



## Employee Recruitment Decision Support System Using Analytical Hierarchy Process Method in Security Services Companies

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### Abstract

The purpose of this study is to determine how to combine the AHP method with other techniques to develop an employee recruiting decision support system. Utilized techniques for gathering data include literature reviews, interviews, and observation. The Rapid Application Development system development technique was employed in this study. Unified Model Language is one of the techniques used in system design to help envision the structure of the system that will be created. The discussion's outcomes allow for the following deductions to be made: Using a combination of web-based AHP and SAW methodologies, the Rapid Application Development method, and the Laravel 8 framework, this research creates an employee recruiting decision support system. It is anticipated that the decision support system for staff recruiting will automate the hiring process, reducing applicant subjectivity. HRD's tasks can be made easier by decision support systems, particularly in the data verification process because the electronic files that are received ensure that they are not mixed up with other documents.

**Keywords:** Decision Support System, Employee Recruitment, Analytical Hierarchy Process, Rapid Application Development.

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### 1. Introduction

Information technology is developing at an extremely fast rate every year. The numerous benefits that the advancement of information technology has brought about have a favorable effect on organizational operations, particularly business activities. Information technology (IT) not only helps organizations function more effectively and efficiently, but it also gives businesses the ability to run their operations and accomplish their objectives [1]. Information technology is becoming a very important instrument that many firms use to enhance their operations and boost productivity and effectiveness [2]. In every way, technology has made life easier for people today and will continue to do so [3]. Making judgments, boosting productivity, enhancing efficacy and efficiency, and supporting performance are a few advantages of utilizing this information system. Human mistake can occur in decisions that are manually calculated by humans. To reduce decision-making errors, a decision support information system is therefore required [4]. A system designed to assist in making decisions on a semi-structured problem is known as a decision support system (DSS). Here, the decision support system can assist in making decisions without totally taking the place of human judgment. A decision support system can be used by businesses to assist with hiring decisions [5].

Simple additive weighting and the analytical hierarchy process (AHP) are two techniques utilized in decision support systems. Multi-objective problems with many criteria can be solved using the Analytic Hierarchy Process (AHP) method in decision support systems [6]. On the other hand, SAW is a technique that ranks all of the possibilities to find the highest-to-lowest value and then chooses the best option from among them. A private business called PT Bhandawa Metafora Warsoyo provides outsourcing services with an emphasis on security. The experts in this field who founded this business are aware of how important security is [7]. Security is the main prerequisite for creating a comfortable and safe environment for carrying out various activities. Therefore, we are committed to providing the best security services by implementing a professional security management system and always trying to be at the forefront in our field to be able to compete and outperform similar companies. The company routinely recruits employees within a certain period of time. However, the employee recruitment system is still manual [8]. The implementation of this manual system is not effective and efficient because every prospective employee must come or send files such as CVs and so on in physical form, namely paper. After sending the required files, the company starts processing the data that has been received. This process takes 9 to 12 working

days, where administrative selection is carried out manually. After that, the company will get in touch with potential employees regarding job applications submitted no earlier than a week after the company receives the application [9].

So far, information on job openings has never been disseminated to companies, so there is no information regarding the requirements or schedule for job openings that prospective employees need when submitting job applications. Applicant files are stored only in a document storage cupboard, so they are vulnerable to being mixed up with other files [10]. Apart from that, application files that can come in at any time can cause the files to be lost or mixed up. Problems with the acceptance system currently in place should be evaluated so that the problems that occur can be resolved. Information systems can be used to fix problems in employee recruitment so that the process can run more effectively and efficiently [11]. The use of information systems in online employee recruitment, also known as employee recruitment information systems, is part of the human resources information system needed by companies to increase efficiency. The employee recruitment process also still has several problems, including subjectivity in the job applicant assessment process, and the assessment process takes a long time because it is done manually, resulting in the decision-making process being slow. Employee recruitment that is done manually has the weakness of making decisions that feel subjective [12]. It is also necessary to pay attention to the fixed weight in the employee recruitment criteria, because if not, the company will have difficulty having employees who meet the standards expected by the company. Mistakes that arise in selecting employees also have a negative impact on the company because they will affect productivity and work efficiency. Apart from that, companies also have to spend time, money, and energy carrying out this process [13]. Several studies regarding recruitment and selection show that employee selection has an influence on employee performance. Selection that results in inappropriate employee hiring decisions will affect future employee performance and the quality of the company.

## **2. Research Methods**

Data collection methods used include observation, interviews, and literature studies. In this research, observations were carried out with the aim of collecting data and looking for information related to the research. Observations are carried out by directly observing the employee recruitment process. After making observations, the next stage is conducting interviews. Interviews were conducted directly. In order to support the research's thesis topic, this method entails reading and studying books, Indonesian journals, and international journals related to system analysis and design, decision support systems, and programming. Based on previous research, the researcher has come to the conclusion that combining AHP (analytical hierarchy process) and simple additive weighting can be used as a way to make decisions when putting together priority scales. This is because AHP helps to make sure that priority weights are always the same, and the SAW method is used to rank. According to researchers, these two methods are appropriate to use to reduce the value of subjectivity, which is often found when there is employee recruitment. In this research, researchers used the rapid application development system development methodology. The tools used in system design are unified model languages to visualize the form of the system to be built. RAD is an object-oriented software development approach to produce high-quality, cheaper products with faster deployment.

The stages of the RAD approach are divided into three stages, namely: Requirement planning: in this stage, it is known what the system needs are, namely by identifying information needs and problems faced to determine objectives. After that, an analysis is carried out to determine how the proposed system to be built is able to overcome problems experienced by the system running currently and meet the needs of system users. Design workshop, namely identifying alternative solutions and choosing the best solution. Then create a business process design and programming design for the data that has been obtained and modeled in the information system architecture. Next, the system is implemented (coded) in a form that is understood by machines, which is realized in the form of a program or program unit. After the design of the system to be created has been approved by the user and analyst, at this stage, the programmer develops the design into a program. After the program is completed, either in part or as a whole, a testing process is carried out on the program to see whether errors occur or not before it is applied to an organization. The system implementation stage is the stage of placing the system so that it is ready to operate.

## **3. Results and Discussion**

Requirements planning: at this stage, the author collects the data needed by the system to be created by limiting the problem to the scope of employee recruitment research by designing an employee recruitment information system, or e-recruitment. In an employee recruitment decision support system, information can be used to manage prospective employee data and provide information about the company. This system can make it easier for the human resource development section to help plan and manage recruitment data more effectively and efficiently. In its implementation, the current recruitment system still uses a manual system, such as files that must be sent directly and announcements made via telephone. This can result in several problems, as follows: There is no decision-support system for employee recruitment, so the employee recruitment process is determined unilaterally

and directly by HRD. The process of selecting files and searching for applicant data is still slow because HRD has to look at prospective employee files one by one. The large number of applications received requires quite a while to compare prospective employees. Employee recruitment selection, which is carried out manually, has disadvantages, namely the possibility of subjectivity and incorrect calculations in the assessment. Based on the weaknesses above, the author proposes a computerized system, namely a web-based system. It is hoped that this proposed system can be used as input for companies in their employee recruitment systems. So the employee recruitment process becomes easier than before.

The proposed system is a proposal that is expected to make it easier for HRD to determine new employees who will be recruited into the company and also shorten the process of calculating the weight between applicants. An overview of the employee recruitment decision support system procedures is as follows: Applicants register an account, which can later be used to enter the system. After registering the applicant's account, enter the website. Next, applicants go to the job application menu and upload the files required by the company. The file has been uploaded to the website. Files that have been uploaded will automatically be entered into the available database. Admins can manage user data and also view data on prospective employees who apply. HRD manages the criteria and weight of applicants by looking at the requirements and criteria that have been set. The decision support system determines the ranking of prospective employees. HRD looks at the ranking results and then announces the selection results via the web. Applicants can see the announcement on the Web. In this research, the author combines the AHP and SAW decision support system methods. The AHP method is used for weighting and then continued with SAW to sort the values of the existing alternatives. The combination of the AHP and SAW methods was carried out based on several previous studies. The first stage is calculating the criteria weights using AHP. The comparison matrix created is based on the Saaty scale table. The value entered is only the comparison value in the upper triangular matrix. Then the lower triangular matrix will be filled in automatically. It can be concluded that by using the Saaty scale of importance levels between criteria, a pairwise comparison matrix can be obtained that explains the level of importance of each criterion with the other criteria. The next stage is to normalize the matrix.

In the design workshop, at this stage, the author provides a proposed system design to overcome the system problems mentioned previously. A use case diagram is a diagram that explains what the system to be designed does and who will interact with the system. Activity diagram that describes the activities that occur in the employee recruitment decision support system. In this registration activity diagram, it explains the activities of actors, namely applicants, to be able to register an account on the website. This activity begins with the system displaying the home page of the website. The actor clicks the Create new user button, and the system will display a registration page containing a registration form. Then the actor fills out the registration form. If the actor fills out the form completely and correctly, the system will display the main page, indicating that the new account has been successfully created. However, if the actor does not fill out the registration form completely and correctly, the system will display a message that the data entered by the actor is incomplete, and the actor is asked to complete the registration form again. In this login activity diagram, it explains the activities of all actors, namely applicants, HRD, and admin, to be able to enter the website system. This activity begins with the system displaying the login page. The actor fills in the ID and password according to the account they have, then clicks the login button. If the ID and password you have entered are correct, the system will display the main page according to the type of account you have. However, if the actor enters the ID or password incorrectly, the system will display a login failed message, and the actor is asked to re-enter the ID and password correctly, according to the account the actor has.

This logout activity diagram explains the activities of all actors, namely applicants, HRD and admin to be able to exit the website system. This activity begins with the actor being logged in to the system, then the actor clicks the logout button. In this manner, the system will end the session, and the actor will have left the system. In this file upload activity diagram, it explains the activities of the actor, namely applicants, to upload the files needed to apply for a job. This activity begins with the actor already in the system and clicking the apply for a job menu. The system will display an upload page containing uploaded health letters, curriculum vitae, last diploma, KTP, SKCK, and certification. The actor uploaded the files needed to apply for the job. If the uploaded data is complete, the system will save the uploaded file. However, if there is data that has not been filled in correctly, the system will display a message that the data entered is not complete, and the actor is asked to re-upload the file completely and correctly. In this job application activity diagram, it explains the activities of the actor, namely the applicant, to apply for a job at the company. This activity begins with the actor already in the system and clicking the apply for a job menu. The system will display an upload page containing uploaded health letters, curriculum vitae (CV), last diploma, KTP, SKCK, and certification. Then the actor clicks on apply for a job, the system will display a message: Do you want to register for this position ? Then the actor clicks on the list, and the system will save the data. If the actor does not click on the list, the system will return to displaying the file column.

In this manage account activity diagram, it explains the activities of the actor, namely admin, to be able to manage users on the website. This activity begins with the actor already in the system and clicking on the account

management menu. Later, actors can carry out three activities, namely adding, changing, and deleting users. In the add and change user menu, actors can fill in or change the available user levels. If the data entered by the actor is complete and correct, the system will save the data. However, if it is not complete and correct, the system will display a message that the data is incomplete, and the actor is asked to fill in the data again. Next, in the delete user menu, actors can delete users by selecting the desired user. After selecting the user to be deleted, the system will display a message indicating whether the user will be deleted or not. If the answer is yes, then the system will delete the information. However, if the answer is no, then the system will return to the menu to select the user to be deleted. This check applicant data activity diagram explains the actions taken by the actor, namely HRD, to view documents that applicants have uploaded. This activity begins with the actor having entered the system and clicking on the applicant list menu. The system will display a list of participants who have applied along with the files they have uploaded. Then, the actor downloads the files that have been uploaded and sees the documents that the participants have uploaded. In this value input activity diagram, it explains the activities of the actor, namely HRD, to provide assessments to prospective employees. This activity begins with the actor having entered the system, and then the actor opens the assessment page. The system will display a list of prospective employees who have applied, and then the actor clicks on the value input menu provided on a scale of 1 - 4. The system will save the HRD assessment.

In the view ranking activity diagram, it explains the activities of the actor, namely HRD, to be able to see the applicant ranking column and select employees who will be accepted and rejected. This activity begins with the actor already in the system and clicking the View ranking menu. The system will display a ranking column for employees who have uploaded files and who have previously been given a score, then the actor selects the number of employees who will be accepted into the company, then the actor clicks pass, and the system will save the results of the employees who have passed or been accepted. In the view graduation results activity diagram, it explains the activities of the actor, namely HRD, to be able to see employees who have been graduated and those who have been rejected on the website. This activity begins with the actor already in the system and clicking on see graduation results. After that, the system will display a list of employees who were approved and rejected. In this check selection results activity diagram, it explains the activities of the actor, namely applicants, to be able to see whether they have passed the selection or not on the website. This activity begins with the actor logging into the system and clicking on the check selection results menu. The system will display the selection results page, then the actor clicks on the selection results, and the system will display a message congratulating you for passing the selection if the applicant passes the selection, and a message apologizing that you did not pass the selection if the applicant does not pass the selection.

This sequence diagram explains the sequence of activities carried out by actors, namely applicants, to be able to register an account on the website. First, the actor clicks the register button on the login page, and the system will display a registration page containing a registration form. The actor then fills in the registration form. If the actor fills out the form completely and correctly, the system will display the main page, indicating that the new account has been successfully created. However, if the actor does not fill out the registration form completely and correctly, the system will display a message that the data entered by the actor is incomplete, and the actor is asked to complete the registration form again. This sequence diagram explains the sequence of activities carried out by actors, namely applicants, HRD, and admin, to be able to enter the employee recruitment website system. First, the actor fills in the ID and password according to the account they have on the Login page, then the actor clicks the Login button. If the ID and password you have entered are correct, the system will display the main page according to the type of account you have. However, if the actor enters the ID or password incorrectly, the system will display a login failed message, and the actor is asked to re-enter the ID and password correctly, according to the account the actor has. This sequence diagram explains the sequence of activities carried out by actors, namely applicants, HRD, and admin, to be able to enter the employee recruitment website system. First, the actor is logged in to the system, then the actor clicks the logout button on the main page. In this manner, the actor will have left the system, and the system will terminate the account session.

This sequence diagram explains the sequence of activities carried out by actors, namely applicants, to upload files to the website. First, the actor who has logged in clicks the apply for a job button. The system will display a job application page containing file upload columns. This column will later be filled in by uploading the files needed to apply for the job. After all the files have been uploaded, applicants click the upload button. If the files are correct, the system will save the files that have previously been uploaded. If there are still files that have not been uploaded, the system will display an incomplete data message. This sequence diagram explains the sequence of activities carried out by actors, namely applicants, to apply for a job at a company. First, the actor who has logged in clicks the apply for a job button. The system will display a job application page containing file upload columns, then the applicant will click the apply button, and the system will display the message "Are you sure you want to register for this position?" The applicant then clicks register, and then the system will save the command. In this manage account sequence diagram, it explains the activities of the actor, namely the administrator, to be able to add, change, and also delete users registered in the system. This activity begins with the actor having entered the system, and

then the system will display the admin page. Admins can select three available activities, namely add user, change user, and delete user.

In this sequence diagram of checking applicant data, it explains the activities of the actor, namely HRD, to be able to see the data uploaded by the applicant. This activity begins with the actor being on the main page and then clicking on the list of applicants. The system will display the applicant list page, then the actor clicks check files to see the files that have been uploaded, and then the system will display the data uploaded by the applicant. In this value input sequence diagram, it explains the activities of the actor, namely HR, to provide assessments to prospective employees. This activity begins with the actor having entered the system and clicking on the assessment menu. The child system displays the value input page. Then, the actor chooses the appropriate value from the file uploaded by the applicant after completing the assessment, and then the actor clicks save. In the sequence diagram, see this ranking list, explaining the actor's activities, namely HR, to be able to see the employee ranking column and graduate employees. This activity begins with the actor having entered the system, then the actor clicks on the ranking, then the system will display a ranking page containing prospective employees who have been previously given a score, then HRD chooses the nominal amount that will be accepted as an employee. After that, HRD clicks the pass button, and the system will save the results of graduated employees.

In the sequence diagram, see the graduation results, explaining the actor's activities, namely HRD, to be able to see the list of applicants who have been passed or rejected on the website. This activity begins with the actor already in the system and clicking on see graduation results. The system will display the graduation results page. The actor can then see which employees are accepted and which are rejected. In this sequence diagram of checking the selection results, it explains the activities of the actor, namely the applicant, to be able to see whether he has passed the selection or not on the website. This activity begins with the actor already in the system and clicking on the check selection results menu. The system will display the selection results page, and then when the applicant clicks on the selection results, the system will display a message congratulating you for passing the selection if the applicant is declared to have passed the selection, and a message apologizing that you did not pass the selection if the applicant does not pass the selection. Class diagrams describe the relationships between classes in an employee recruitment decision support system. The technique for identifying objects is to determine a list of potential objects by reviewing each use-case narrative to determine objects that might describe the list of potential objects. Class diagrams are used to describe a collection of classes. This diagram is the most commonly found in object-oriented modeling. The class diagram proposed for this employee recruitment decision support system consists of 5 tables, namely user, file, assessment, vacancy, and assessment, which are interconnected.

On the login page, you can see the company logo at the top of the page. There is also a column for entering a username in the form of a username and password. Under the column, there is a link to register and a login button. On the registration page, there is a form that applicants will fill out to be able to register themselves in the system. This form consists of several columns, including the username, name, and password columns. At the bottom, there is a link to I have an account if you already have an account. On the applicant page, at the top left of the page is the company logo, and above the company logo is the company name. There are buttons to apply for a job, check results, and log out, each of which will take you to the page of your choice. On the job application page, there is the name of the account owner. On the job application page, there are columns for health certificate, curriculum vitae (CV), latest diploma, identity card, SKCK, and certification. In this column, there is a browse button that, when clicked, will display a pop-up to upload files. Then, at the bottom of the page, there are upload and job application buttons. The upload button is useful for uploading files that have been entered, and the apply job button is useful for applying for jobs in that position.

On the main admin page, there is an account management button that, when clicked, will direct you to the user management page. On the account management page, there is a list of registered or previously registered account users; then there is a search toolbox to make it easier to find system user names; there is an add button at the top that will direct you to the add account page; and then there are edit and delete buttons next to the list of system users. On the add account page, there is a form that the admin will fill out to be able to register HR in the system. This form consists of several columns, including the username, name, password, and level columns. At the bottom, there is a save button. On the main page for HR, there are buttons for registering applicants, assessment, ranking, and also a graduation button. Each button functions to take the HR to the page you want to go to. On the applicant list page, there is a list of applicants who have previously uploaded files; there is also a check button to see what documents the applicant has uploaded; there is a value input button that, when clicked, displays a value entry column; and there is also a search feature to make it easier to search for the applicant's name.

On the value input page, which displays a list of applicants and the values input by HR, there is a search feature to make it easier to find names from the list of applicants; there is also a value input button, whose function is to provide an assessment based on the files uploaded by applicants; there is also an edit button, which functions to change or edit assessments that have been previously given; and there is also a delete button, which functions to delete applicants who have already been assessed. On the ranking page, there is a list of rankings and results of participants who have been assessed previously, and then there is a graduation column, which is used by HR to

determine how many participants will be accepted. According to HR's prior determination, the graduation page shows a list of participants who passed and did not pass. On the results check page, participants will be announced as to whether they have been accepted or not. If they are accepted, they will display a message of congratulations that you have been accepted, and if they are not accepted, they will display a message saying that they are sorry you were not accepted. Programming (coding): at this stage, all designs and user interfaces created are implemented using a programming language to become a usable system. At this stage, a trial was carried out on the employee recruitment decision support system using the black-box testing method. Testing is carried out using the system, and the output results from the processes carried out by the system are viewed. This testing is divided based on the use case that has been designed and then observing whether the system can provide the output as expected or not.

#### **4. Conclusion**

Based on the results of the discussion, the following conclusions can be drawn: This research produces an employee recruitment decision support system using a combination of the web-based AHP and Saw method with the rapid application development method and is built using the Laravel 8 framework. The employee recruitment decision support system is expected to automate the recruitment process, which can minimize subjectivity towards applicants. Decision support systems can simplify HR tasks, especially in the data verification process, because the files received are in electronic form, so they will not be scattered with other documents. For further development of this research, the author provides the following suggestions: The employee recruitment decision support system can be further developed using a combination of methods such as AHP and Topsis. Adding additional functional features to the employee recruitment decision support system, such as notifications to applicant emails, will enable the system to provide notifications if the applicant is accepted or not without having to open the web first.

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