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Designing of Electronic Employee Recruitment System Using The Analytical Hierarchy Process Method

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Abstract

A computer-based information system called the Decision Support System (DSS) generates several decision alternatives to help management cope with diverse issues in a semi-structured way. As a company engaged in marine survey services, the process of hiring new employees is important. It takes a long time to choose and decide whether to accept potential employees under the present recruitment procedure, and HRD is having trouble making decisions on accepting applicants who satisfy the requirements. Building a decision-support system for employing people is the aim of this research. The Rapid Application Development (RAD) model is the system development approach used in this study. The Unified Modelling Language (UML) is used in the system design. System coding is done using PHP and MySQL. The results of the AHP method are applicants who have the highest criterion value, meaning that they have a higher value than other applicants, so that companies can get the employees they want according to the criteria specified in the form of tables and rankings. The manager can get help from this decision-support system when making a choice.

Keywords: Decision Support System, Information System, AHP, Decision.

1. Introduction

New conditions have arisen at all levels of the social environment as a result of the modern information and communication technologies' (ICT) recent rapid development and integration into people's daily lives. The development of this technology covers several fields, including recruitment. Recruitment is important in managing human resources (HR). The purpose of recruitment itself is to get the right employee for the right position, so that the employee is able to work optimally and can stay at the company for a long time. Companies sometimes get new recruits whose performance is not as expected. Employees in the company are assets that are needed. Therefore, in accepting a new employee, the Company must be more selective in obtaining quality employees to support the company's performance. To get the employees that the company expects, it must be done right. Recruitment is carried out to meet the needs of the company as well as to obtain a qualified and professional workforce. So that if these things have been fulfilled, then the link between company goals, human resources, and performance results will be realized.

A decision support system (DSS) is a computer-based information system that generates multiple choice alternatives to aid management in solving various problems in an unstructured or semi-structured way utilising data and models. The goal of DSS is to assist decision-makers in selecting among a variety of choice options that are obtained after information has been processed using a decision-maker model. Decision-support systems can employ a variety of techniques. The Analytical Hierarchy Process (AHP) is one technique that is frequently employed. The Analytical Hierarchy Process (AHP) technique is a decision-making model that includes a number of criteria that can help the human framework in making judgements where aspects of logic, experience or knowledge, emotions, and feelings are combined into a systematic process. The AHP technique was chosen because it has the ability to resolve complicated multi-criteria problems in a hierarchy that can be graphically depicted and is simple for decision-makers to understand. If the HRD division is the offending part.

This company is a company engaged in marine survey services. This company is located in Indonesia. The procedure of employing new staff is crucial for the business because it provides marine surveying services. The problem that is often faced is that companies have difficulty determining applicants who meet the criteria. Of the many existing applicants, the number is not proportional to the applicants who will be accepted, so the HRD (Human Resources Development) division takes quite a long time to select applicants. So that it can slow down

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the recruitment process. Therefore, we need a system to facilitate or assist managers in making decisions about recruiting employees. It is hoped that using a decision support system, also known as a decision support system, will make the process of hiring potential employees more efficient by taking into account the weight values of each criterion that are in line with the company's policies when determining the series of new hires.

Based on prior investigation, this study shares similarities, specifically employing the AHP (Analytical Hierarchy Process) framework formulated by Thomas L. Saaty in the 1970s. In this decision support framework, complex multi-factor or multi-criteria dilemmas are delineated in a hierarchy. From previous investigation, it can be deduced that the utilization of the AHP (Analytical Hierarchy Process) technique can serve as a resolution for decision-making in the recruitment system of new employees as AHP aids in decision-making concerning staffing based on pre-established criteria, and the AHP evaluation procedure is more equitable and impartial in comparison to manual processes that are often prone to human errors. In contrast to previous research, in this study the authors carried out the system development stages and also the system testing stages, where in system development they used the RAD method and for system testing they used black box testing. Therefore, the authors believe that the process of recruiting new employees using the AHP method can be used as a solution to carry out the process of recruiting employees in a company because AHP supports consistent determination of priority weights, qualitative and quantitative assessments, and facilitates modelling.

2. Research Methods

Interviews, observation, literature review, and other methods of data gathering were all used in this study. The Rapid Application Development (RAD) model with Unified Model Language (UML) diagrams to depict the flow of processes and data in the system to be built is the system development approach employed in this study. The stages in the RAD method are as follows: Requirements Planning: In this stage, users and analysts meet to make plans for the system to be created and determine the goals of the application. This stage produces a general description of the company, a current system analysis, a system requirements analysis, and a proposed system analysis. RAD Design Workshop (RAD Design Workshop) At this stage, the researcher carried out a design with the tools used, namely the Unified Modelling Language (UML), and a design for calculating the weight of the criteria and alternatives, which was carried out using the AHP method with the following stages: making a system design for decision support, making use case diagrams, creating activity diagrams, creating sequence diagrams, making potential objects, making class diagrams, mapping databases, making database specifications, and designing interfaces. Implementation: At this stage, the researcher will implement the design that has been made into the programmer. Researchers will use Bootstrap to implement the interface design, use the MySQL DBMS, and design processes using the PHP programming language. After implementing these designs, the researcher will carry out tests using black box testing.

3. Results and Discussion

Based on the analysis of the system running at the company, there are several obstacles, namely that HRD has difficulty making decisions about accepting applicants and also takes quite a long time to select applicants. Therefore, the system requirements needed based on these problems include: The system is able to assist in making decisions to accept applicants. The system is able to streamline the process of selecting applicants. In the results of the current system analysis, there are still several problems, including the lack of effectiveness of HRD performance in analyzing the acceptance of new prospective employees and the ineffectiveness of time in making decisions, so the researchers tried to provide a proposed system analysis to solve the problem. Applicants register by entering applicant data on the system. When the input process is complete, the system will display the input data as confirmation, whether there was an error in filling it in or not. If there is an error, the applicant can make an edit on the system; if there is not, then the data will automatically be stored in the database. HRD no longer performs acceptance analysis manually, but the assessment process will be automatically calculated by the system based on applicant data information.

In this study, the stages for decision-making use a model of the calculation method in a decision support system, namely AHP. At this point, the researcher chooses the factors that will be weighted for selecting new staff candidates. These criteria are certificates, experience, licences, age, and medical tests. These criteria were obtained during direct interviews with HRD. If these criteria are formed into a Hierarchical structure, From the hierarchical structure, each criterion has different ratings, such as strongly supported, support, sufficiently supported, less supported, and not supported. The explanation of the assessment criteria is as follows: Certificate, experience, university, age, and medical test. The next stage is to compare the level of importance between the criteria obtained from filling out the importance table questionnaire using the current scale by HRD. When the level of significance between criteria can be determined using a scale, a pairwise comparison matrix that describes the significance of each criterion in relation to other criteria can be created. Certificates are more important when compared to age and health tests. Meanwhile, experience is more important when compared to certificates, age, and health tests.

Meanwhile, University is more important than a certificate, experience, age, or health test. A health test is more important than age.

The comparison value (value 1) is divided by the number in the certificate column (value 9,583) to yield the value 0.104 in the certificate column, the certificate row. The same is true of other values. The sum of each row is used to get the value of the total column. The number 0.682 for the first row is calculated by adding the values 0.104 + 0.048 + 0.119 + 0.2 + 0.211. The value of the priority column is calculated by dividing the value of the total column by the number of criteria. The number of criteria in this situation is 5. The priority value of the certificate, which is 0.136 times the value of the certificate comparison, which is 1, yields the value of 0.136 for the certificate comparison. The values in each of these rows are added up to produce the total column. From 0.136 + 0.062 + 0.107 + 0.178 + 0.293, 0.776 is obtained. The Random Consistency Index List, which has a predefined value with a matrix size of 5, is where the IR value is drawn from. In this case, the IR value is 1.12. The consistency ratio obtained from the calculation above is acceptable because CR is less than 0.1, and the evaluation criteria are regarded as being consistent. Strong versus weak support has more significance. More important than lack of support is support. Meanwhile, computing 1/value in the supporting column and the highly supporting column yielded the value 0.5 in the supporting column and the latter.

The previous comparison value (value 1) divided by the quantity of very supporting columns (value 1.833) yields the value of 0.545 in the very supportive column, the very supportive row. The same is true of other values. The sum of each row is used to get the value of the total column. The total of 0.545 + 0.571 + 0.500 is 1.167 for the first row. The value of the priority column is calculated by dividing the value of the total column by the number of criteria. Three requirements are present in this situation. The priority value in that row is divided by the highest value in the priority column, which is 0.539, to produce the value for the sub-criteria's priority column. The extremely supportive priority value, 0.539, is multiplied by the very supportive comparison value, 1, to get the value of 0.416 in the very supportive comparison. The values in each row of the table are added up to create the total column. The sum of the numbers 0.539 + 0.595 + 0.491 equals 1.625. The IR value is 0.58 when it is selected from a list of Random Consistency indexes whose values were calculated using a 3x3 matrix. The consistency ratio of the calculation above is acceptable since CR < 0.1, and the sub-criteria evaluation is regarded as consistent. Strong versus weak support has more significance. More important than lack of support is support. Less supportive is more critical than adequate support, while adequate support is more critical than none at all. The very supportive column is supported by the row's value of 0.5. The very supportive row is supported by the outcome of computing 1/value in the column.

The comparison value (value 1) divided by the quantity of experience columns (value 2.28) yields the value of 0.438 for the extremely supportive column and row. The same is true of other values. The sum of each row is used to get the value of the total column. The value of 2.081 for the first row is calculated by adding together 0.438 + 0.490 + 0.439 + 0.381 + 0.333. By dividing the value in the total column by the number of criteria, the value in the priority column is calculated. The number of criteria in this situation is 5. The priority value in that row is divided by the highest value in the priority column, which is 0.416, to produce the value for the sub-criteria's priority column. The significance of 0.416 in the highly favorable comparison is derived from the highly favorable priority value of 4.13, which is 0.416 multiplied by the highly favorable comparison value, namely 1. The overall column in the table is obtained by summing up the values in each row in the table. The significance of 2.129 is derived from the sum of 0.416 + 0.524 + 0.483 + 0.394 + 0.312. When the IR value is taken from a list of Random Consistency indexes whose values have been determined with a matrix size of 5, the IR value is 1.12. Because CR <0.1, the consistency ratio of the calculation is acceptable, and the sub-criteria assessment is considered consistent. Being highly favorable is more important than being supportive. Support is more important than absence of support. While the value 0.5 in the row supports the highly favorable column, the result of calculating the 1/value in the column supports the highly favorable row.

The value 0.545 in the extremely supportive column, the extremely supportive row, is derived from the value (value 1) divided by the number of extremely supportive columns (value 1.833). Similarly with other values. The value of the total column is derived from the sum of each row. For the first row, the value 1.167 is the sum of 0.545 + 0.571 + 0.500. The priority column value is derived from the value in the total column divided by the number of criteria. In this case, the number of criteria is 3. The value in the priority column of the sub-criteria is derived from the priority value in that row divided by the highest value in the priority column, which is 0.539. The value of 0.416 in the extremely supportive comparison is derived from the extremely supportive priority value, which is 0.539, multiplied by the extremely supportive comparison value, which is 1. The sum column in the table is obtained by adding together the values in each row in the table. The value of 1.625 is obtained from the total of 0.539 + 0.595 + 0.491. Where the IR value is taken from a list of random consistency indices whose values have been determined with a matrix size of 3, the IR value is 0.58. Because CR < 0.1, the consistency ratio of the calculation above is acceptable, and the sub-criteria assessment is considered consistent. Strong backing is more important than weak backing. Backing is more important than lack of backing. Less supportive is more important than enough backing, and enough backing is more important than not supporting. The value of 0.5 in the row that supports the highly supportive column is the result of calculating 1/value in the column that supports the highly supportive row.

The comparison value (value 1) divided by the quantity of experience columns (value 2.28) yields the value of 0.438 for the extremely supportive column and row. The same is true of other values. The sum of each row is used to get the value of the total column. The value of 2.081 for the first row is calculated by adding together 0.438 + 0.490 + 0.439 + 0.381 + 0.333. By dividing the value in the total column by the number of criteria, the value in the priority column is calculated. The number of criteria in this situation is 5. The priority value in that row is divided by the highest value in the priority column, which is 0.416, to produce the value for the sub-criteria's priority column. The extremely supportive priority value, which is 0.416 times the very supportive comparison value, which is 1, yields the value of 0.416 for the very supportive comparison. The values in each row of the table are added up to create the total column in the above table. The total of 0.416 + 0.524 + 0.483 + 0.394 + 0.312 yields the number 2.129. The IR value is 1.12 when it is selected from a list of random consistency indices whose values were calculated with a matrix size of 5. The consistency ratio of the calculation above is acceptable because CR is less than 0.1, and the sub-criteria assessment is regarded as consistent. Strong backing is more crucial than no backing. Calculating 1/the value in the column does not support, but the row is extremely supportive yields the value of 0.5 in the row, which does not support, but the column is very supportive.

The value of 0.667 in the column is very supportive; the row does not support the value obtained from the comparison in the previous table (value 1) divided by the number of health test columns (value 1.5). Likewise with other values. The sum of each row is used to get the value of the total column. The first row's value of 1.333 is calculated by adding together the values of 0.667 and 0.667. By dividing the value in the total column by the number of criteria, the value in the priority column is calculated. The number of criteria in this situation is 2. The priority value in that row is divided by the highest value in the priority column, which is 0.667, to produce the value for the sub-criteria's priority column. The extremely supportive priority, which is 0.667 times the very supportive comparison value, which is 1, yields the value of 0.667 for the very supportive comparison. The sum of the values in each row of the table is used to create a dipole in the total column above. The product of the numbers 0.667 and 0.667 yields the number 1.333. The IR value is zero when the random consistency index list used to calculate the value has a matrix size of two. The consistency ratio calculated above is acceptable since CR < 0.1, and the sub-criteria assessment is regarded as consistent as a result.

The value of the grand applicant candidate for the certificate, which is the sub-criteria value of 0.552 multiplied by the criterion value of 0.136, and so on, is used to calculate the value of 0.075 in the column for the grand row certificate. The sum of each row is used to get the total column in the table above. This sum serves as the benchmark for judging an applicant's likelihood of approval. The likelihood that the candidate will be accepted increases with value. Before making a class diagram, the writer first does a potential object analysis. At this stage, an analysis of any potential objects contained in the use case diagrams that have been made previously is carried out to be included in the class diagram. After getting a list of potential objects, the next step is to create a class diagram. Making class diagrams by forming system classes based on a list of potential objects with added attributes, operations, and relationships between these classes. At this coding stage, the researcher coded to build an electronic employee recruitment system (E-Recruitment) using the main programming language, namely PHP with the Laravel 8.0 framework, a MySQL database to store data, and PHP My Admin to manage databases. At this stage, trials were carried out on the electronic employee recruitment system (E-Recruitment) using the black-box testing method. Testing is carried out using the system and looking at the output results from the processes carried out by the system. This test is divided based on the use cases that have been designed and then observes whether the system can provide the expected output or not.

4. Conclusion

The decision support system that has been built can help HRD make decisions about accepting new prospective employees because it can solve complex multi-criteria problems in a hierarchy that can be understood by HRD. The system can make the process of selecting prospective employees faster because HRD does not need to search for applicant document files one by one to assess the completeness of applicant data at the selection stage. With this employee recruitment decision support system, it can minimize errors in determining employees who are eligible for work by making a decision based on scientific calculations using the AHP method. The results of the AHP method are applicants who have the highest criterion value, meaning that they have a higher value than other applicants, so that companies can get the employees they want according to the criteria specified in the form of tables and rankings. This decision support system can be further developed by adding criteria or sub-criteria parameters so as to strengthen the results of decision-making. For further research, you can try other methods such as MCDM, TOPSIS, and SAW so that you can compare the results of several methods.

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