the flowchart design for this study were started from home, then given the option to go to several menus such as: criteria, weight values, alternatives, weight values-alternative, calculation results (see figure 2).
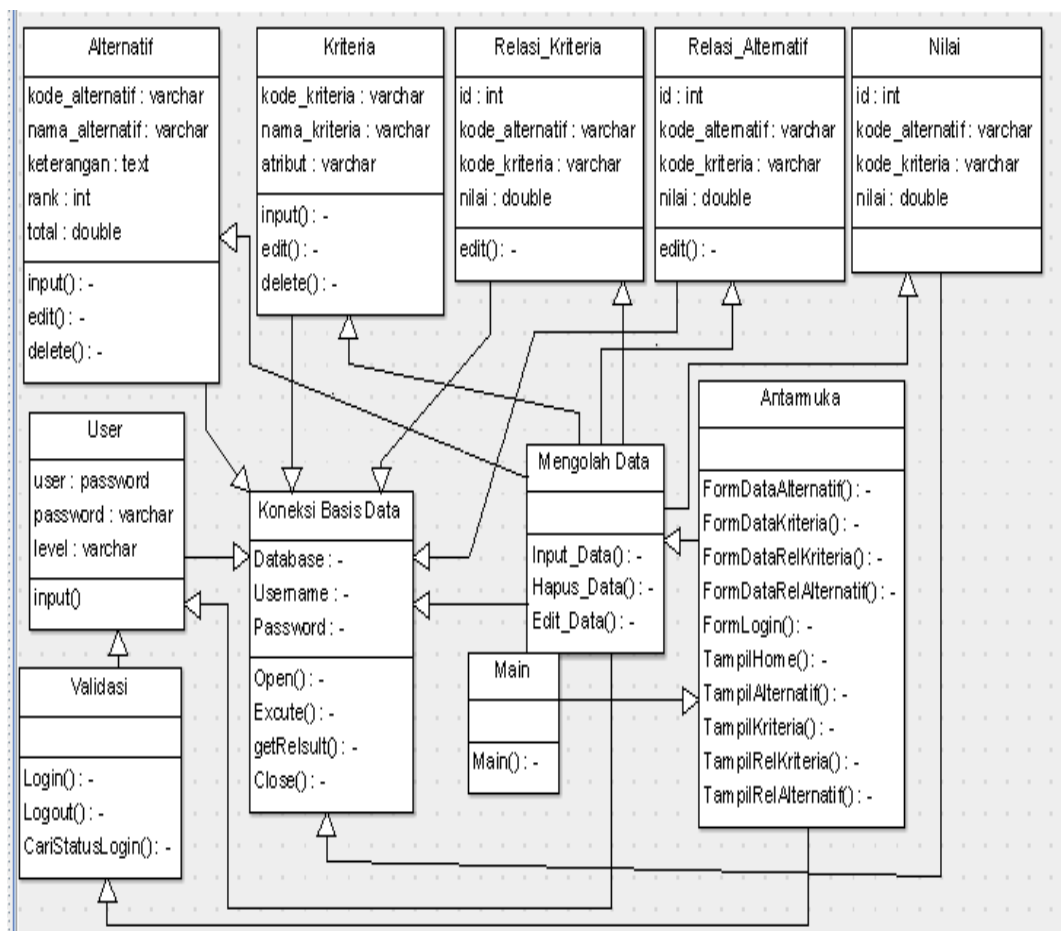

Figure 1. Class diagram of employee soft skill competency assessment

The general design for this study includes input data on the form of employee data and assessment data filled in by all employees who will be evaluated for their soft skill competencies. After the data is obtained, the first step is to determine the paired matrix in the form of numbers 1 to 9, which shows the comparison of an element which can be seen in table 2.
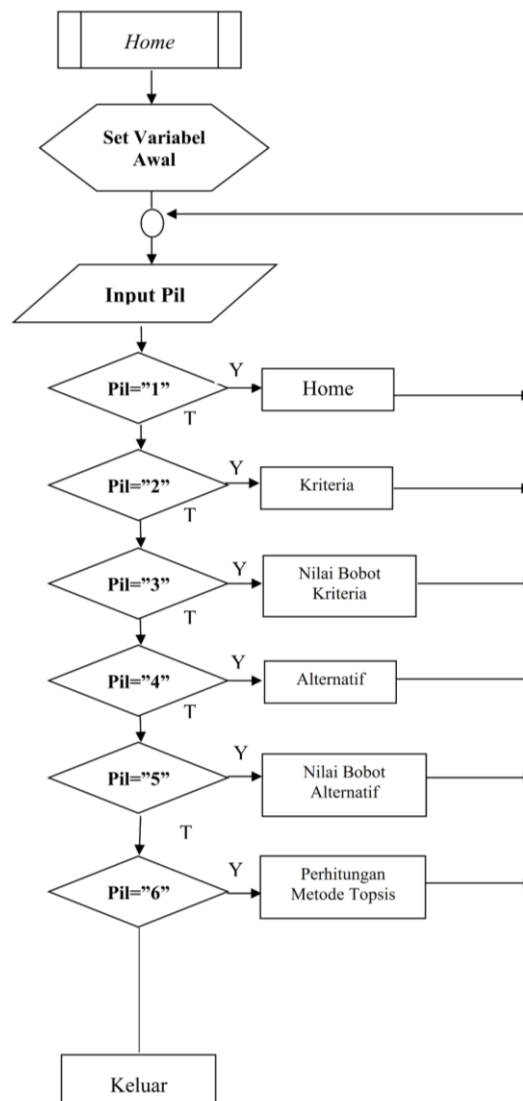
Figure 2. Flowchart system

Table 2. Pairwise comparison matrix criteria

| Criteria	K1	K2	K3	K4	K5
K1	1	1	7	5	7
K2	1.00	1	5	7	9
K3	0.14	0.20	1	2	3
K4	0.20	0.14	0.50	1	2
K5	0.14	0.11	0.33	0.50	1
Total	2.49	2.45	13.83	15.50	22.00

Legend:
K1   = Communication skills
K2   = Ability to cooperate
K3   = Motivation/initiative
K4   = Organizational ability
K5   = Confidence

Table 3. Global priority value of each criteria

Alternative	K1	K2	K3	K4	K5	Total	Ranking
Siti Madina Agustina Siregar,	0,122	0,120	0,108	0,103	0,122	0.575	3
Rahmad, SH	0,102	0,108	0,133	0,145	0,133	0.621	2
Masnun, SH	0,141	0,152	0,111	0,111	0,108	0.622	1
Zainal Abidin, S.Pd	0,105	0,093	0,095	0,096	0,083	0.471	4
Anwar Sipayung, A.Md	0,054	0,063	0,071	0,071	0,081	0.339	6
Ilyas, S.Pd, M.Si	0,060	0,060	0,091	0,079	0,073	0.362	5
Seri Asniarti	0,058	0,060	0,058	0,057	0,061	0.294	7
Supiah, SH	0,061	0,054	0,040	0,042	0,048	0.245	8
Rumondang N.S, A.Md	0,047	0,048	0,046	0,049	0,045	0.235	9
Nasrul Ashwin, SH	0,040	0,038	0,046	0,047	0,044	0.214	10
Soriani Tambunan	0,033	0,033	0,037	0,027	0,041	0.170	12
Milianna Siagian	0,044	0,038	0,030	0,032	0,038	0.180	11
Intan Luthfillah	0,025	0,024	0,026	0,028	0,031	0.134	13
Hasrul Yahya	0,030	0,025	0,028	0,025	0,024	0.131	14
Fatmayani	0,023	0,027	0,025	0,030	0,021	0.126	15
Asmawati	0,018	0,016	0,020	0,022	0,019	0.095	17
Sapari	0,020	0,024	0,017	0,020	0,018	0.098	16
Rahmad Hamdani	0,019	0,015	0,020	0,014	0,012	0.078	18

After the pair, wise comparison matrix has been obtained, the next step is to create this for each criterion. Then compare the priority value to each alternative with the priority value as shown in table 3. Based on these results, the highest score as Employee Soft Skill is alternative A3, namely *Masnun* with a value of 0.622 ranks 1, which refers to each criterion held by the *Talawi District Office*.
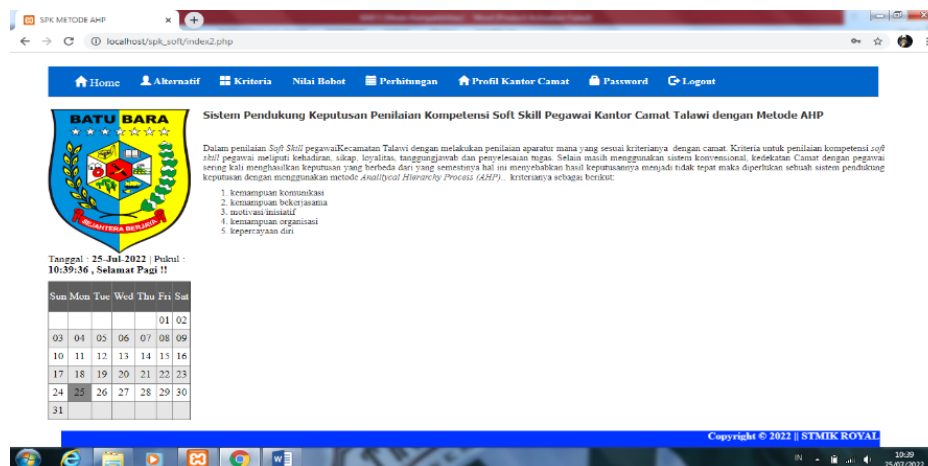
Figure 3. Main menu

After analysing using the AHP method, the system that will be presented as a web form is built using the PHP programming language which focuses on dynamic system performance, and MySQL, which is in command of managing data. Figure 3 is the main page which has several menus consisting of: Home, Alternative, Criteria, Weight Value, Calculation, Organization Profile, Change Password, and Logout. While in Figure 4, it can be seen that the page contains the results from the calculations that have been carried out by the system has

been created. This page also displays to the value of each criterion after the calculation using the AHP method.
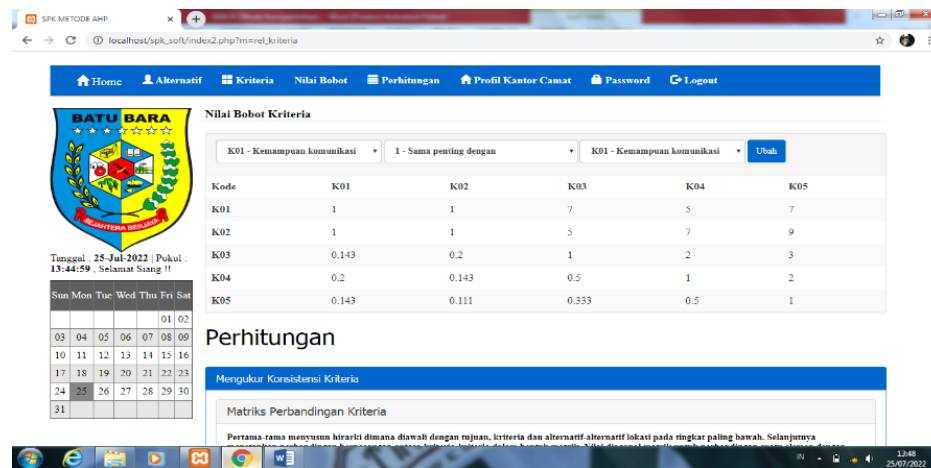

Figure 4. Calculation results page

Black box testing aims to determine the functionality in the software or system that has been created. Our findings based on the table four show that the components in this system have been running well without any errors (see table 4). In addition, this system is in accordance with calculations using the AHP method based on predetermined criteria.

Table 4. The result of black box testing

Test Class	Test detail	Result
Login test	Verify admin and patient login data, by entering username and password in order to activate all buttons on the main page of the decision support system.	success
New selection inputs, alternatives and criteria	The decision support system process for Employee Soft Skill Competency Assessment, as well as the process of saving, editing, deleting, canceling and searching for alternative data and criteria for the AHP method	success
Tests show data, new selection, alternatives and criteria	Displaying the input results, new selections, alternatives and criteria appear	success
Testing data input added user	The process of adding user data as well as the process of saving, editing, deleting, and canceling	success
the test shows the added user data	Displaying the input results display the added user data	success
Decision support system process testing	It is a decision support system process for Employee Soft Skill Competency Assessment as well as a yes, no, go action, and close process.	success
About test	showing about the author	success
Logout test	The process of logging out from the main page of the decision support system.	success

Discussion

The results of the data that have been processed by the system are then ranked to get the highest score as the best employee is alternative A3 with a value of 0.622. This shows that the employee deserves to be used as the best recommendation in terms of communication skills, ability to cooperate, motivation/initiative, organizational ability, and confidence. Furthermore, the decision support system that we have made is in accordance with the concept of the AHP method. Where this method provides a ranking based on alternative values and weights in accordance with the assessment criteria that have been set.

Our findings are relevant to those of several previous studies (Anggoro & Supriyanti, 2019; Mahendra & Indrawan, 2020; Putra et al., 2020; Septilia et al., 2020; Yanto, 2021). Their findings are in accordance with the criteria and assessment by the system. Based on these things, it is concluded that the use of the AHP method in the process of implementing a decision support system has proven to be very effective in making decisions and can be applied to other problems in accordance with other fields as well.

System testing is done by black-box, which results at the conclusion that the system can functionally issue output based on manual calculations that have been carried out. Tests such as managing alternative data, criteria, criteria weights can run as they should. The function within the calculation process using the AHP method also shows a value that is in accordance with the calculations carried out by the researcher. That is, the results from the tests implemented to have been in accordance with expectations and can be used properly.

CONCLUSION

We have succeeded in making a decision support system using the AHP method and according to the concept behind this method. This method provides weights and alternatives so that it can give a ranking based on predetermined criteria. In addition, this system also has good functionality and there are no errors that occur when applied. Therefore, the existence within this system can make it easier for organizations to assess the soft skill competence of their employees.

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