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Development of a Web-Based AHP Decision Support System for Foster Child Character Evaluation

Pengembangan Sistem Pendukung Keputusan Berbasis Web dengan Metode AHP untuk Evaluasi Karakter Anak Asuh

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A B S T R A C T

In an era of rapidly developing technology - especially among the millennial generation - the need for a fast yet simple and practical system has increased significantly. The Indonesian Independent Golden Generation Foundation, a social institution in Bekasi, has been facing challenges in managing data and determining the character of foster children which is being done manually and without a proper structure. This research aims to develop an application to determine the character of foster childrens using the Analytical Hierarchy Process (AHP) method. This application is designed to overcome problems of efficiency and accuracy in data management and to determine the character of foster childrens. The AHP method is used to break down complex problems into a hierarchically arranged components, using weighted comparisons for decision making. The research results show that this application can simplify the performance of the foundation administrators, speed up the process of determining the character of a foster children more objectively, and reduce subjectivity in decision making. There is criterias considered that includes honesty, independence, respect, creativity and discipline. This application is expected to be able to provide an effective solution for foundations in managing foster child data efficiently and accurately.

Keyword: Character Determination, Foster Child, AHP Method

A B S T R A K

In era teknologi yang berkembang pesat – terutama di kalangan generasi milenial – kebutuhan akan sistem yang cepat namun sederhana dan praktis semakin meningkat secara signifikan. Yayasan Generasi Emas Mandiri Indonesia, sebuah lembaga sosial di Bekasi, menghadapi tantangan dalam pengelolaan data dan penentuan karakter anak asuh yang dilakukan secara manual dan tanpa struktur yang baik. Penelitian ini bertujuan untuk mengembangkan aplikasi penentuan karakter anak asuh dengan menggunakan metode Analytical Hierarchy Process (AHP). Aplikasi ini dirancang untuk mengatasi permasalahan efisiensi dan akurasi pengelolaan data serta menentukan karakter anak asuh. Metode AHP digunakan untuk memecah permasalahan yang kompleks menjadi komponen-komponen yang tersusun secara hierarkis, dengan menggunakan perbandingan berbobot untuk pengambilan keputusan. Hasil penelitian menunjukkan bahwa aplikasi ini dapat mempermudah kinerja pengurus yayasan, mempercepat proses penentuan karakter anak asuh secara lebih obyektif, dan mengurangi subjektivitas dalam pengambilan keputusan. Ada kriteria yang dipertimbangkan antara lain kejujuran, kemandirian, rasa hormat, kreativitas dan disiplin. Aplikasi ini diharapkan mampu memberikan solusi efektif bagi yayasan dalam mengelola data anak asuh secara efisien dan akurat.

Kata Kunci: Penentuan Karakter, Anak Asuh, Metode AHP

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1. INTRODUCTION

In the era of rapidly advancing technology, many social service institutions continue to face challenges in managing data efficiently and objectively. Yayasan Generasi Emas Mandiri Indonesia, located in Bekasi, still relies on manual processes to record foster child data and assess their character. As a non-profit organization that supports orphans and underprivileged youth, the foundation requires an integrated and efficient system to address increasing data volume and minimize subjective bias in decision-making.

In the context of system development, "design" is defined as the process of creating a new system or application that previously did not exist within an organization [1]. An "application" refers to a subclass of software that directly utilizes computing capabilities to perform user-specific tasks such as processing, storing, and retrieving data [2].

The concept of "character" is closely tied to one's personality and includes elements such as attitude, traits, temperament, and moral values [3]. Meanwhile, a “child” is defined as an individual from the moment of conception until the end of adolescence [4]. In this study, character assessment refers to the evaluation of these traits in foster children, which are crucial for monitoring their growth, discipline, and social development.

To support structured decision-making in this context, this study applies the Analytical Hierarchy Process (AHP), a multi-criteria decision-making method developed by Thomas L. Saaty. AHP works by decomposing complex decision problems into hierarchical components, assigning priority values based on pairwise comparisons, and checking for consistency in the decision-maker’s judgments [5], [6].

Previous studies have successfully implemented AHP in web-based applications, including employee performance evaluation systems [7] and decision support systems for student admission [8]. These applications proved effective in generating objective ranking results and improving decision speed and reliability.

Additionally, recent research highlights the growing integration of AHP into decision support systems (DSS) across sectors, including finance, education, sustainability, and logistics. Qatawneh [9] demonstrated the impact of AHP-DSS integration in the banking sector, while Petrillo et al. [10] provided a comprehensive review of the method’s benefits and limitations. Other studies applied AHP to problems such as sustainable material selection [11], smartphone recommendation [12], award assessment [13], secure group decision-making [14], and public transportation evaluation [15].

Building on these theoretical and empirical foundations, this study aims to design and implement a Web-Based AHP Decision Support System to assess the character of foster children. The system is expected to streamline data processing, improve the transparency of assessments, and enable more structured and evidence-based decision-making at the foundation.

2. METHODOLOGY

This research uses the Analytical Hierarchy Process (AHP) method as the main approach to support decision making. AHP is a decision support model developed by Thomas L. Saaty, which breaks down complex multi-criteria problems into a hierarchical structure. According to Saaty (1993), a hierarchy is defined as a representation of a complex problem in a multi-level structure, where the first level is the goal, followed by levels of criteria, sub-criteria, and finally alternatives [16]. By organizing decision components hierarchically, AHP allows problems to be structured systematically and analyzed logically using weighted comparisons.

The development of the foster child character assessment application follows the following stages:

1. **Problem Definition and Goal Setting**

   The research begins by identifying the main issue: the foundation's need for an objective and efficient method to assess foster children’s character. The primary goal defined is to determine the most appropriate character traits of each child based on defined criteria.

2. **Hierarchy Structuring**

   The hierarchical structure consists of:
   - Goal: Foster child character evaluation
   - Criteria: Honesty, independence, respect, creativity, and discipline
   - Alternatives: Individual foster children whose characters are to be assessed

3. **Pairwise Comparison and Weight Calculation**

   The weighting of each criterion is carried out using pairwise comparisons based on Saaty's 1–9 scale. The calculations include determining eigenvectors and performing a consistency ratio (CR) check to ensure the comparisons are logically consistent ($CR \leq 0.1$).

4. Application Development

A web-based application was built to process the AHP calculations. The system includes interfaces for entering criteria, alternatives, and comparison values. It also displays the pairwise comparison matrices and the final ranking results. The application was developed using PHP (Laravel) and MySQL.

5. Data Collection

Input data were collected from experts within the foundation, such as counselors and senior staff, who contributed their assessments during the pairwise comparison process to evaluate the importance of each criterion.

6. System Testing and Evaluation

The application was tested using black-box testing to ensure the functionality of each module. Usability testing was also conducted with the foundation staff to assess ease of use, clarity, and performance. The system generates a final report containing the ranking of foster children based on character scores derived from the AHP method.

This methodology ensures that the developed application not only automates the decision-making process but also improves the accuracy, consistency, and objectivity of foster child character evaluations.

3. RESULTS AND DISCUSSION

The developed web-based application applies the Analytical Hierarchy Process (AHP) to support foster child character assessment at Yayasan Generasi Emas Mandiri Indonesia. The system processes expert input on character criteria and individual foster children to generate a final ranking based on calculated priority scores.

1. System Use Case

The functionality of the application is defined in a use case diagram that illustrates the interaction between users (administrators) and the system.

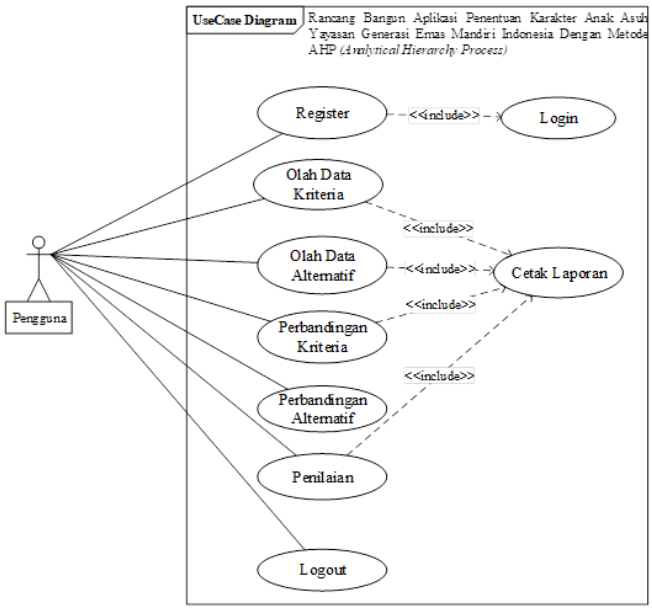

Figure 1. Usecase Diagram

This diagram shows that administrators can access modules to manage criteria, alternatives, perform pairwise comparisons, and generate ranking results.

2. Input of Pairwise Comparisons

The system allows users to input pairwise comparisons among the predefined criteria using Saaty's 1–9 scale.

Figure 2. Comparison Criteria Page View

This interface simplifies the process for foundation staff to enter expert judgments regarding which character traits are more important.

3. AHP Calculation and Matrix Display

After input, the system automatically calculates the relative weight of each criterion using eigenvector methods and provides the consistency ratio (CR).

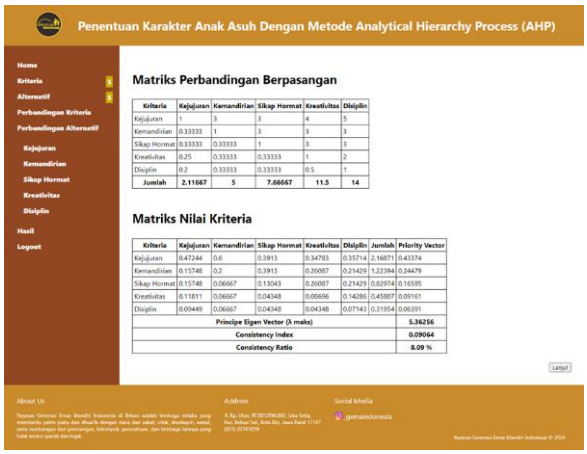

Figure 3. Comparison Criteria Matrix Page View

All CR values in the trials were below 0.1, indicating acceptable consistency in pairwise judgments.

4. Comparison of Alternatives

Each foster child is compared under every criterion, and the resulting matrices are displayed for transparency.

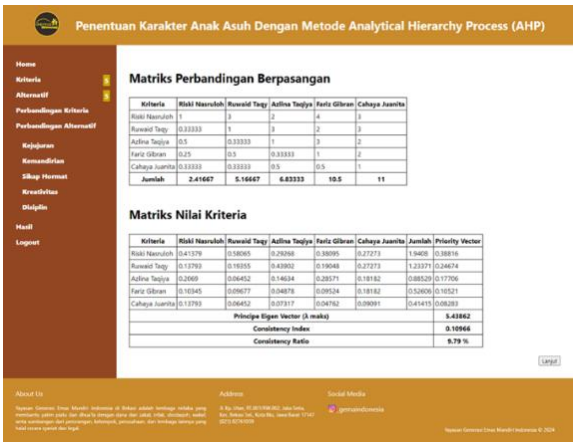

Figure 4. Alternative Comparison Matrix Page View

These comparisons allow the system to assess how strongly each child exhibits each character trait.

5. Ranking Results Output

After the comparisons are completed, the system synthesizes the scores into a final ranking.

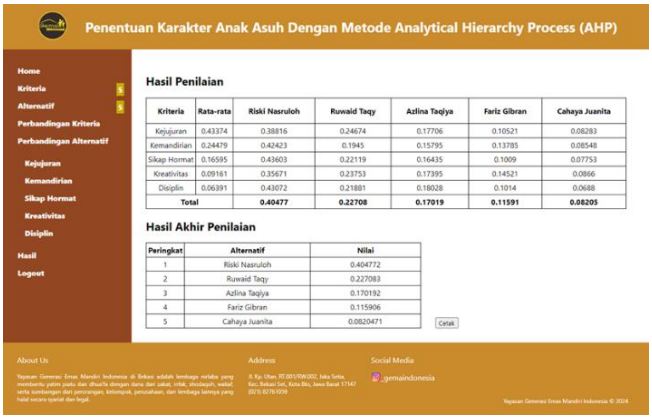

Figure 5. Results Page View

This output helps the foundation identify which children score highest across the criteria. The result is automatically stored and can be exported for reporting or internal documentation.

This study confirms that AHP-based decision support systems can significantly improve decision-making accuracy in nonprofit and social service contexts. The findings are consistent with those of Yunita et al. [7], who developed a web-based AHP system for employee performance evaluation. Similarly, Susilowati and Faisal [8] demonstrated that AHP reduced human error in student selection and produced consistent ranking outputs.

In the present study, the application successfully transformed subjective assessments into structured numerical values. This enabled the foundation to evaluate foster children using five character criteria: honesty, independence, respect, creativity, and discipline. These results support the theoretical strength of AHP in solving complex multi-criteria decision problems through hierarchical decomposition and logical prioritization [5], [10].

Compared to traditional manual assessments, the system offered greater efficiency and reduced the influence of personal bias. This outcome is aligned with the work of Bhuiyan and Hammad [6], who found that AHP-based systems improved decision-making in construction planning through hybrid modeling. Additionally, system usability testing showed that foundation staff found the application accessible and intuitive, reflecting good practice in user-centered system design as emphasized by Setyawan and Munari [2] and supported by recent DSS usability evaluations [9].

This research contributes to the academic discourse by extending the application of AHP to character assessment in the foster care context. Previous studies have primarily applied AHP in technical domains such as smartphone selection [12] and award evaluations [13]. The current implementation illustrates that AHP can also be adapted to qualitative and human-centered areas of decision-making, particularly in the social services sector.

Despite its benefits, the system has limitations. The accuracy of the final rankings depends heavily on expert judgments in the pairwise comparison process, which can be subjective. Future system development may consider incorporating Fuzzy AHP or group-based aggregation methods to enhance reliability, as recommended by Kułakowski et al. [14]. Furthermore, expanding the evaluation model to include indicators such as academic achievement or behavioral development could improve the comprehensiveness of the character assessment, consistent with approaches applied in public sector service analysis [15].

4. CONCLUSION

Based on the description and discussion above, it can be concluded that the development of a special system or application for determining the character of foster children is needed to support accurate and systematic decision making. Implementation of the Analytical Hierarchy Process (AHP) method can replace manual processes and predictions, resulting in a more objective and reliable character assessment. This technology-based application can overcome the challenges of increasing the number of foster children by handling big data and accelerating the evaluation of children's character. Clear and standardized assessment criteria and a centralized data integration system will facilitate the assessment, storage, and access of foster children's character information efficiently, facilitating the evaluation and monitoring of children's development more accurately.

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