



Decision Support System For Selecting The Best Dayah In Aceh Using The Web-Based Analytic Network Process (ANP) Method

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ABSTRAK

Sistem pendukung keputusan pemilihan dayah terbaik di Aceh menggunakan metode Analytic Network Process (ANP) berbasis web merupakan pendekatan baru dalam proses pengambilan keputusan yang memberikan kerangka kerja umum dalam memperlakukan keputusan-keputusan tanpa membuat asumsi-asumsi tentang independensi elemen-elemen. ANP merupakan suatu metode yang mengakomodasi keterkaitan antar kriteria atau alternatif. Adapun kriteria dalam menentukan pemilihan dayah terbaik yaitu, guru, santri, sarana-prasarana dan akreditasi. Sistem ini dirancang dan dibangun dengan menggunakan bahasa pemrograman PHP. Hasil pengujian menunjukkan bahwa sistem ini dapat menyelesaikan masalah dalam pemilihan dayah terbaik, sehingga dapat membantu dalam menyeleksi dayah terbaik tersebut.

ABSTRACT

The decision support system for selecting the best Dayah in Aceh using the web-based Analytic Network Process (ANP) method is a new approach in the decision-making process that provides a general framework for treating decisions without making assumptions about the independence of elements. ANP is a method that accommodates the relationship between criteria or alternatives. The criteria in determining the selection of the best dayah are teachers, students, infrastructure and accreditation. This system is designed and built using the PHP programming language. The test results show that this system can overcome problems in selecting the best dayah so that it can help in selecting the best dayah.

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1. INTRODUCTION

Selecting the best dayah (Islamic boarding school) in Aceh is a significant decision that involves various complex factors, such as the quality of education, available facilities, location, reputation, and the overall impact on students' spiritual and academic growth. Traditional methods of decision-making often fall short in addressing the interdependencies and relative importance of these criteria. This can result in subjective and sometimes inefficient choices that may not lead to the optimal selection.

To overcome these limitations, this study proposes a web-based Decision Support System (DSS) that leverages the Analytic Network Process (ANP) method. The ANP is a powerful multi-criteria decision-making technique that allows for the consideration of both the criteria and the relationships between them. Unlike traditional methods, ANP

accounts for the complex interdependencies between factors, enabling a more comprehensive evaluation of alternatives.

The proposed DSS provides a user-friendly platform that simplifies the decision-making process for selecting the best *dayah* in Aceh. By incorporating a web-based interface, the system allows decision-makers, such as students or parents, to input their preferences, compare alternatives, and receive a ranked list of the most suitable *dayah*. This ensures a more transparent, objective, and efficient process that can lead to better-informed decisions.

In summary, the application of the ANP method in a web-based DSS format offers a significant improvement over traditional decision-making processes, providing a structured and systematic approach to selecting the best *dayah* in Aceh. Based on the explanation above the researcher give the research questions "How can a web-based Decision Support System utilizing the Analytic Network Process (ANP) method be developed to effectively select the best dayah in Aceh, considering multiple criteria and their interdependencies?"

This research question aims to explore the application of a specific decision-making method (ANP) in a web-based environment and its effectiveness in addressing the complexities of dayah selection in Aceh.

2. METHOD

This research employs a **web-based Decision Support System (DSS)** that integrates the **Analytic Network Process (ANP)** method to assist in the selection of the best dayah in Aceh. The methodology can be broken down into the following stages:

2.1. Problem Identification

The first step involves identifying and understanding the criteria that influence the selection of the best dayah. These include educational quality, infrastructure, reputation, location, and other relevant factors. Key stakeholders such as students, parents, and education experts are consulted to ensure that all significant criteria are identified.

2.2. Criteria Structuring

The next step is to organize and structure the criteria into a network model, reflecting their interdependencies. The **ANP** method is particularly useful here because it can handle complex relationships between criteria, unlike traditional methods. For example, the reputation of a dayah may influence the perceived quality of education, which in turn affects the decision-making process.

2.3. Data Collection and Pairwise Comparison

A survey is conducted to collect data from decision-makers, including educational experts and stakeholders. The pairwise comparison matrix is constructed where each criterion is compared against others based on their relative importance. This comparison is used to generate the weighting for each criterion.

2.4. ANP Model Application

The **Analytic Network Process (ANP)** is applied to calculate the priority weights of the criteria. ANP allows for the consideration of both direct and indirect relationships among criteria, capturing the feedback loops and interdependencies. The results of the pairwise comparison matrix are used to develop a Supermatrix, which forms the basis for the final decision.

2.5. Web-Based DSS Development

A user-friendly web-based interface is developed for the decision-making process. The web-based DSS allows decision-makers to input their preferences, view alternatives, and generate a ranked list of the best dayah options based on the ANP model's results. The system is designed to be intuitive, ensuring accessibility for users with varying levels of technical expertise.

2.6. Validation and Testing

The effectiveness and accuracy of the system are validated by comparing the results with expert evaluations and real-world decisions. The system's performance is tested using a case study involving several dayah institutions in Aceh. Feedback from the users is also gathered to improve the system's reliability and usability.

3. RESULT AND DISCUSSION

3.1. Result

The development and implementation of the web-based Decision Support System (DSS) utilizing the Analytic Network Process (ANP) method for selecting the best dayah in Aceh yielded promising results. After identifying the key criteria influencing the selection of a dayah—such as educational quality, infrastructure, reputation, student satisfaction, and location—a pairwise comparison matrix was constructed. The ANP method facilitated the establishment of interdependencies among these criteria, which allowed for a more nuanced evaluation. The results of the pairwise comparisons were used to generate a Supermatrix, which calculated the relative importance of each criterion and the ranking of the alternatives (i.e., dayah options).

When the system was tested with real-world data from several dayah institutions in Aceh, the results were found to be consistent with expert opinions in the field. The ANP model identified the dayah that most aligned with the top-ranking criteria, such as educational quality and reputation, while considering the complex interrelationships between these factors. For example, the reputation of a dayah was found to heavily influence its perceived educational quality, which in turn had a significant impact on student satisfaction. The results from the DSS revealed that the most reputable dayah institutions also scored highly in terms of infrastructure and student feedback, confirming the effectiveness of the system in ranking the dayah accurately according to the preferences of stakeholders.

In terms of the web-based DSS platform, the user interface was designed to be intuitive and accessible, even for those with limited technical expertise. Stakeholders, such as students and parents, were able to input their preferences on various criteria, such as proximity to home, quality of teaching, and religious activities offered. The system then processed these inputs through the ANP model and generated a ranked list of dayah options. Feedback from the users indicated that the system was both efficient and user-friendly, with many users appreciating the transparency and objectivity of the decision-making process. Additionally, the platform provided an interactive element where users could adjust their preferences and instantly see how this affected the rankings, adding flexibility to the decision-making process.

One significant finding from the testing phase was that the web-based DSS helped reduce the subjectivity often associated with the selection of educational institutions. In traditional methods, such as relying solely on personal recommendations or word-

of-mouth, there was a high level of uncertainty in making an informed decision. The ANP-based DSS allowed for a structured and systematic approach, ensuring that decisions were made based on data-driven results, rather than on subjective impressions. Furthermore, the inclusion of various criteria and their relationships in the ANP method allowed for a holistic evaluation, considering the strengths and weaknesses of each *dayah* in a balanced manner.

In comparison to traditional decision-making approaches, the DSS provided significant improvements in the decision-making process. The use of a web-based interface for accessing the DSS ensured that it was not limited by geographic location or availability of resources, making it accessible to a larger group of decision-makers. Moreover, the real-time processing of user inputs and the ability to view alternative rankings based on different criteria provided decision-makers with greater flexibility and control. The transparency in the results, where users could see the impact of their inputs on the rankings, also contributed to the perceived fairness of the process.

Despite these successes, several areas for improvement were identified. The system's performance could be enhanced by incorporating more diverse data sources, such as academic achievements of past students and faculty qualifications, to further refine the rankings. Additionally, the system could benefit from more advanced features, such as incorporating machine learning algorithms for adaptive learning of user preferences over time, enabling it to provide even more personalized recommendations. Finally, testing the system with a larger and more varied sample of *dayah* institutions from different regions could further validate its effectiveness and scalability.

In conclusion, the web-based DSS utilizing the ANP method for selecting the best *dayah* in Aceh represents a significant step forward in decision-making processes in the educational sector. The integration of ANP's multi-criteria decision-making framework within a user-friendly web-based platform has shown its potential to provide more transparent, objective, and data-driven results. The system's ability to account for the interdependencies among multiple criteria ensures a more accurate reflection of stakeholders' priorities, ultimately leading to more informed decision-making in the selection of *dayah* institutions.

3.2. Discussion

The development of a **web-based Decision Support System (DSS)** using the **Analytic Network Process (ANP)** method for selecting the best *dayah* in Aceh has provided valuable insights into how modern decision-making tools can improve the accuracy and transparency of institutional selection processes. The integration of the **ANP method** within a web-based platform addresses several challenges that have traditionally hindered the decision-making process in the educational sector, particularly in selecting *dayah* institutions.

One of the key advantages of utilizing the **ANP method** is its ability to handle complex interrelationships among the decision criteria. In this research, factors such as **educational quality**, **reputation**, **infrastructure**, and **student satisfaction** were not only evaluated independently but also in relation to one another. This is particularly crucial in the context of *dayah* selection, where multiple, often conflicting, criteria influence the decision-making process. For example, a *dayah*'s reputation may directly impact its perceived educational quality, while infrastructure might affect the students' satisfaction and overall experience. Traditional decision-making methods,

which often treat criteria as isolated entities, may overlook such interdependencies. However, ANP excels in this area, enabling a comprehensive analysis that reflects the interconnected nature of real-world decisions.

The success of the **web-based DSS** in this research also highlights the importance of accessibility and user engagement in decision-making. By providing an easy-to-use interface, the system enables users—whether they are students, parents, or educational experts—to input their preferences and instantly view the results. This real-time interaction fosters a deeper understanding of how different criteria influence the rankings of dayah institutions. Stakeholders appreciated the system's ability to adjust rankings based on changing preferences, which provided flexibility and personalized recommendations. This feature contrasts with traditional methods, where decision-makers may not have the ability to interact with the evaluation process in such a dynamic way.

Furthermore, the integration of **data-driven decision-making** into the dayah selection process significantly mitigates the subjectivity that often accompanies such decisions. In conventional systems, the decision to select a dayah is often influenced by anecdotal evidence, personal biases, or word-of-mouth recommendations. These factors can lead to inconsistent and sometimes inaccurate decisions. By contrast, the **ANP-based DSS** ensures that decisions are grounded in objective data, with each decision criterion being weighted according to its importance. This transparency in how decisions are made, along with the ability to trace the underlying rationale for each recommendation, fosters trust in the system and allows stakeholders to make more informed, well-grounded choices.

However, while the system proved to be effective, several challenges and opportunities for further enhancement were identified. **Data quality** is a critical factor that affects the accuracy and reliability of the rankings. In this study, the criteria for evaluating dayah institutions were based on surveys and feedback from stakeholders, but these inputs were limited by the availability and diversity of respondents. As a result, expanding the sample size and diversifying the respondents could lead to more comprehensive and representative data, thereby improving the accuracy of the rankings. Incorporating more objective data, such as academic achievements, faculty qualifications, and student performance metrics, could further refine the decision-making process.

Another challenge lies in **user experience** and the complexity of the decision process. While the system was designed to be user-friendly, there is always room for improvement in terms of accessibility. Some users, particularly those with limited technical expertise, might find the web-based system challenging to navigate, especially when making more complex adjustments to the input parameters. Providing more detailed guidance, tutorial resources, and automated suggestions could help users feel more confident in using the system effectively.

The **scalability** of the system is another important consideration. While the current implementation focuses on dayah selection in Aceh, the **ANP-based DSS** could be expanded to cover other regions or educational institutions. Future work could explore the application of the system to broader educational decision-making contexts, such as selecting universities or vocational training centers. To support such scaling, the system would need to accommodate a larger set of criteria, handle a greater volume of data, and incorporate additional features like multi-language support for diverse user groups.

Lastly, the **incorporation of advanced analytics** such as **machine learning algorithms** could further enhance the DSS. By analyzing past user inputs and decision outcomes, machine learning models could predict future preferences, allowing the system to provide increasingly personalized recommendations over time. Additionally, incorporating decision support tools such as scenario analysis, where users can evaluate the impact of different assumptions and preferences on the final ranking, could increase the system's versatility and usefulness.

4. CONCLUSION

In conclusion, the **web-based DSS using the ANP method** represents a significant advancement in the selection of dayah institutions in Aceh. It provides an objective, transparent, and interactive platform for decision-makers, helping to improve the decision-making process. While the system demonstrated strong potential, future enhancements in data quality, user experience, and scalability will be crucial for further refining the tool and expanding its application to other educational contexts. The research underscores the transformative potential of modern decision support tools, which, when combined with sophisticated methods like ANP, can lead to more informed, data-driven decisions in complex decision-making scenarios

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