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Decision Support System for Hiring Expert Staff at CV. BMS Using AHP Method

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Abstract*—In this study there are problems in the CV. Bangkit Mandiri Sejahtera (BMS) Semarang company engaged in the field of building head offices in Central Java, especially in the Semarang area, which until now still uses the process of hiring employees manually or through print media and the selection process also takes around 1 month starting from interview test until the final announcement because it is still done conventionally and does not yet have a computerized system. From these problems, the researcher will create a computerized employee recruitment system so that it can assist in the selection process and cut the time needed for the selection process so that the needs of employees and experts can be carried out more quickly and precisely. The solution is to apply the AHP (Analytical Hierarchy Process) method to the Decision Support System to create experts to get maximum results. The results of this study after the application of the AHP method is that the time required for the selection and certifying stage is less than 1 month, then the ranking results of the applicants are also immediately visible from the total existing vector values starting from the smallest, namely 74,443 to the largest, namely 86,667 and stated passed the selection process. In the system created, applicants can log in and see whether they have passed or not in the selection process and continue with the filing process..

Keywords : Include 3 – 5 keywords or phrases, keywords are separated by a comma.

I. INTRODUCTION

The company is a place where production activities of an item take place, where human resources (HR) have a function as users who act as movers and executors in the form of a predetermined vision and mission of the company. The quality of employees in supporting the progress of the company is very important, so many companies are trying to have quality employee values. As an example of a problem case that was carried out in CV. Bangkit Mandiri Sejahtera (BMS) Semarang, the company is engaged in building contractors in Central Java, especially in the Semarang area. The types of buildings being worked on are housing, private homes, shops, dealers etc.

The measurement process is a measurement of the competency level of each employee, of course it cannot be done by manual calculation. In addition to the time problem, the possibility of errors or miscalculations due to too much data can occur. Therefore, to increase the effectiveness and efficiency of decision making, especially in selecting the best mechanic, the AHP method will be applied. Where this method can do a good ranking with the most vector values to determine the best mechanic. [1].

Decision support systems that researchers use to process data more quickly and accurately so that the decision-making process can be done more easily. To realize the above, it is necessary to develop a decision support system that is suitable for the employee recruitment selection process in a company [2]. In this case, the author uses the Analytical Hierarchy Process (AHP) method, because according to research conducted by Lestri, Neneng and Puspaningrum explaining that by using the Analytical Hierarchy Process (AHP) method in the Decision Support System (SPK), the determination of employees can be calculated based on the calculation of the weight respective criteria, so that employees can choose high achievers within the company quickly [3]. Meanwhile, according to research conducted by Sumartono and Sihotang 2021, this method provides assistance in solving a complete problem by building a hierarchical system of criteria, groups that have interests, and data acquisition by taking various considerations to give weighted values or priorities according to the problem [4].

The problem of this research is how to build an application that functions as a decision making tool in selecting new employees at CV. BMS Semarang by using the Decision Support System method in order to assist companies in selecting employees objectively and professionally based on the criteria desired by CV. BMS Semarang.

II. RESEARCH METHODS

The research method that will be used is the Analytical Hierarchy Process (AHP). AHP itself is a comprehensive decision-making method with qualitative and quantitative characteristics in its calculations. The shortcomings of the previous model can be corrected using the AHP calculation method [5].

2.1 Collecting Data Method

Data collection using observation and interview methods. The first is observation, which is to see the visible behavior and the goals to be achieved. Visible behavior is behavior that can be seen directly by the eye, measured, heard and counted [6]. At this data collection stage, direct observation or observation and data collection was carried out from CV. BMS. The advantages of this method are being able to record growth behavior and other things when the incident is taking place, being able to obtain data by subject directly. The downside is that it takes a long time to get results.

The interview method functions as a tester for the truth and stability of a data obtained from the results of interviews with informants, which have been obtained and processed in other ways such as observation, questionnaires and others [7]. The target for informants from this interview process is to recruit new employees at the CV. BMS. As for the day or time of the interview, it was determined to adjust to the free time available from the relevant informants.

2.2 Data Analysis Method

2.2.1 Identify

The ability used to identify the existence of cases is a crucial characteristic to support the successful completion of cases [8]. If the problem is not identified, maybe the strategy used will not be found. Then collected data to identify which will be used in the CV. BMS. The following are the data criteria that will be used:

1. Identity data. Includes all personal identities of prospective employees.
2. Last formal education. Formal education either high school graduates, D3, or S1.
3. Work experience. Work experience is reviewed according to the length of time prospective job applicants have worked at the previous company.
4. Age of Prospective Job Applicants. The age criteria are ≥ 26 years, 20-25 years, and 17-19 years.
5. The height of the job applicant. The height of prospective job applicants starts from 155 cm in height, 160 cm – 165 cm in height and 166-170 cm in height. Skill (ability) is assessed from each applicant who applies according to the job vacancy position applied for through the value criteria: proficient with a value (75-100), sufficient with a value (50-74), and less (25-49).
6. The average value or GPA of prospective applicants is assessed from the certificates that have been listed for the SMA level. The average value is 7.00 and for the Diploma or Bachelor level the average GPA value is 2.75 - 3.50.
7. Each applicant is required to attach a health certificate and is assessed from a certificate from a doctor prepared by the applicant with conditions (score 75-100).

2.2.2 Understand

Analyzing the system that has been implemented and used aims to analyze a system whether it is in sync with the primary goal of the system itself, namely to make the system easier for users. System analysis in a company is very important because the function based on the analysis itself is to find out how the system is running so that the system being built can produce the desired results and can achieve the planned goals [9].

2.2.3 Analyze

The principle of compiling a hierarchy is to describe and describe a system in detail and detail, by breaking down the problem into separate elements. The most important part of the hierarchical analysis process can be made into a table consisting of 3 (three) stages as follows:

Table 1. Hierarchical Analysis Process

No	Hierarchy Basic Concept	Information
1	State the purpose/goal of the analysis	Employee Recruitment
2	Define criteria	Education, Age, Height and Grades
3	Define alternatives	Admin, Sales, Warehouse, Drivers

Furthermore, this information is then arranged to form a multilevel tree. To create a complex system that can be understood by breaking it down into three supporting elements, namely objectives, criteria and alternatives. By arranging elements hierarchically, and combining them.

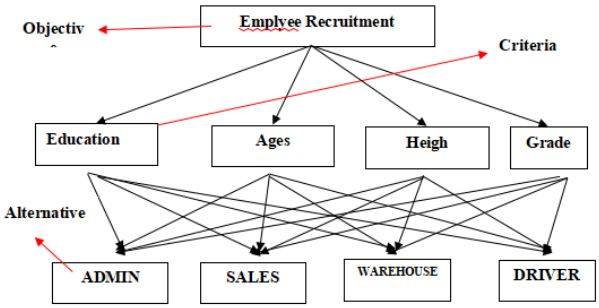


Figure 1. Hierarchical Structure

Based on the analysis conducted regarding the recruitment of CV BMS employees with a system that has been running still has some shortcomings and weaknesses which will be explained as follows:

1. Submission of application files is still done manually or visiting the company directly, as a result resulting in a backlog of application files and the Company's HRD takes more time to select incoming applications.
2. The data storage of applicants is still manual and the security is not guaranteed, for example in the event of a natural disaster. This will cause all files or data to be lost, as a result, it is necessary to increase the data storage in a more secure place.
3. Summons for test selection, invitations for interviews/interviews, summons for work placements which still use print media and are copied/reproduced as a result require a lot of paper.
4. Applicants are required to come and be present at the company several times to take the selection test and written test, then be re-selected during the interview/interview and call for work placement as a result it takes a lot of time for job applicants and of course for the HRD of the company.

5. The output paper of the applicant's written test will be corrected by HRD one by one as a result it takes more time to process.

2.2.3 Report

The final result of the CV BMS employee decision support system with the AHP method will later be in the form of a web system where Applicants or users can register first to view information about job vacancies and fill in the data in the application such as Username and Password. After that, you can carry out the login process to be able to view data from the information that has been provided by the company and can send a cover letter by including the existing application files or documents then sending via the application from the application will validate the data and applicants can find out the results of the tests that have been carried out. carried out [10].

For the admin to find out the data that has been sent such as name, address, education and grades and work experience of the user to be considered by the company whether or not an applicant is accepted. and later these data will go through the application process that is already running through the AHP method decision support system can determine the final score of each applicant [11].

2.3 Research Flow

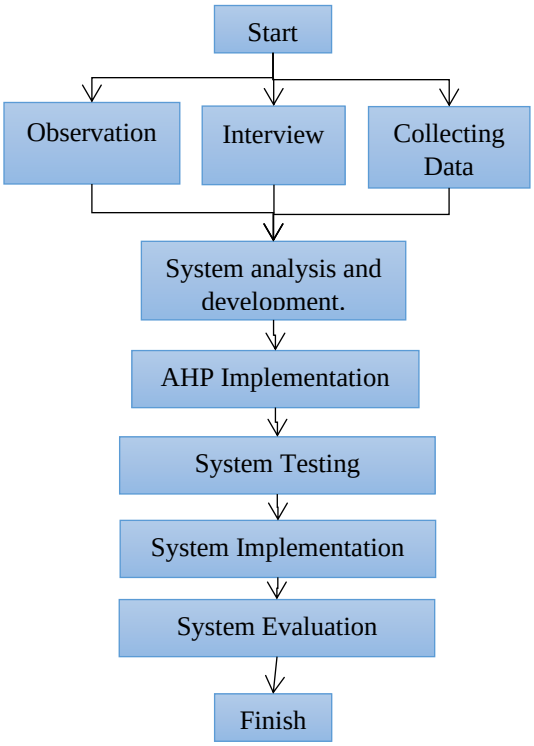


Figure 2. Research Flow

The first step that needs to be done is to survey and observe the problems that exist in CV.BMS, then collect company data from sources and make direct observations through interviews, observation and document collection of applicants. Then an analysis of previous research is carried out and then compared with the research that we are doing and then concludes the results for making a system. From the decision support system that has been determined, then the SPK is analyzed to determine the desired method. After the AHP method decision support system is made, the next step is to test the feasibility of the system. The results of the test system are then evaluated first to determine the feasibility of the application before being handed over to system users [12]. Draw conclusions from the research results that have been made and then provide input on the system that has been built.

III. RESULT AND ANALYSIS

3.1 User Interface

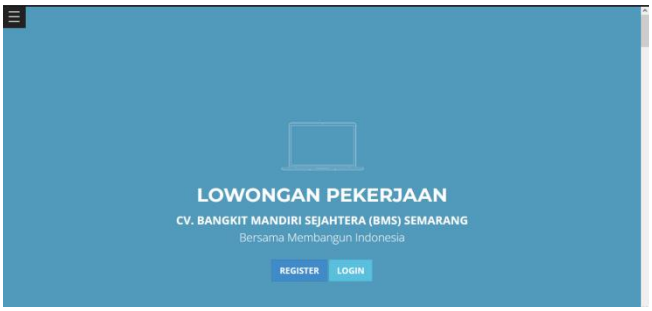


Figure 3. Home Page

The picture above is the main page of the decision support system using the AHP method. On the main page there are several menus such as Login and Register. For prospective applicants who do not have an account, they can register directly with the Register button provided.

Figure 4. Applicants Profile

After registering and then logging in, job applicants can fill in their complete personal data and upload the required files such as CVs, diplomas, ID cards, etc. And the most important thing is to fill in the job vacancies that are currently needed in accordance with the qualifications.

3.2 Testing and Explanation

At this stage, the normalization of each of the existing criteria will be explained and will be explained in the

calculation table which has been sorted from the smallest to the largest priority assessment. Here is the table:

Table 2. Paired Matrix Calculation

Criteria	Ages	Education	Healthy	Experience	Certificate
Ages	2	0.44	0.3	0.25	0.22
Education	4	2	0.7	0.53	0.44
Healthy	6	2.77	2	0.82	0.66
Experience	8	3.44	2.5	2	0.88
Certificate	8	4	2.9	2.39	2

From the data table above shows the element values in each column of each criterion, then the number of elements in each column is as follows:

Ages : 1 + 4 + 6 + 8 + 8 = 27
Education : 0.44 + 2 + 2.77 + 3.44 + 4 = 12.65
Healthy : 0.3 + 0.7 + 2 + 2.5 + 2.9 = 8.4
Experience : 0.25 + 0.53 + 0.82 + 2 + 2.39 = 5.99
Certificate : 0.22 + 0.44 + 0.66 + 0.88 + 2 = 4.2

Table 3. Normalization Matrix

Criteria	Ages	Education	Healthy	Experience	Certificate
Ages	0.05	0.05	0.05	0.05	0.05
Education	0.25	0.25	0.25	0.25	0.25
Healthy	0.15	0.15	0.15	0.15	0.15
Experience	0.25	0.25	0.25	0.25	0.25
Certificate	0.30	0.30	0.30	0.30	0.30

After knowing the results of the normalization matrix, then do the sum of each row in the matrix. The number of each row in the table can be calculated using the following method:

Ages : 0.05 + 0.05 + 0.05 + 0.05 + 0.05 = 0.25
Education : 0.25 + 0.25 + 0.25 + 0.25 + 0.25 = 1.25
Healthy : 0.15 + 0.15 + 0.15 + 0.15 + 0.15 = 0.75
Experience : 0.25 + 0.25 + 0.25 + 0.25 + 0.25 = 1.25
Certificate : 0.30 + 0.30 + 0.30 + 0.30 + 0.30 = 1.50

After obtaining the results of each row, then calculate the priority value of the criteria. The trick is to divide each number of rows using the number of elements (n=5), then the priority value of each criterion can be calculated as follows:

Age criteria priority value : 0.25 / 5 = 0.05
Education criteria priority value : 1.25 / 5 = 0.25
Healthy criteria priority value : 0.75 / 5 = 0.15
Experience criteria priority value : 1.25 / 5 = 0.25
Certificate criteria priority value : 1.50 / 5 = 0.30

Then it is translated in percent form in the following table:

Table 4. Criteria Weight Value

Criteria	Weight	Percentage
Ages	0.05	5%
Education	0.25	25%
Healthy	0.15	15%
Experience	0.25	25%
Certificate	0.30	30%
Total	1	100%

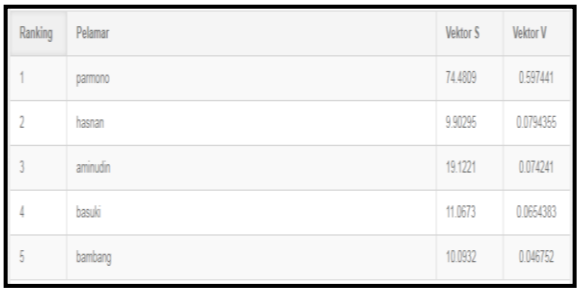
Test consistency using the method of calculating (A) (WT), namely multiplying the pairwise comparison matrix using the criteria priority weights, after that calculating the maximum lambda value using the equation formula (2,1) (A) (WT) = lamda max = 4.880

Calculating the consistency index with the formula:
Cl = (lamda max - n) / n - 1
Cl = (lamda max – n) / n -1 = (4.880 – 5)/5 – 1 = -0.12/4 = -0.03

The formula for calculating the consistency ratio: CR = Cl/IR, where IR is a random value index of 1.12 because the size of the matrix is 5, the value of CR can be calculated in the following way: CR = Cl/IR = -0.03/1.25 = -0.024, Because the consistency ratio value is -0.024 ≤ 0.1, the matrix above is consistent.

3.3 Ranking Results

The end result of this research is the acceptance of experts according to the qualifications and positions required by CV.BMS. The results of the test and files that have been completed by the applicant will be described in the following figure and table:



Ranking	Pelamar	Vektor S	Vektor V
1	parmono	74.4809	0.597441
2	hasnan	9.90295	0.0794355
3	aminudin	19.1221	0.074241
4	basuki	11.0673	0.0654383
5	bambang	10.0932	0.046752

Figure 5. Ranking Result

The picture above shows the results of a ranking process that has been carried out and shows the results of the

calculated criteria data by generating the value of each applicant through the ranking process. It can be seen from the results of the table below:

Table 5. Sample Value of Applicants 1

No	Applicants	Information	Weight Value	Raised Weight Value
1	Sample Value of Applicants 1	Certificate Education Experience Healthy Ages	90 90 90 80 80	0.2900 0.2900 0.2900 0.2100 0.2100
		Total Vektor's		86.667

Table 6. Sample Value of Applicants 2

No	Applicants	Information	Weight Value	Raised Weight Value
1	Sample Value of Applicants 2	Certificate Education Experience Healthy Ages	85 85 80 70 70	0.2900 0.2900 0.2900 0.2100 0.2100
		Total Vektor's		78.890

Table 7. Sample Value of Applicants 3

No	Applicants	Information	Weight Value	Raised Weight Value
1	Sample Value of Applicants 3	Certificate Education Experience Healthy Ages	80 80 70 70 70	0.2900 0.2900 0.2100 0.2100 0.2100
		Total Vektor's		74.443

Table 8. Sample Value of Applicants 4

No	Applicants	Information	Weight Value	Raised Weight Value
1	Sample Value of Applicants 4	Certificate Education Experience Healthy Ages	85 85 75 70 70	0.2900 0.2900 0.2100 0.2100 0.2100
		Total Vektor's		77.766

Table 9. Sample Value of Applicants 5

No	Applicants	Information	Weight Value	Raised Weight Value
1	Sample Value of Applicants 5	Certificate Education Experience Healthy Ages	90 85 85 70 80	0.2900 0.2900 0.2900 0.2100 0.2100
		Total Vektor's		82.255

3.4 Results Announcement

The last part is how applicants find out the results of the selection starting from the administrative selection and test selection. Applicants can log in using their respective accounts then head to the Announcement of Results page.

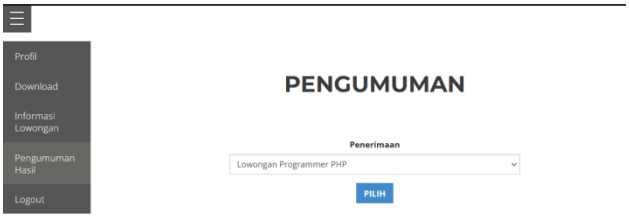


Figure 6. Result Announcement Page

The picture above shows the results page for the announcement of hiring experts at CV.BMS according to the best qualifications in terms of overall value.

Figure 7. Result Announcement

After selecting the selected formation, the results of the recruitment of experts will appear. If it does not pass, a notification will appear that the applicant has failed and if successful, a notification will appear that the applicant has passed the selection and proceeds to the filing process.

VI. CONCLUSION

The system used to assist in selecting new employees using a decision support system with the company's AHP (Analytical Hierarchy Process) method can help solve company problems regarding employee selection, in determining the best employee selecting applicants by determining weights and comparing pairs on each applicant criterion with how to do weighting calculations quickly and

accurately. as well as being able to select employees according to the fields and expertise possessed by each selected applicant through the ranking results on the CV. Prosperous Independent Rise (BMS).

The criteria used are age, education, health, work experience and skills certificates. Then weighting is given to each criterion which can later be used to rank prospective applicants. The results of the sample of prospective applicants who have been ranked and calculated for the vector value starting from the smallest are 74,443, 77,766, 78,890, 82,255 and the highest is 86,667, where the highest score is an applicant who passes the selection process.

Decision Support Systems with the AHP method can provide complete information for applicants starting from the registration process, completeness of application files to the final results or announcement of graduation or failure of applicants. Apart from that, for companies, the newly created system makes it very easy for companies and saves time because the process is faster, from the time it takes about 1 month to less than 1 month or about 2 weeks.

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