Web-Based Recruitment Selection Application Development with Analytical Hierarchy Process (AHP) Method

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Abstract. This research aimed to design and develop a support system to determine the selection of recruitment, especially assistant for the Integrated ICT Laboratory at Budi Luhur University according to predetermined criteria. The method used in developing the application was the Analytical Hierarchy Process (AHP) method, which was to rank decision alternatives and accept the excellence one for several criterion cases that mixes qualitative and quantitative components in the whole assessment of available alternatives. The results showed that there were 6 (six) criteria in the selection of the Integrated ICT Laboratory Assistant, including Attendance Value, Competency Value, Project Value, Hardware Value, Interview Value, and Psychological Test Value, which were in accordance with the criteria in the Integrated ICT Laboratory at Budi Luhur University. The system can speed up the process of accepting assistants, because the calculation process, as well as printing the final score are in one system, according to the terms and criteria specified, making it more effective and efficient.

1. Introduction
Currently, Information and Communication Technology has experienced progress, which is very rapid and has entered all fields. Technology cannot be separated from almost all aspects of human activity. With the use of such information technology, humans, being able to get information, are able to make an agency, both public and private, able to process data more effectively and efficiently compared to the manual method. For an agency the use of computers is an advantage. The information system was created with the aim of making it easier for an agency to process and store data so that it can provide accurate and precise information. That way, an accurate and precise information system can make an agency’s performance more efficient because it can reduce unwanted errors.

The Integrated Information and Communication Technology Laboratory (Lab ICT) is a computer laboratory used to support practicum courses at Budi Luhur University, such as teaching and learning activities, Mid-Semester Examinations, and Final Semester Examinations for practicum courses. Each activity is supervised by at least one assistant. Assistants are students who help the ICT Lab
operations. Before becoming an assistant, students who register to become assistants will undergo a training period of approximately six months and are referred to as prospective assistants. During the training period, prospective assistants will be assessed on the basis of craftsmanship, neatness, given projects, and so on. The project is given based on the existing business processes in the Integrated ICT Lab, such as creating systems and servers.

So far, the process of measuring the value of the assistant candidates is made manually by the Integrated ICT Lab supervisor and that is why this process can take long time. In order to make the process of calculating the value of prospective assistants easier and faster, on this basis it is needed to design a Decision Support System to assess prospective assistants who are eligible to be appointed as assistants using the Analytical Hierarchy Process (AHP) method. The AHP method brings benefit of being able to consider both qualitative and quantitative assessments.

2. Theoretical review

2.1. Information System

A system consists of various elements that complement each other in achieving goals and objectives. The elements that are enclosed in the system are termed subsystems, which should be linked each other and be involved through appropriate communications in order to enable the effectiveness and efficiency of the system [1]. The Information means the data which is operated into a form and can be utilized by everyone who desires it. Data as a plural form of datum is classified as a source of information that has a function as a presenter of events that actually happened [2].

Furthermore, Iswandy states that the information system is a structured series that is used to support various activities that are useful in daily life such as to support official operational activities in institutions and provide information that is certainly very useful for users. In addition, this information system is defined as a collection of several parts of a complex element that are intertwined with one another and cannot be separated. These elements can greatly assist an institution in terms of processing the data needed to support operational activities. After the data processing process is complete, this system will distribute the data and store the information so that it allows users to still be able to access the data at any time if they need it. In short it can be said that the design of an information system is carried out to assist users in facilitating their work where this system can provide a detailed description and complete design so that it can make it easier for programmers or computer experts to process the data they need. [1].

2.2. Decision Support System

Before the concept of decision support or what is usually abbreviated as DSS is famous as it is today, this system was first developed by Michael S. Scott Morton in the 1970s [3]. At that time Morton did not use the term DSS but rather the term management decision system which aims to assist users in organizing and making decisions within the scope of management in various institutions. The background of the emergence of this concept was at that time the management system had difficulty in solving unstructured problems. Furthermore, Moore and Chang characterize this system as a system that has the ability to process data accurately, can make it easier for users to make decisions, is sustainable and very reliable to use when users experience doubts in making decisions [4].

As the name implies, this decision support system certainly functions in terms of providing support to the party in charge of an institution or organization in making a decision, especially if the related parties above are trapped in an unfavorable situation, namely when the party does not have a standard and structured reference. However, this decision support system can only be used as an alternative decision provider, because the final decision will be returned to the decision maker such as company leaders, supervisors and others. In other words, it can be said that the results achieved by this decision support system need to be reviewed again by the responsible parties so that the decisions taken can be more reliable. As it is known that everyone wants to produce the best decision and with the support of
calculation results based on DSS, the decision-making process will be more systematic and consistent and especially not subjective [5].

According to Wira et al [6], the stages carried out in the Decision Support System process are as follows:
1. Problem Definition.
2. Collection of relevant data or information elements.
3. Processing data into information in the form of reports graphics and writing.
4. Find alternative solutions.

The components of the Decision Support System as shown in Figure 1 consist of [7]:
1. Data management is one part of the DSS that was developed with the aim of carrying out data organizing tasks, starting from providing all the data needed in an organizational system to the data storage stage. The place to store data in this system is called the Database Management System (DBMS). The purpose of storing data in this DBMS is to make it easier for users to access data again and extract the data in a very short time.
2. The Management Model is a component that helps users in managing the financial system of a particular organization or institution. In addition, this model can also be used in terms of statistical management or various models in the form of numbers.
3. Communication or user dialogue subsystem is a system that allows users to interact. In this case the user has access to control the DSS where they can design the interface.
4. Knowledge management is an optional part of the system developed in order to provide support to other parts of the system.

![Figure 1. The component of the Decision Support System [7]](image)

2.3. Analytical Hierarchy Process (AHP)
The Analytical Hierarchy Process (AHP) method is a system developed by a mathematician named by Dr. Thomas L. Satty [8]. This system is designed to assist users in providing a scale for various indicators. Usually, an organization has difficulty in determining the priority scale in making decisions, especially when they are faced with a number of unstructured components. One example is when you have to give weight to each component that is a criterion in decision making. With the help of this AHP, it is certain that the process of determining the weight of each component will be more structured, systematic and reliable [5].

The analysis system with AHP is very possible to be used in solving problems that can be measured by numbers, namely problems related to assessment. Usually these problems are related to statements of attitudes or opinions in the form of words, but the level of high or low or good and bad can be measured by giving a weighting scale [9].
3. Application Design

3.1. Screen Design
In making an application, layer design is a very important thing. The layer design must be easy to understand, so that admins feel comfortable using the application of the Analytical Hierarchy Process (AHP) Algorithm Implementation to determine the selection of labor recruitment.

3.1.1. Login Form Screen Design. Figure 2 is a screen design of the Login Form for admins to login. Users who want to enter the AHP Algorithm Implementation application must enter the correct username and password in the textfield provided on the Login Form in this application. If the username and password are correct, the user will enter the main menu which can access the menu in the application.

3.1.2. Main Menu Screen Design. Figure 3 is the layer design of the admin main menu. The main admin menu can access the master data menu, transaction data analysis and reports. For the main admin sub menu, the admin can access the master data sub menu which includes: Value Data, Criteria Data, Alternative Data, User Data for the Data Analysis Transaction sub menu which consists of Criteria Analysis, Alternative Analysis, Revenue Results and reports and Logout for the profile menu is at the top right of the user's photo. In order to access the menus and sub menus in the main admin menu, the admin must first log in.

3.1.3. Value Data Master Form Screen Design. Figure 4 displays the Value Master Data Form for paired value comparisons. The Value Data Master Form consists of nine scales, the modal button is
added to add data, the modal button is to change to change the data, and the modal button is to delete to delete the data.

![Analytical Hierarchy Process (AHP) Screen Design](image1.png)

**Figure 4. Value Data Master Form Screen Design**

3.1.4. **Criteria Master Data Form Screen Design.** Figure 5 displays the Criteria Master Data Form to determine the weight value in the criteria master data form. In the Criteria Master Data Form there is a modal add data button to add criteria data, a mod button modal to change the data in the Criteria Master Data, and a delete button to delete data in the Criteria Master Data.

![Analytical Hierarchy Process (AHP) Screen Design](image2.png)

**Figure 5. Criteria Master Data Form Screen Design**

3.1.5. **Report Form Screen Design.** The design of the Report Form layer can be seen in Figure 6 below.
Criteria report screen design will print criteria data, namely criteria code, criteria name and criteria weights. Figure 7 shows the Draft Criteria Report:

Figure 7. Criteria report screen design

Figure 8 shows the decision result report that will print Presence Value, Competency Value, Project Value, Hardware Value, Interview Value, Psychological test score on each alternative, total score and decision description.

Figure 8. The Decision Result Report Screen Design

4. Implementation
4.1. Program Implementation
So that the application implementation of the Analytical Hierarchy Process algorithm (AHP). Can run well, the specifications used for implementation of this application must also support. The following specifications can support this system, including:

4.1.1. Hardware. Hardware used for implementation of this application is as follows: a. Processor AMD E1-6010 1.4Ghz b. RAM / Memory 10 GB c. Laptops d. 500GB Hard Drive.

4.1.2. Software. Software used for implementation of this application is as follows: a. Microsoft Windows 7 Operating System b. MySQL c. PHP 7.2.12 d. Xampp e. Google Chrome f. Notepad++.

4.2. Screen Display
In this section, we describe the application screen display for the implementation of the Analytical Hierarchy Process (AHP) algorithm from the first run to completion. The following will provide an explanation of each display in the application implementation of the Analytical Hierarchy Process (AHP) algorithm.

4.2.1. Login Form Screen Display. Before being able to access the Main Menu, the User is required to fill in their username and password. Display the login form as shown in Figure 9. If an error occurs when filling out the login form, the application will display an error message as shown in Figure 10 and if the username is no longer active, the application will display a message as shown in Figure 11 and if it is successfully logged in it will display a message as shown in Figure 12 then go to the Main Menu.

4.2.2. Value Data Master Screen Display. Figure 13 displays Master Data Value Data for paired value comparison. The Value Data Master Form has nine scales, there is a modal add button to add data, a
delete data button to delete the value data you want to delete, there is modal button change to change data.

Figure 13. Value Data Master Screen Display

4.2.3. Report Screen Display. Figure 14 displays two report options, including: Criteria Report and Decision Result Report.

Figure 14. Report Screen Display

The results of the Criteria Report will print criteria data containing the Criteria Code, Criterion Name and Criteria Weight as shown in Figure 15 below.

Figure 15. Criteria Report Screen Display
The results of the Decision Result Report will print the final score data on each alternative and a decision statement for the acceptance of alternatives or prospective assistants. Figure 16 is the result of the display of the Decision Result Report.

![Figure 16. Decision Result Report Display](image)

4.2.4. Profile Form Screen Display. Figure 17 displays the Profile Form in which there is a profile that is useful for knowing the User Profile who is in control of the system. And in it there is a Username, User Name, Position, and Password. Then there is a change profile button which is used to change the user profile.

![Figure 17. Profile Form Screen Display](image)

5. Conclusion and Suggestion

5.1. Conclusion
There are several conclusions which can be taken in accordance with the research objectives, including:

- There are six criteria in the selection of the Integrated ICT Laboratory Assistant at Budi Luhur University, they were Attendance Value, Competency Value, Project Value, Hardware Value, Interview Value, and Psychological Test Value, which are in accordance with the criteria in the Integrated ICT Laboratory of Budi Luhur University. The system can speed up the process of accepting assistants, because the calculation processes, as well as printing the final score are in one system, according to the terms and criteria specified, making it more effective and efficient.
This system produces a report on the value of the Analytical Hierarchy Process (AHP) which has the final score for the assistant candidate along with a statement of acceptance, so that it can assist the selection team for the Integrated ICT Laboratory of Budi Luhur University in the decision-making process. The final result of the Implementation of the Analytical Hierarchy Process (AHP) Application is only to assist decision makers in accepting alternatives from many existing alternatives, so that the assessment becomes faster with accurate data. However, the final decision is still determined by the decision maker.

5.2. Suggestion

For the sake of the conclusions above, the authors provide suggestions that are considered useful in the future, including:

- This application can be developed in line with the development of system user needs so as to improve system performance.
- This application can be developed by comparison using the Simple Additive Weighting (SAW) or Weighted Product (WP) method so that the accuracy of the data can be seen.
- Further development of the system is to build a more user-friendly system by taking into account the aspects of interaction and computers.

6. References

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