

Applying Analytical Hierarchy Process in a Decision Support System for Study Program Recommendation

Aldyth Najma Rova Marthin¹, Mahardika Inra Takaendengan^{2*}, Marline Sofiana Paendong³

^{1,2}Information System, Universitas Sam Ratulangi, Indonesia

³Mathematics, Universitas Sam Ratulangi, Indonesia

¹aldythmarthin106@student.unsrat.ac.id, ^{2*}mahardika@unsrat.ac.id ,

³marlinepaendong@unsrat.ac.id

Abstract: Choosing a study program is a critical academic decision yet many students still face uncertainty because they must compare interests, academic readiness, technology-related preferences, and career prospects without a structured decision model. This condition can lead to unsuitable program choices and reduce confidence in academic planning. This study designs, implements, and evaluates a web-based Decision Support System for study program recommendation using the Analytical Hierarchy Process. The model uses four criteria: interest and talent, technology-related hobby, academic score, and job prospects. Teacher criteria data were collected before web implementation, while student alternative data were collected after the system was implemented. Teacher matrices were screened using the Consistency Ratio requirement, and the valid matrix produced criteria weights of 0.436 for interest and talent, 0.320 for job prospects, 0.192 for technology-related hobby, and 0.053 for academic score. The system was developed with Python and Flask, then evaluated using Black Box Testing and User Acceptance Testing. The main scenario produced Informatics Engineering as the first recommendation with a score of 0.4880 or 49 percent. Across 24 post-implementation student responses, Informatics Engineering was also the most frequent top recommendation. However, only 16 of 96 student alternative matrices met the CR threshold, which indicates the need for automatic consistency validation. Black Box Testing confirmed that all tested core functions worked as expected, and UAT produced an acceptance percentage of 81 percent. These results show that the system can provide systematic and usable recommendation support for study program selection.

Keywords: Decision Support System; Analytical Hierarchy Process; Study Program Recommendation; Web-Based System; User Acceptance Testing;

1. INTRODUCTION

Choosing a study program is a strategic decision for students who plan to continue their education at university. This decision affects academic performance, skill formation, learning motivation, and career direction. Higher education has a direct role in forming skilled and competitive graduates, while wrong program selection can create academic and psychological pressure [1], [2], [3].

Previous research shows that this problem is not only theoretical. Diana et al. reported that around 30 percent of 1,283 students felt they had chosen the wrong major, which indicates that study program selection remains a real academic problem among university

students [2]. This phenomenon shows that students need decision support before entering higher education, especially when they must align personal interest, academic ability, and career expectations in one decision [2].

Students often face uncertainty when choosing a study program. This uncertainty appears because students have limited information about program characteristics, career prospects, and the match between personal interests and academic ability. External factors, such as family expectations and peer influence, can also affect the decision. As a result, students may choose a program that does not reflect their interests, talents, or career goals [2], [3].

Study program selection is a multi-criteria decision problem. Students must consider several factors at the same time, including interest and talent, technology-related hobby, academic score, and job prospects. Without a structured model, the decision may rely on assumptions or short-term preference. This condition reduces objectivity and makes the selection process difficult to evaluate.

A Decision Support System can address this problem by organizing data, applying a decision model, and presenting alternatives in ranked form. A DSS supports semi-structured decisions by combining data, models, and user judgment [15], [16]. In this study, the system does not replace student judgment. It provides a rational reference that students can use before making a final decision.

The Analytical Hierarchy Process supports this purpose because it breaks a complex decision into a hierarchy of goal, criteria, and alternatives. AHP also provides a consistency test to verify whether pairwise comparisons remain logically acceptable [13], [14]. Previous studies have applied DSS and AHP in education, employee selection, tourism recommendation, and data validation [4], [5], [6], [7]. These studies show that AHP can transform subjective preference into structured priority weights.

This study addresses the need for a recommendation system that combines student-related criteria, university program alternatives, web implementation, and user acceptance evaluation. It also uses supplementary teacher and student data to clarify the position of AHP inputs. Teacher criteria data were collected before web implementation, while student alternative data were collected after the AHP model was implemented into the web system.

This study asks two research questions. First, how can a web-based Decision Support System support students in selecting a study program based on relevant criteria? Second, how can AHP be integrated into the system to produce structured and consistent recommendations? This study aims to design, implement, and evaluate an AHP-based DSS that supports systematic and objective study program recommendation.

2. RESEARCH METHODOLOGY

This study used a quantitative descriptive approach with system development. The quantitative approach processed numerical pairwise comparison data through AHP. The descriptive approach explained the model structure, calculation procedure, system flow, and evaluation process. Two supplementary datasets were used. Teacher criteria data were collected before the AHP model was implemented into the web system. Student alternative data were collected after implementation to evaluate recommendation output and response consistency.

Research Design

The study followed seven stages: problem identification, literature review, data collection, AHP model design, web system development, system testing, and result analysis. This sequence connects the decision model with the implemented system.



Figure 1. Research Stages

Figure 1 illustrates the full research flow from problem identification to result analysis. This sequence shows that the study was not limited to system development, but also included decision model construction, data collection, implementation, and evaluation. The flow ensures that the AHP model and the web-based system were developed through a connected and traceable research process.

Research Criteria and Alternatives

The criteria represented the main factors that students consider when choosing a study program. The alternatives represented the study programs included in the decision model.

Table 1. Research Criteria

Code	Criterion	Description
C1	Interest and Talent	Measures student preference and personal ability related to a study program
C2	Technology-related Hobby	Measures student interest in technology-related activities
C3	Academic Score	Measures academic readiness for a study program
C4	Job Prospects	Measures career opportunity consideration

Table 2. Study Program Alternatives

Code	Alternative
A1	Information Systems
A2	Mathematics
A3	Informatics Engineering
A4	Electrical Engineering

The AHP structure consisted of three levels. The first level was the goal. The second level was the criteria. The third level was the alternatives.

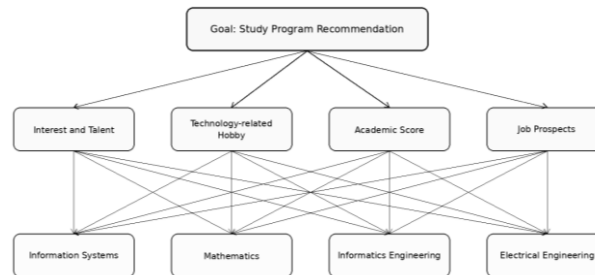


Figure 2. AHP Decision Hierarchy

Figure 2 presents the AHP hierarchy used in the study. The hierarchy places the study program recommendation as the main goal, followed by four decision criteria and four study program alternatives. This structure clarifies how the decision problem was decomposed into measurable elements before pairwise comparison was conducted.

Supplementary Data Source

Two supplementary datasets were used to clarify how AHP inputs were obtained. The teacher dataset was collected before web implementation and was used to determine criteria weights. The student dataset was collected after web implementation and was used

to evaluate alternative comparison output from actual system use. This separation is important because criteria weighting represents expert judgment, while alternative weighting represents user judgment after the system was available.

Table 3. Supplementary Data Position

Dataset	Timing	Main role	Use
Teacher criteria data	Before web implementation	Expert criteria comparison	Screened using CR and used to define criteria weights
Student alternative data	After web implementation	Student alternative comparison	Used to examine recommendation distribution, score averages, CR quality, and ranking reliability

Data Collection Technique

Data were collected using questionnaires. The questionnaire used pairwise comparison questions. Respondents compared one element with another element based on the Saaty scale. The criteria comparison was used to define the importance of each criterion. The alternative comparison was used to assess study program alternatives under each criterion. The input values then became the basis for the AHP calculation.

Table 4. Saaty Pairwise Comparison Scale

Intensity	Definition
1	Equally important
3	Slightly more important
5	Strongly more important
7	Very strongly more important
9	Extremely more important
2, 4, 6, 8	Intermediate values between two adjacent judgments
Reciprocal	If element i has one value against element j, then element j has the reciprocal value against element i

The number of pairwise comparisons was calculated using Formula 1.

$$\text{Number of Comparisons} = \frac{n(n-1)}{2} \quad (1)$$

Where:

n = Number of compared elements

Because this study used four criteria, the number of criteria comparisons was:

$$\frac{4(4-1)}{2} = \frac{12}{2} = 6$$

AHP Calculation Procedure

The AHP calculation followed six main steps: constructing the pairwise comparison matrix, filling reciprocal values, normalizing the matrix, calculating priority weights, testing consistency, and ranking alternatives.

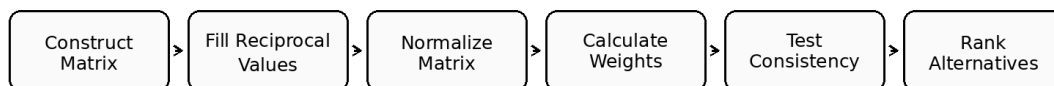


Figure 3. AHP Workflow

Figure 3 shows the calculation flow of the AHP method. The process starts from pairwise comparison, continues with reciprocal value formation, matrix normalization, priority weight calculation, consistency testing, and final ranking. This workflow explains how

subjective judgments from respondents were transformed into structured recommendation scores.

Pairwise Comparison Matrix

A pairwise comparison matrix was used to compare each element against the other elements. The diagonal value was always 1 because each element had the same importance as itself.

Table 5. Pairwise Comparison Matrix

Criteria	C1	C2	C3	C4
C1	1	a_{12}	a_{13}	a_{14}
C2	a_{21}	1	a_{23}	a_{24}
C3	a_{31}	a_{32}	1	a_{34}
C4	a_{41}	a_{42}	a_{43}	1

The reciprocal value was calculated using Formula 2

$$a_{ji} = \frac{1}{a_{ij}} \quad (2)$$

a_{ji} = reciprocal value

a_{ij} = initial comparison value

This rule keeps the matrix consistent in structure. When one criterion is more important than another criterion, the opposite comparison uses the inverse value.

Matrix Normalization

Normalization changed the comparison values into proportional values. Each element was divided by the total value of its column.

$$X_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad (3)$$

Where:

X_{ij} = normalized value in row i and column j

a_{ij} = original comparison value in row i and column j

$\sum_{i=1}^n a_{ij}$ = total value in column j

n = number of compared elements

This step ensured that all values used the same scale before priority weights were calculated.

Priority Weight Calculation

After normalization, the priority weight was calculated by averaging each row in the normalized matrix.

$$W_i = \frac{\sum_{j=1}^n X_{ij}}{n} \quad (4)$$

W_i = priority weight for element i

X_{ij} = normalized value in row i and column j

n = number of compared elements

The priority weight showed the relative importance of each criterion or alternative.

Consistency Test

AHP requires a consistency test to check whether the comparison values are logically acceptable. The test used lambda maximum, Consistency Index, and Consistency Ratio. Lambda maximum was calculated using Formula 5.

$$\lambda_{\max} = \sum_{i=1}^n (C_i \times W_i) \quad (5)$$

Where:

λ_{\max} = maximum eigen value

C_i = total value of column i

W_i = priority weight for element i

The Consistency Index was calculated using Formula 6.

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad (6)$$

Where:

CI = Consistency Index

λ_{\max} = maximum eigen value

n = number of compared elements

$$CR = \frac{CI}{RI} \quad (7)$$

Where:

CR = Consistency Ratio

CI = Consistency Index

RI = Random Index

Table 6. Random Index Standard

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

A matrix is consistent when the CR value is less than or equal to 0.10. If the CR value is higher than 0.10, the comparison should be reviewed.

Final Ranking Calculation

The final ranking was calculated by multiplying each criterion weight by the local weight of each alternative. The multiplication results were then summed to produce the final preference score.

$$V_i = \sum_{j=1}^n (W_j \times S_{ij}) \quad (8)$$

Where:

V_i =final preference score for alternative i

W_j =priority weight of criterion j

S_{ij} =local weight of alternative i under criterion j

n =number of criteria

The alternative with the highest final score became the main study program recommendation.

System Development Procedure

The system was developed as a web-based application using Python and Flask. HTML was used to structure the pages, while CSS was used to design the interface. The system contained four main pages.

Table 7. System Interface Components

Page	Function
Landing Page	Introduces the system and provides access to the questionnaire
Biodata Page	Collects user identity and initial study program interest
Compare Page	Collects pairwise comparison input from users
Result Page	Displays the final study program recommendation

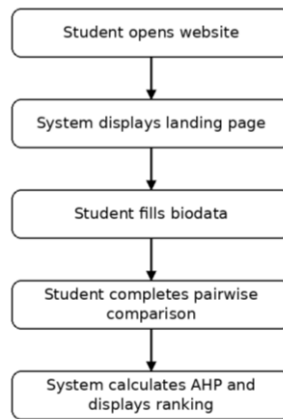


Figure 4. System Activity Flow

Figure 4 describes the user activity flow in the web-based Decision Support System. The process begins when the student accesses the system, fills in biodata, completes the pairwise comparison form, and receives the recommendation result. This flow shows how the AHP calculation was integrated into the system interface so users could obtain recommendations without manual computation.

System Testing Method

This study used Black Box Testing and User Acceptance Testing. Black Box Testing evaluated system functionality. The test checked whether each feature produced the expected output. The tested features included page access, navigation buttons, guide pop-up, biodata validation, questionnaire processing, result display, reset button, and return-to-home button. User Acceptance Testing measured user acceptance after respondents used the system. The test used a Likert scale from 1 to 5.

Table 8. Likert Scale for User Acceptance Testing

Score	Category
1	Strongly Disagree
2	Disagree
3	Fairly Agree
4	Agree
5	Strongly Agree

The UAT percentage was calculated using Formula 9.

$$UAT\% = \frac{\text{Mean Score}}{\text{Maximum Likert Score}} \times 100\% \quad (9)$$

This testing method was used to evaluate whether the system was functional, understandable, and useful for students in the study program selection process.

3. RESULT AND DISCUSSIONS

This section reports the AHP calculation, teacher data screening, consistency test, final recommendation, system implementation, Black Box Testing, User Acceptance Testing, and supplementary student data validation. The findings show whether the method and system achieved the research aim, while also identifying limits that must be corrected in future implementation.

AHP Criteria Weighting Result

The pairwise comparison matrix was constructed from teacher criteria judgments collected before web implementation. The supplementary teacher file contained 13 criteria comparison sheets. Because AHP requires logical consistency, the matrices were screened before the final criteria weights were used in the system. One teacher matrix met the CR threshold and became the criteria-weight basis for the web implementation.

Table 9. Teacher criteria data consistency

Component	Result
Teacher criteria matrices analyzed	13
Matrices with CR ≤ 0.10	1
Matrices with CR > 0.10	12
Selected criteria matrix CR	0.076

Table 10. Criteria Pairwise Comparison Matrix

Criterion	Interest and Talent	Technology-related Hobby	Academic Score	Job Prospects
Interest and Talent	1	2	7	2
Technology-related Hobby	0.500	1	5	0.333
Academic Score	0.143	0.200	1	0.200
Job Prospects	0.500	3	5	1

The matrix used reciprocal comparison. If one criterion was rated higher than another criterion, the opposite comparison used the inverse value using Formula (1). After the matrix was formed, each value was normalized using the column total using Formula (2). The priority weight was calculated from the average value of each normalized row using formula (3) and resulted as below.

Table 11. Criteria Priority Weights

Criterion	Weight	Percentage	Rank
Interest and Talent	0.436	43.6%	1
Job Prospects	0.320	32.0%	2
Technology Hobby	0.192	19.2%	3
Academic Score	0.053	5.3%	4

The result shows that **interest and talent** became the most influential criterion, with a weight of 0.436. This means the recommendation model gave the highest priority to the student's personal suitability. **Job prospects** ranked second with a weight of 0.320. **Technology hobby** ranked third with 0.192. **Academic score** had the lowest weight, with 0.053. This result is logical for a study program recommendation system. A student's

interest and talent should have strong influence because study program choice affects long-term academic motivation. Job prospects also remain important because students often consider employment opportunities after graduation.

AHP Consistency Test Result

The consistency test verified whether the criteria comparison matrix was logically acceptable. The lambda maximum was calculated using Formula (5)

$$\lambda_{\max} = (2.143 \times 0.436) + (6.2 \times 0.192) + (18 \times 0.053) + (3.533 \times 0.320) = 4.203$$

The Consistency Index was calculated using Formula (6)

$$CI = \frac{4.203 - 4}{4 - 1} = 0.068$$

The Consistency Ratio was calculated using Formula (7) while the $n = 4$, the $RI = 0.90$

$$CR = \frac{0.068}{0.90} = 0.076$$

Table 12. Consistency Test Result

Component	Value
Number of criteria	4
Lambda maximum	4.203
Consistency Index	0.068
Random Index	0.90
Consistency Ratio	0.076
Threshold	0.10
Status	Consistent

The CR value was 0.076. This value is below 0.10. Therefore, the criteria comparison matrix was consistent. The priority weights were valid and could be used in the final ranking process.

Final Study Program Ranking Result

After the criteria weights were obtained, the system calculated the final score for each alternative. The final score was calculated by multiplying each criterion weight by the local weight of the alternative under that criterion using Formula (8).

$$V_{IS} = (0.436 \times 0.21) + (0.192 \times 0.26) + (0.053 \times 0.29) + (0.320 \times 0.26) = 0.2385$$

$$V_{MATH} = (0.436 \times 0.07) + (0.192 \times 0.09) + (0.053 \times 0.08) + (0.320 \times 0.06) = 0.0736$$

$$V_{EE} = (0.436 \times 0.15) + (0.192 \times 0.17) + (0.053 \times 0.18) + (0.320 \times 0.29) = 0.1999$$

$$V_{IE} = (0.436 \times 0.57) + (0.192 \times 0.48) + (0.053 \times 0.46) + (0.320 \times 0.38) = 0.4880$$

Table 13. Final Ranking Result

Rank	Study Program	Final Score	Percentage
1	Informatics Engineering	0.4880	49%
2	Information Systems	0.2385	24%
3	Electrical Engineering	0.1999	20%
4	Mathematics	0.0736	7%

The ranking result shows that **Informatics Engineering** became the main recommendation, with a final score of 0.4880 or 49%. **Information Systems** ranked second with 0.2385 or 24%. **Electrical Engineering** ranked third with 0.1999 or 20%. **Mathematics** ranked fourth with 0.0736 or 7%.

This result shows how AHP converts subjective comparisons into measurable ranking output. The ranking also reflects the influence of the highest criteria weights. Since interest and talent had the highest weight, alternatives that scored strongly on that criterion received a stronger final score.

System Implementation Result

The AHP model was implemented into a web-based system. The system used Python and Flask for backend processing. HTML and CSS were used to build the user interface. The source thesis describes four main pages: Landing Page, Biodata Page, Compare Page, and Result Page

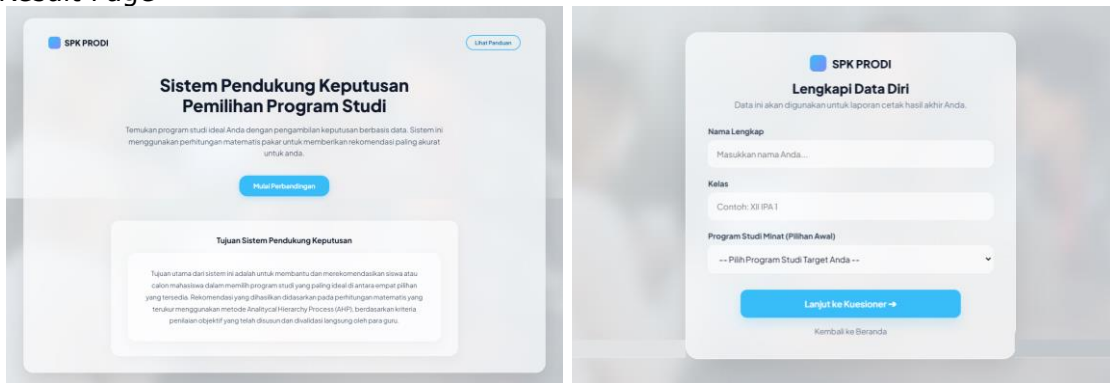


Figure 5. Landing Page and Biodata Page

Figure 5 displays the initial interface of the system. The landing page introduces the purpose of the application, while the biodata page collects user identity and initial study program interest. These pages support the first interaction between the user and the system before the AHP comparison process begins.

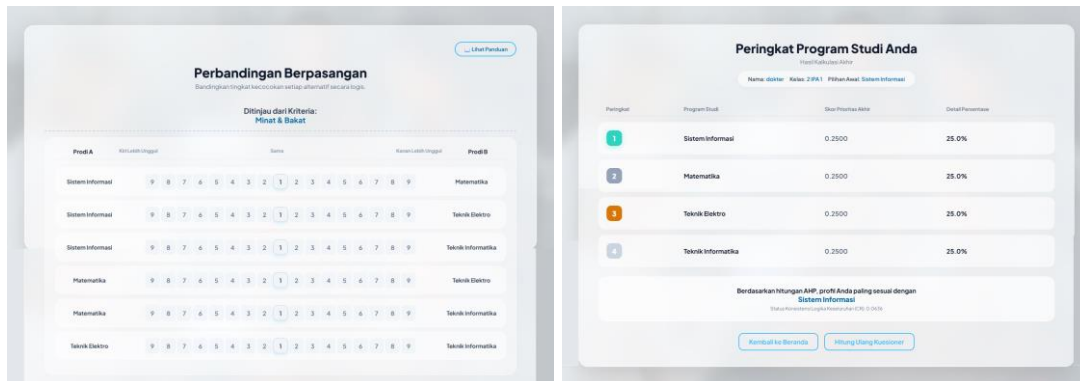


Figure 6. Pairwise Comparison and Ranking Result

Figure 6 shows the main decision interaction and output display. The pairwise comparison page allows users to compare study program alternatives based on each criterion, while the result page presents the final ranking and percentage score. This figure demonstrates that the system can process user input into a clear recommendation output through the AHP calculation pipeline.

Blackbox Testing Result

Black Box Testing was used to evaluate system functionality. The test focused on whether each feature produced the expected output.

Table 14. Blackbox Testing Result

No.	Tested Feature	Expected Result	Status
1	Main page access	System displays the homepage correctly	Successful
2	Start button	System moves to the biodata page	Successful
3	Guide button	System displays the AHP scale guide pop-up	Successful
4	Empty biodata form	System rejects incomplete input	Successful
5	Correct biodata form	System moves to the questionnaire page	Successful
6	Left or right scale input	System processes selected comparison values	Successful
7	Equal value input	System processes equal comparison values	Successful
8	Student data display	System displays user data on the result page	Successful
9	Ranking order	System sorts alternatives from highest to lowest score	Successful
10	Reset button	System clears previous input and returns to questionnaire	Successful
11	Home button	System returns to the homepage	Successful

All tested features were successful. This means the system met its functional requirements. The system could receive input, validate forms, process AHP calculation, display recommendations, reset the questionnaire, and navigate between pages.

User Acceptance Testing Result

User Acceptance Testing measured user perception after using the system. The test used a Likert scale from 1 to 5.

Table 15. UAT Scale

Score	Category
1	Strongly Disagree
2	Disagree
3	Fairly Agree
4	Agree
5	Strongly Agree

The UAT involved 24 respondents. The questionnaire measured relevance, confidence, usefulness, interface clarity, ease of questionnaire use, and usefulness of the guide feature.

Table 16. UAT Result

No.	Statement Indicator	Mean	Percentage
1	Recommendation relevance to user profile	3.87	77%
2	Confidence from displayed compatibility percentage	3.79	75%
3	Helpfulness in reducing confusion	4.04	80%
4	Interface clarity and comfort	4.25	85%
5	Ease of questionnaire input	4.08	81%
6	Usefulness of guide feature	4.37	87%

The overall mean was calculated using:

$$\text{Overall Mean} = \frac{3.87 + 3.79 + 4.04 + 4.25 + 4.08 + 4.37}{6} = 4.07$$

The overall percentage was calculated using:

$$\text{Overall Percentage} = \frac{4.07}{5} \times 100\% = 81\%$$

Table 17. Overall UAT Result

Component	Value
Number of respondents	24
Number of indicators	6
Maximum Likert score	5
Overall mean	4.07
Overall percentage	81%
Acceptance status	Accepted

The highest score was found in the guide feature, with 87%. This means users considered the guide useful for understanding how to fill in the comparison scale. The lowest score was found in the confidence indicator, with 75%. This result indicates that users could understand the recommendation output, but some of them were not fully confident in the displayed compatibility percentage. The lower confidence score may occur because the percentage result does not yet include a simple explanation of how the score was produced from pairwise comparison, criteria weights, and consistency testing. Users may accept the system interface, but they still need clearer interpretation before trusting the recommendation as a decision reference. Therefore, future interface development should add a short explanation beside the result percentage, such as the dominant criteria, the meaning of the score, and the consistency status of the comparison. Overall, the UAT result shows that users accepted the system. The score of 81% indicates that the system was understandable, useful, and suitable as a decision-support tool for study program selection.

Table 18. Post-implementation student recommendation distribution

Study Program	Top Recommendation Count	Share	Mean Final Score
Informatics Engineering	10	41.7%	0.3145
Mathematics	9	37.5%	0.2570
Electrical Engineering	3	12.5%	0.2303
Information Systems	2	8.3%	0.1887

Based on final scores, Informatics Engineering was the most frequent top recommendation across the 24 student responses. Mathematics followed closely. This result shows that the system output varied across users and should not be reduced to a single universal ranking.

Table 19. Consistency of student alternative matrices

Alternative Matrix	Consistent Matrices	Total Matrices	Share
Interest and Talent	7	24	29.2%
Technology-related Hobby	2	24	8.3%
Academic Score	4	24	16.7%
Job Prospects	3	24	12.5%
Total	16	96	16.7%

The student consistency result reveals the main methodological weakness of the current implementation. No student response had all four alternative matrices fully consistent. Therefore, the current system is valid as a working AHP-based recommendation prototype, but future implementation must block or revise inconsistent inputs before final ranking is displayed.

Discussion

The results show that AHP can support study program recommendation in a structured way. The method converts user and expert judgments into measurable values. The pairwise comparison matrix helps users compare criteria and alternatives step by step. The priority weight calculation shows which criteria influence the recommendation most

strongly. The consistency test strengthens the reliability of the method. The CR value of 0.076 proves that the criteria comparison was consistent because it was below 0.10. This result means the matrix can be used as a valid basis for ranking. The final ranking result shows that Informatics Engineering became the first recommendation. This output was not produced by a single criterion. It was produced by combining all criteria weights and alternative weights. Therefore, the recommendation reflects a multi-criteria decision process.

The system implementation also proves that AHP can be applied in a web-based environment. Students only need to fill in the comparison form. The system then performs the calculation automatically and displays the result. This design reduces manual calculation effort and makes the decision model easier to use. Black Box Testing showed that all core functions worked successfully. This confirms that the system met functional requirements. UAT results also showed strong user acceptance. The overall percentage of 81% indicates that students found the system helpful and understandable. These findings support the main objective of the study. The web-based Decision Support System can help students choose a study program in a more systematic and objective way. It can also support schools or guidance counsellors by providing a structured recommendation tool for academic direction.

4. CONCLUSION

This study confirms that the Analytical Hierarchy Process can be integrated into a web-based Decision Support System to support study program recommendation in a structured and measurable way. The system answers the research problem by guiding students from data input, pairwise comparison, automated AHP calculation, to ranked recommendation output. The criteria weighting and consistency test show that the selected expert judgment was valid for use in the recommendation model, while Black Box Testing and User Acceptance Testing show that the system worked properly and was accepted by users. The findings also show that the system can help students evaluate study program alternatives more systematically, although user judgment consistency remains a limitation in the current implementation. Future work should add automatic Consistency Ratio validation, require users to revise inconsistent comparisons, generate ranking directly from final scores, involve more respondents from different schools, and expand the number of study program alternatives.

5. REFERENCES

- [1] I. L. Kusuma and M. W. Dewi, "Sosialisasi pentingnya pendidikan tinggi bagi lulusan SMU sederajat (SMAN 2 Karanganyar)," *BUDIMAS: Jurnal Pengabdian Masyarakat*, vol. 3, no. 2, pp. 222-226, 2021, doi: 10.29040/budimas.v3i2.2437.
- [2] D. Diana, I. Guntur, A. Roebianto, and C. Christy, "Choosing the wrong major: What is the profile of students who feel they have chosen the wrong major?," *Jurnal Psikologi Pendidikan dan Konseling*, vol. 9, no. 2, p. 77, 2023, doi: 10.26858/jppk.v9i2.45753.
- [3] R. H. Sprague Jr., "A framework for the development of decision support systems," *MIS Quarterly*, vol. 4, no. 4, pp. 1-26, 1980, doi: 10.2307/248957.
- [4] J. P. Shim, M. Warkentin, J. F. Courtney, D. J. Power, R. Sharda, and C. Carlsson, "Past, present, and future of decision support technology," *Decision Support Systems*, vol. 33, no. 2, pp. 111-126, 2002, doi: 10.1016/S0167-9236(01)00139-7.
- [5] T. L. Saaty, "How to make a decision: The analytic hierarchy process," *European Journal of Operational Research*, vol. 48, no. 1, pp. 9-26, 1990, doi: 10.1016/0377-2217(90)90057-I.

- [6] O. S. Vaidya and S. Kumar, "Analytic hierarchy process: An overview of applications," *European Journal of Operational Research*, vol. 169, no. 1, pp. 1-29, 2006, doi: 10.1016/j.ejor.2004.04.028.
- [7] R. Fatullah, H. Hasanah, and D. Rizky, "Sistem pendukung keputusan pemilihan jurusan kuliah dengan metode Analytical Hierarchy Process (AHP) berbasis web pada SMAN 1 Kramatwatu," *Smart Comp: Jurnalnya Orang Pintar Komputer*, vol. 11, no. 1, pp. 37-43, 2022, doi: 10.30591/smartcomp.v11i1.3096.
- [8] M. A. Syihab, "Sistem pakar pemilihan minat program studi menggunakan metode Forward Chaining," *JATISI (Jurnal Teknik Informatika dan Sistem Informasi)*, vol. 8, no. 3, pp. 1373-1383, 2021, doi: 10.35957/jatisi.v8i3.1069.
- [9] S. A. Widiana, I. Firdaus, E. Tenda, M. I. Takaendengan, and E. Ketaren, "Sistem Pendukung Keputusan Seleksi Calon Karyawan Marketing Menggunakan Metode Simple Additive Weighting (SAW)," *Jurnal TIMES*, vol. 13, no. 1, pp. 49-55, 2024, doi: 10.51351/jtm.13.1.2024742.
- [10] M. A. Prawira and R. Amin, "Sistem pendukung keputusan pemilihan karyawan terbaik pada PT. Citra Prima Batara dengan metode AHP," *Jurnal Teknik Komputer*, vol. 8, no. 1, pp. 89-97, 2022, doi: 10.31294/jtk.v8i1.11641.
- [11] R. Hendri, M. B. Hartanto, and A. Agustin, "Rancang bangun sistem pendukung keputusan validasi data pegawai Polda dengan metode AHP berbasis web," *Jurnal Teknologi dan Informatika (JEDA)*, vol. 4, no. 1, 2023, doi: 10.57084/jeda.v4i1.1189.
- [12] T. L. Saaty, "Decision making with the analytic hierarchy process," *International Journal of Services Sciences*, vol. 1, no. 1, pp. 83-98, 2008, doi: 10.1504/IJSSCI.2008.017590.
- [13] M. Maysaroh, M. Fahmi, H. Destiana, Y. I. Maulana, and I. Komarudin, "Metode AHP dalam sistem pendukung keputusan pada pemilihan website penerbangan online," *Jurnal Pariwisata Bisnis Digital dan Manajemen*, vol. 1, no. 2, pp. 49-59, 2022, doi: 10.33480/jasdim.v1i2.3376.
- [14] H. L. Walingkas and P. O. N. Saian, "Penerapan framework Flask pada pembangunan sistem informasi pemasok barang," *Jurnal JTIC (Jurnal Teknologi Informasi dan Komunikasi)*, vol. 7, no. 2, pp. 227-234, 2023, doi: 10.35870/jtik.v7i2.729.
- [15] K. Triatama, A. S. Puspaningrum, S. Sintaro, and M. I. Takaendengan, "Rancang bangun sistem informasi nilai akhir siswa berbasis web menggunakan Extreme Programming," *Jurnal Informatika dan Rekayasa Perangkat Lunak*, vol. 4, no. 2, pp. 135-140, 2023, doi: 10.33365/jatika.v4i2.2581.
- [16] A. A. Ilham, A. Azmi, A. R. Ramadhani, A. Falah, D. Fakthi, and A. Saifudin, "Pengujian sistem informasi parkir PT KISP berbasis desktop dengan metode Black-Box," *Jurnal Informatika Universitas Pamulang*, vol. 6, no. 1, pp. 96-101, 2021, doi: 10.32493/informatika.v6i1.8547.
- [17] A. Aliyah, N. Hartono, and A. A. Muin, "Penggunaan User Acceptance Testing (UAT) pada pengujian sistem informasi pengelolaan keuangan dan inventaris barang," *Switch: Jurnal Sains dan Teknologi Informasi*, vol. 3, no. 2, pp. 42-58, 2025, doi: 10.62951/switch.v3i1.330.
- [18] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319-340, 1989, doi: 10.2307/249008.
- [19] A. A. Salo and R. P. Hamalainen, "On the measurement of preferences in the analytic hierarchy process," *Journal of Multi-Criteria Decision Analysis*, vol. 6, no. 6, pp. 309-319, 1997, doi: 10.1002/(SICI)1099-1360(199711)6:6<309::AID-MCDA163>3.0.CO;2-2.
- [20] J. R. Lewis, "IBM computer usability satisfaction questionnaires: Psychometric evaluation and instructions for use," *International Journal of Human-Computer Interaction*, vol. 7, no. 1, pp. 57-78, 1995, doi: 10.1080/10447319509526110.