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Decision Support Systems for Career Recommendations for Graduates in Islamic Broadcasting Communication Studies Using ANP and TOPSIS Methods

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Abstract: The insufficient number of alumni students displaying a strong work ethic can be attributed to a mismatch between the talents and interests of alumni in the UINSU MEDAN KPI area, which should be the focal point of monitoring for these Indonesian youths. The effective management of alumni can offer a potential solution. In this study, researchers employed the ANP method to calculate career recommendations and ranked them using the TOPSIS method. The research methodology included a comprehensive literature review, observational data collection, interviews, documentation analysis, system flowchart design, ANP method application, TOPSIS method application, and system testing conducted using the black box method. Based on the calculations using the ANP and TOPSIS methods, Alternative A1 emerged as the top priority, scoring 1, while Alternative A13 received the lowest priority with a score of 0.13. These calculations were based on six criteria: discipline, honesty, responsibility, teamwork skills, and technical or practical proficiency. The highest-ranked career recommendation was "Insight into print, radio, and television media" with a manual priority of 0.7747 and a system-assigned priority of 0.73. Conversely, "Cameramen in television media" received the lowest score, with a value of 0.13 and a system-assigned priority of 0.13.

Keywords: ANP; Decision Support Systems; TOPSIS; Web Applications; Student.

1. Introduction

In accordance with the Kamus Besar Bahasa Indonesia Praktis, a student is defined as an individual enrolled in a university program. These individuals, with their finesse in dynamism and a scientific approach to perceiving objective, logical, and rational realities, represent the strength of the student body. The primary goal of higher education is to equip graduates with the skills necessary to thrive in specific industries or embark on entrepreneurial endeavors. This underscores the significance of producing self-reliant and industry-specific graduates in the era of Society 5.0. Therefore, students who opt to enter the workforce must undergo thorough preparation to ensure their competence in their chosen fields. The challenges faced by graduates, particularly those from the Faculty of Dakwah and Communication at the State Islamic University of North Sumatra, Medan (UINSU MEDAN KPI), include uncertainty in choosing a career path that aligns with their interests and talents. Graduates often find themselves making career choices influenced by peer pressure, parental expectations, or selecting job opportunities that do not align with their passions. Consequently, many students end up in occupations that they feel are unsuitable, leading to decreased work motivation and a lack of focus, which indirectly affects their prospects.

One effective solution to address these challenges is to administer interest and talent assessment tests, providing alumni with valuable insights to guide their career choices. Regrettably, many faculties at UIN Sumatera Utara Medan have yet to implement career exploration tests to match alumni with roles that align with their interests and talents. This

gap is particularly noticeable in the Islamic Broadcasting Communication Studies program within the Faculty of Dakwah and Communication at UIN Sumatera Utara Medan. The Islamic Broadcasting Communication Studies program (KPI) is one of the programs offered at the Faculty of Dakwah and Communication, Universitas Islam Negeri Sumatera Medan (FDK UIN-SU Medan). Each year, it graduates approximately 200 Bachelor of Social Science degree holders. However, career exploration and talent assessment have not been systematically conducted within KPI UIN-SU Medan. Professional evaluation tools can aid alumni in making informed career choices, as they often lack the time to consider all available options during their final year of study.

Identifying alumni's interests and talents can be achieved through various career evaluation methods, with the Holland hypothesis being a popular choice. Holland's theory presents six interesting categories: Realistic, Artistic, Social, Investigative, Conventional, and Enterprising (RIASEC). As confirming the Holland theory's accuracy can be challenging and is subject to variation, it remains a widely developed and employed concept. To maximize career advice based on Holland's theory, a multi-criteria decision support technique known as Analytic Network Process (ANP) is employed [1]. This research aims to construct a decision support system capable of recommending career paths for KPI UIN-SU Medan alumni upon graduation, prioritizing career options (alternatives) based on their highest preference value (v1). This prioritization will be achieved through the combined use of the ANP and TOPSIS methods [2], especially tailored to the context of KPI UIN-SU Medan. Decision-making involves selecting a sequence of actions from various available options to achieve a goal. The TOPSIS approach to preferred option selection considers the value closest to the positive ideal solution and the value farthest from the negative ideal solution, as indicated by several studies on the method. Using the Euclidean distance to calculate relative proximity, the fundamental premise of the TOPSIS method is to identify alternatives based on their proximity to both the positive and negative ideal solutions [3]. Consistent results are obtained when ranking calculations are conducted using the TOPSIS approach.

Given the challenges, this research aims to develop a web-based system. According to a study, the job selection process can be facilitated and expedited using computerized online talent assessments. Moreover, users can complete web-based talent assessments independently, without the need for counselors. Compared to direct interactions with experts, computerized talent assessments offer benefits such as increased engagement, cost-effectiveness, and, in some cases, being free of charge. This research endeavors to assist KPI UIN-SU Medan alumni, who are currently pursuing higher education, in determining suitable career paths by administering web-based career recommendation tests. The tests draw upon Holland's theory and employ the ANP and TOPSIS methods to provide tailored career recommendations.

2. Research Method

2.1 Decision Support Systems (DSS)

Interactive computer systems referred to as Decision Support Systems (DSS) utilize models and data to solve unstructured and semi-structured problems, aiding decision-makers in making informed choices. The original definition of a DSS encompasses model-based systems with data processing techniques and considerations that facilitate managerial decision-making. To attain its objectives, a DSS must be clear, controlled, flexible, and comprehensive [4][12].

2.2 Analytic Network Process (ANP)

The Analytic Network Process (ANP) method is an extension of the Analytical Hierarchy Process (AHP). ANP addresses the shortcomings of AHP by considering interdependencies among criteria or alternatives. Using individual ratio scales as the starting point, ANP is a broad theory of relative measurement used to create combined priority ratios that provide a relative measure of the influence of interacting elements concerning control requirements. ANP, a mathematical theory, enables systematic feedback and captures both physical and subtle elements [13][19].

2.3 Technique for Others Reference by Similarity to Ideal Solution (TOPSIS)

The premise of the TOPSIS guidelines is that the optimal option is the one closest to the perfect solution in the positive direction and farthest from the ideal solution in the negative direction [20][22].

2.4 Research Stages

The research stages outline the structured approach employed in conducting this study. This research adopts a quantitative approach, and the following stages are employed when designing the web-based decision support system:

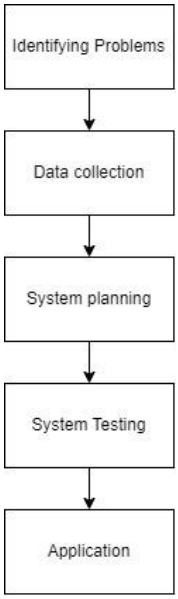

Figure 1. Research Stages

1) Problem Identification
The primary issue identified is the scarcity of alumni with a strong work ethic due to a mismatch between the world of work and the talents and interests of alumni in the Islamic Broadcasting Communication Studies program at UIN-SU Medan. These alumni represent the youth of Indonesia, making them a significant demographic to address. Therefore, the researcher aims to calculate career recommendations for these alumni using the ANP method, followed by ranking using the TOPSIS method.

2) Data Collection Techniques
   a. Literature Review: A systematic review of literature related to interest and talent tests, specifically the Holland Code-based assessments.
   b. Observation: Direct observations within the KPI UIN-SU Medan campus to gain insights into the daily activities, interactions, and behaviors of alumni.
   c. Interviews: In-depth interviews with key stakeholders, including the Chair of the Communication and Islamic Broadcasting program, alumni, and career counselors, to gather qualitative data on alumni challenges and program expectations.
   d. Document Analysis: Examination of relevant documents such as academic records, career guidance materials, and alumni profiles to supplement data collected through other methods.
3) System Design
   a. Flowchart Design: Development of a system flowchart to visualize the decision-making process within the DSS.
   b. ANP and TOPSIS Flowchart: Designing flowcharts to illustrate the steps involved in applying the ANP and TOPSIS methods within the DSS.
4) System Testing
The system will undergo testing using the black-box method to evaluate its functionality, user-friendliness, and overall performance.
5) Implementation
In this research, implementation involves the creation of a web-based application.

3. Result and Discussion

3.1 Results

3.1.1. ANP Method (Analytical Network Process)

The data used in this research is criteria and alternative data from the KPI Research Study Program. Alternative data used is that in this research there are career recommendations for KPI study programs.

Table 1. Alternative Data

No.	Career Recommendation
1	Print Media, Radio and Television Journalist
2	Editor and Writer in Print Media
3	Mass Media Analysis
4	Radio and Television Broadcaster
5	Master of Ceremonies and Protocols
6	Entrepreneur in the Field of Communication and Broadcasting
7	Public Relations Officer
8	Television Production Manager
9	Personnel/Staff in the field of Publishing and Broadcasting
10	Editor of Mass Media, Print, Electronic and Online Media
11	Print Media, Radio and Television Journalist
12	Editor and Writer in Print Media
13	Mass Media Analysis
14	Radio and Television Broadcaster
15	Master of Ceremonies and Protocols

Table 2. Criteria Data

No	Criteria
1	Discipline
2	Honesty
3	Responsibility
4	Ability to Work in Groups
5	Technical/Practical Skills

3.1.2. ANP calculation

1) Defining the problem and determining clusters and elements.

In this case there are 6 (six) clusters, namely discipline, honesty, responsibility, ability to work in groups, technical skills and alternatives.

Table 3. Comparison of ANP Criteria Weights

Alternative	Discipline	Honesty	Responsibility	Ability to work in groups	Technical/practical skills
	C1	C2	C3	C4	C5
A1	5	5	5	3	3
A2	3	3	3	5	3
A3	3	3	3	5	3
A4	3	5	5	5	5
A5	3	5	3	3	5
A6	5	5	3	3	5
A7	3	3	5	3	3
A8	3	3	5	3	5
A9	3	3	3	3	3
A10	3	3	3	3	3
A11	5	5	5	5	3
A12	3	3	3	3	3
A13	3	3	3	3	3
A14	3	5	5	3	5
A15	5	5	5	5	5

2) Create a network structure

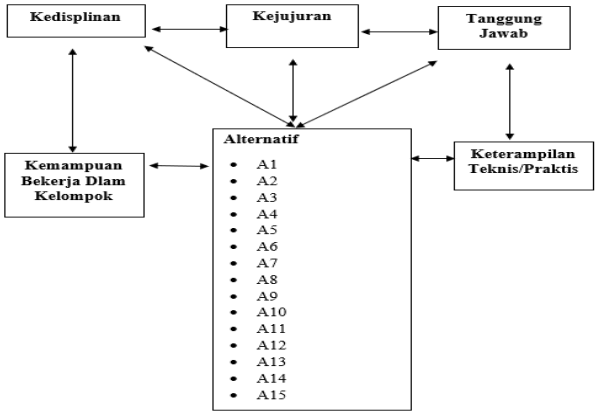

Figure 2. ANP Network Structure

3) Create a pairwise comparison matrix of criteria and test the consistency of ratios
Calculations between each criterion for Alternative 1 can be seen in Table 4.

Table 4. Pairwise Comparison Matrix

Media Journalist (A01)	C1	C2	C3	C4	C5
C1	1	1	1	3	3
C2	1	1	1	3	3
C3	1	1	1	3	3
C4	0,333333	0,333333	0,333333	1	1
C5	0,333333	0,333333	0,333333	1	1

Each gray area is filled with a reciprocal value or opposite value (1/n). For the K21 value

K21 = 1 / (K12) (1)
= 1 / 1 = 1

Description:
K21 = Row 2 Column 1
K12 = Row 1 Column 2

The next stage is to calculate the Normalized Pairwise Comparison Matrix by dividing the contents of the pairwise comparison matrix by the corresponding number of columns shown in Table 5.

Table 5. Pairwise Comparison Matrix Continued

A01	C1	C2	C3	C4	C5	Priority	Consistency Measure
C1	0,272727	0,272727	0,272727	0,272727	0,27272	0,27272727	1
C2	0,272727	0,272727	0,272727	0,272727	0,27272	0,27272727	1
C3	0,272727	0,272727	0,272727	0,272727	0,27272	0,27272727	1
C4	0,090909	0,090909	0,090909	0,090909	0,09090	0,09090909	1
C5	0,090909	0,090909	0,090909	0,090909	0,09090	0,09090909	1
						CI	-1
						Ratio Index	1,12
						CR	-0,892857143
						Consistency	Consistent

For the K11 value (Line 1 Column 1):
K11 = 1 / 3.667 = 0.27

Information :
1= Row K11 in Table
3,667 = Total Number of Column C1 in Table

On Priority Weights for Priority Values Row 1 (P1):
P1= 0.27+0.27+0.27+0.27+0.27 / 5 = 0.27

Information :
P1 = Priority Weight (The results of dividing the Comparison Matrix are averaged by adding up the rows, then the results of the addition are divided by the number of criteria so that the priority weight is found).
In Consistency Measure for Line 1 (CM1) Values
CM1= ((1*0.27)+(1*0.27)+(1*0.27)+(3*0.27)+(3*0.27)/0.27) = 1

Information :
Consistency Measure Obtained from multiplying the matrix in the table by the priority weight of each row. Next, look for the Consistency Index (CI) which can be obtained using the formula.

$$CI = \lambda max\text{-}n/\ n\text{-}1 \quad (2)$$

LambdaMax is the average of CM = (1 + 1 +1 + 1 +1) -5/4 = -1
Next, look for the Ratio Index
Based on the Saaty Theory, the Ratio Index value has been determined based on the matrix order of the number of criteria. The following table is:

Table 6. Ratio Index

Ordo matriks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ratio index	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.46	1.49	1.51	1.48	1.56	1.57	1.59

Because the Matrix consists of 5 criteria, automatically R1 = 1.12. to calculate the Consistency Ratio, namely C1/R1 = -1.001/1.12 = -0.89. CR values below 0.1 (<0.1) are considered consistent, more than inconsistent. The calculation of the pairwise comparison matrix between each criterion for Alternative 2 to Alternative 15 is carried out in the same way as in the example of the ANP calculation stages for Alternative 1. The calculation results for Alternative 1 to Alternative 15 are shown in Table 7.

Table 7. Calculation of pairwise comparison matrix between each criterion

	C1	C2	C3	C4	C5
A1	0,2727	0,2727	0,2727	0,0909	0,0909
A2	0,4286	0,1429	0,1429	0,1429	0,1429
A3	0,4286	0,1429	0,1429	0,1429	0,1429
A4	0,2	0,2	0,2	0,2	0,2
A5	0,2	0,2	0,2	0,2	2
A6	0,2489	0,2489	0,1959	0,1677	0,1387
A7	0,2	0,2	0,2	0,2	0,2
A8	0,2	0,2	0,2	0,2	0,2
A9	0,2	0,2	0,2	0,2	0,2
A10	0,2	0,2	0,2	0,2	0,2
A11	0,2381	0,2381	0,2381	0,2381	0,0476
A12	0,2	0,2	0,2	0,2	0,2
A13	0,2311	0,1756	0,1978	0,1978	0,1978
A14	0,2816	0,2816	0,1574	0,2328	0,0466
A15	0,2308	0,2308	0,2308	0,2308	0,0769

Calculation of the pairwise comparison matrix between each alternative against Criteria 1 to Criterion 5 is carried out in the same way as the pairwise comparison matrix between each criterion against the previous alternative, to obtain priority weights.

4) Supermatrix is created by combining all priorities

Table 8. Calculation of pairwise comparison matrix between each alternative

Supermatriks	A1	A3	A5	A7	A9	A11	A13	A15	C1	C2	C3	C4	C5
A1	1	0	0	0	0	0	0	0	0,27	0,27	0,27	0,09	0,09
A2	0	0	0	0	0	0	0	0	0,42	0,14	0,14	0,14	0,14
A3	0	1	0	0	0	0	0	0	0,42	0,14	0,14	0,14	0,14
A4	0	0	0	0	0	0	0	0	0,2	0,2	0,2	0,2	0,2
A5	0	0	1	0	0	0	0	0	0,2	0,2	0,2	0,2	2
A6	0	0	0	0	0	0	0	0	0,24	0,24	0,19	0,16	0,13
A7	0	0	0	1	0	0	0	0	0,2	0,2	0,2	0,2	0,2
A8	0	0	0	0	0	0	0	0	0,2	0,2	0,2	0,2	0,2
A9	0	0	0	0	1	0	0	0	0,2	0,2	0,2	0,2	0,2
A10	0	0	0	0	0	0	0	0	0,2	0,2	0,2	0,2	0,2
A11	0	0	0	0	0	1	0	0	0,23	0,23	0,23	0,23	0,04
A12	0	0	0	0	0	0	0	0	0,2	0,2	0,2	0,2	0,2
A13	0	0	0	0	0	0	1	0	0,23	0,17	0,19	0,19	0,19
A14	0	0	0	0	0	0	0	0	0,28	0,28	0,15	0,23	0,04
A15	0	0	0	0	0	0	0	1	0,23	0,23	0,23	0,23	0,07
C1	0,0895	0,0895	0,0664	0,0664	0,06	0,05	0,04	0,05	1	0	0	0	0
C2	0,1077	0,081	0,0547	0,0674	0,06	0,06	0,03	0,05	0	1	0	0	0
C3	0,1125	0,0809	0,0728	0,0656	0,05	0,05	0,04	0,04	0	0	1	0	0
C4	0,0851	0,0851	0,0775	0,0775	0,05	0,04	0,04	0,04	0	0	0	1	0
C5	0,0868	0,0868	0,0777	0,0777	0,07	0,08	0,05	0,02	0	0	0	0	1
Total	1,4816	1,4233	1,3491	1,3546	1,32	1,30	1,22	1,21	4,7	4,13	3,97	3,84	5,08

5) Weighted Super matrix is done by dividing each supermatrix value.

Table 9. Weighted Supermatrix

WS	A1	A3	A5	A7	A9	A11	A13	A15	C1	C2	C3	C4	C5
A1	1	0	0	0	0	0	0	0	0,13	0,136	0,13	0,04	0,04
A3	0	1	0	0	0	0	0	0	0,21	0,07	0,07	0,07	0,07
A5	0	0	1	0	0	0	0	0	0,1	0,1	0,1	0,1	1
A7	0	0	0	1	0	0	0	0	0,1	0,1	0,1	0,1	0,1
A9	0	0	0	0	1	0	0	0	0,1	0,1	0,1	0,1	0,1
A11	0	0	0	0	0	1	0	0	0,11	0,11	0,11	0,11	0,02
A13	0	0	0	0	0	0	1	0	0,11	0,08	0,09	0,09	0,09
A15	0	0	0	0	0	0	0	1	0,11	0,11	0,11	0,11	0,03
C1	0,044	0,044	0,03	0,03	0,03	0,02	0,020	0,02	1	0	0	0	0
C2	0,053	0,040	0,027	0,03	0,03	0,03	0,016	0,02	0	1	0	0	0
C3	0,056	0,040	0,036	0,03	0,02	0,02	0,02	0,02	0	0	1	0	0
C4	0,042	0,042	0,038	0,03	0,02	0,02	0,02	0,02	0	0	0	1	0
C5	0,04	0,04	0,038	0,03	0,03	0,04	0,02	0,01	0	0	0	0	1

6) Limit Super Matrix is done by multiplying or exponentiating the Weighted Super Matrix continuously.

Table 10. Supermatrix Limits

Supermatrix Limits	A1	A3	A5	A7	A9	A11	A13	A15	C1	C2	C3	C4	C5
A1	0,27	0,27	0,27	0,27	0,27	0,27	0,27	0,27	0,13	0,13	0,13	0,13	0,13
A3	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,21	0,21	0,21	0,21	0,21
A5	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,1	0,1	0,1	0,1	0,1
A7	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,1	0,1	0,1	0,1	0,1
A9	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,1	0,1	0,1	0,1	0,1
A11	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,11	0,11	0,11	0,11	0,11
A13	0,02	0,024	0,024	0,02	0,02	0,02	0,02	0,02	0,11	0,11	0,11	0,11	0,11
A15	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,11	0,11	0,11	0,11	0,11
C1	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,31	0,31	0,31	0,31	0,31
C2	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,06
C3	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,06
C4	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,06	0,06	0,06	0,06	0,06
C5	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,06	0,06	0,06	0,06	0,06

3.1.3 Topsis Method

1) Topsis calculation

The implementation of the Topsis method is shown in Table 11. To get the weight value of the Topsis alternative. To carry out normalization we must square each matrix element in table 11, for example for cells A01-C04 the value 5 is squared to 5* 5 = 25. The results are as follows:

Table 11. Topsis Calculation Table

	C1	C2	C3	C4	C5
A1	25	25	25	9	9
A3	9	9	9	25	9
A5	9	25	9	9	25
A7	9	9	25	9	9
A9	9	9	9	9	9
A11	25	25	25	25	9
A13	9	9	9	9	9
A15	25	25	25	25	25
Total	199	247	247	215	231
Akar	14,10674	15,71623	15,71623	14,66288	15,19868

The normalization stage is by dividing each element of the table 10 matrix by the root (sqrt) of the corresponding total rows in table 10, the results are as in table 12 below.

Table 12. Normalization Calculation Table

Alternative	C01	C02	C03	C04	C05
A1	0,35444060	0,31814238	0,318142381	0,204598302	0,197385508
A3	0,21266436	0,19088542	0,190885429	0,34099717	0,197385508
A5	0,21266436	0,31814238	0,190885429	0,204598302	0,328975847
A7	0,21266436	0,19088542	0,318142381	0,204598302	0,197385508
A9	0,21266436	0,19088542	0,190885429	0,204598302	0,197385508
A11	0,02512562	0,31814238	0,318142381	0,34099717	0,197385508
A13	0,21266436	0,19088542	0,190885429	0,204598302	0,197385508
A15	0,35444060	0,31814238	0,318142381	0,34099717	0,328975847

For example, for the first row (A01) it is obtained from:
A01-C01 = 5 / sqrt(199) = 5 / 14.10674= 0.354440603

Table 13. Criteria Weight Table

Criteria	Value	Attribute
Discipline	5	Benefit
Honesty	4	Benefit
Responsibility	3	Benefit
Ability to Work in Groups	1	Cost
Technical or Practical Skills	2	Cost

Weighted normalization is obtained from multiplying the matrix in table 13 (normalization) with table 12 (criterion weights), the results are as in table 14 below:

Table 14. Weight Normalization Calculation Table

Alternative	C01	C02	C03	C04	C05
A1	1,772203013	1,272569526	0,954427144	0,204598302	0,394771017
A3	1,063321808	0,763541716	0,572656287	0,34099717	0,394771017
A5	1,063321808	0,763541716	0,572656287	0,204598302	0,657951695
A7	1,063321808	0,763541716	0,954427144	0,204598302	0,394771017
A9	1,063321808	0,763541716	0,572656287	0,204598302	0,394771017
A11	0,125628141	1,272569526	0,954427144	0,34099717	0,394771017
A13	1,063321808	0,763541716	0,572656287	0,204598302	0,394771017
A15	1,772203013	1,272569526	0,954427144	0,34099717	0,657951695

Example: Row A01 Column C01 is obtained by = (0.35444060 x 5) = 1.772203013

The ideal solution matrix is obtained based on weighted normalization and criteria attributes (cost or benefit).

Table 15. Ideal Solution Matrix Calculation Table

	C01	C02	C03	C04	C05
Positive	1,772	1,27257	0,95443	0,2046	0,3947
Negative	1,063	0,76354	0,57226	0,341	0,65795

Example of finding the positive ideal distance A01:
A01 positive = SQRT([(1.772 – 1.772)2] + [(1.27257– 1.27257)2] + [(0.95443 – 0.95443)2] + [(0.2046 – 0.2046)2] + [(0.3947– 0.3947)2]) = 0

Table 16. Calculation table for solution distances and preference values

Alternative	Positive	Negative	Preference
A1	0	0,997	1
A2	0,962	0,263	0,214
A3	0,962	0,263	0,214
A4	0,768	0,636	0,452
A5	0,847	0,526	0,383
A6	0,463	0,883	0,655
A7	0,872	0,483	0,356
A8	0,911	0,405	0,307
A9	0,952	0,296	0,237
A10	0,952	0,296	0,237
A11	0,136	0,988	0,878
A12	0,952	0,296	0,237
A13	0,952	0,296	0,237
A14	0,756	0,650	0,462
A15	0,296	0,952	0,762

Example: A01 = 0.997/ (0+ 0.997) = 1

3.1.4 Data Analysis Results

Based on the ANP and Topsis calculation results, the highest priority value is Alternative A1 with a value of 1 and the lowest priority value is Alternative A13 with a value of 0.13. The results of the complete priority ordering are shown in Table 17.

Table 17. Final calculation of combination of ANP and topsis values

Value Combination				
Alternative	ANP	TOPSIS	Total	Rank
A01	0,2747	1	0,7747	1
A02	0,245	0,29324	0,39162	6
A03	0,0244	0,29324	0,17102	14
A04	0,0244	0,67644	0,36262	7
A05	0,0243	0,51931	0,283955	8
A06	0,0241	0,78997	0,419085	3
A07	0,0241	0,51931	0,283755	9
A08	0,0241	0,39438	0,22129	10
A09	0,0241	0,39438	0,22129	11
A10	0,0241	0,39438	0,22129	12
A11	0,0241	0,89278	0,47049	2
A12	0,0241	0,39438	0,22129	13
A13	0,024	0,22802	0,13801	15
A14	0,0236	0,77198	0,40959	4
A15	0,0236	0,77198	0,40959	5

Table 18. Ranking or Priority Ordering

Best Career Recommendation Names	Total	Rank
A1= Print Media, Radio and Television Journalist	0,7	1
A11= Graphic designer, cover, illustrator and advertisement	0,47	2
A6 = Entrepreneur in the field of communications and broadcasting	0,42	3
A14 = Researcher in the field of communication and da'wah	0,41	4

A15 = Preacher's power in the community and government institutions	0,40	5
A2 = Editors and writers in print media	0,39	6
A4 = Radio and television broadcaster	0,36	7
A5 = Master of ceremonies and protocol	0,29	8
A7 = Public relations officer	0,28	9
A8 = Television production manager	0,22	10
A9 = Personnel/Staff in the field of publishing and broadcasting	0,219	11
A10 = Editor of mass media, print, electronic and online media	0,218	12
A12 = Multimedia designer	0,217	13
A3 = Mass media analyst	0,17	14
A13 = Cameraman in television media	0,13	15

3.1.5 Implementation

The display that will appear first when running this application is the login form as in Figure 3.

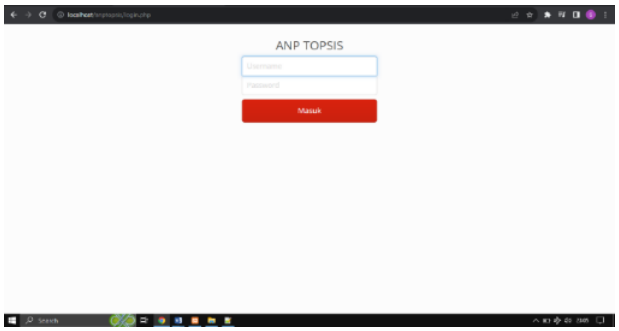

Figure 3. Web-Based Career Recommendation Login Display

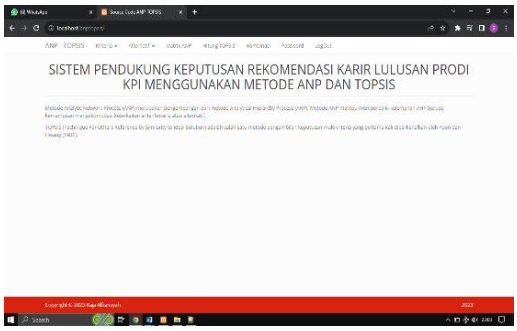

Figure 4. Admin Main Menu Display

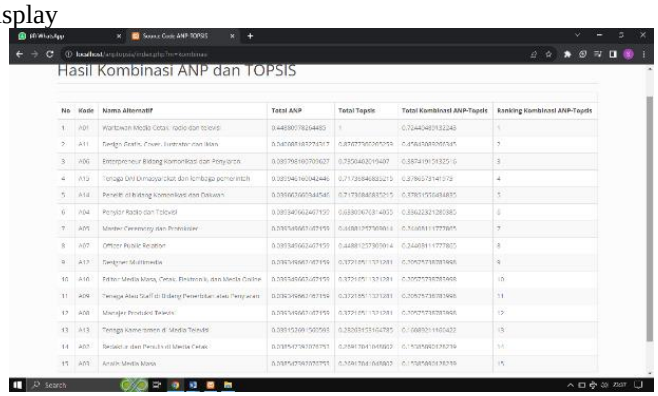

Figure 5. Final Ranking Display Based on ANP and Topsis

The main menu consists of dashboard, criteria, alternatives, ANP calculations, Topsis calculations, combinations, reports, passwords, and log out (figure 4). Next, calculate the combination of anp and topsis rankings, which will produce anp and topsis rankings which can be seen in Figure 5.

3.2. Discussion

In this research, the ANP and TOPSIS methods were used to evaluate career recommendations for the KPI (Key Performance Indicator) study program. These methods involve a systematic process of determining criteria, alternatives, and establishing pairwise comparisons to determine their relative importance. The criteria include discipline, honesty, responsibility, ability to work in groups, and technical/practical skills. By calculating pairwise comparisons, priority weights are obtained for each criterion. The ANP method creates a network structure and involves consistency checks to ensure the reliability of the comparison. The Supermatrix is formed by combining all the priorities, and the Limit Super Matrix is calculated. In parallel, the TOPSIS method normalizes the data, considering positive and negative ideal solutions. Weighted normalization is determined based on the criteria weights, which leads to the identification of the ideal solution matrix. This research produces a ranking of career recommendations based on the ANP and TOPSIS methods, thus providing valuable insight into the chosen career paths of KPI study program graduates. The top-ranked career recommendation was "Print, Radio and Television Journalist", while "Cameraman in Television Media" received the lowest ranking. These findings provide valuable guidance for students and educational institutions when making career-related decisions. Implementation of these methods in a web-based application allows efficient and easy-to-use

access to results, making them accessible to a wider audience and facilitating informed career choices for KPI program graduates.

4. Related Work

Several studies have explored the implementation of decision support systems (DSS) using various methods. Yusman *et al.* (2020) presents a DSS to analyze rice sales at HRD using the Analytical Network Process (ANP) method [1]. Another study discusses the use of the TOPSIS method in decision support systems [2]. Maria and Junirianto (2021) applied TOPSIS in selecting rubber seeds [3], while Setiawan Pamuji *et al.* (2021) focused on determining wellbore assistance using the Analytic Hierarchy Process (AHP) [4]. Mukti and Diana (2022) applied AHP to select the best teachers in elementary schools [5], while Mahendra and Nugraha (2020) compared the AHP-SAW and AHP-WP methods in selecting the best e-commerce platform [6]. Sitompul *et al.* (2023) used AHP to determine exemplary students in a secondary school [7]. Herdiansah (2020) discussed the use of AHP for selecting engineering majors in universities [8]. Furthermore, research by Al *et al.* (2023) applied fuzzy AHP for scholarship recipient selection [9], while Wulandari *et al.* (2023) Using AHP to determine the eligibility of Smart Indonesia Card (KIP) recipients [10]. Puji and Kharisma (2019) explored the selection of lecturers using the AHP and SAW methods [11], and Handoko (2022) discussed the selection of futsal team captains using the Analytical Hierarchy Process [12].

Izzah, Khalid, and Rolliawati (2020) introduced a decision support system to evaluate the feasibility of the Keluarga Harapan program [13]. Wagimin and Cahyo (2023) analyzed the selection of soda ash raw material suppliers using the Analytical Network Process [14]. Jannah, Putra, and Tambunan (2021) applied ANP in determining cash assistance recipients [15], and Syafitri *et al.* (2021) used ANP to select canvassers at Indosat Ooredoo [16]. Adam and Lengkong (2019) discussed evaluating the performance of Klabat University employees using ANP [17]. Apandi *et al.* (2020) determines employee bonuses at PT. Global Harvest Precision Engineering with ANP [18]. Samosir *et al.* (2021) evaluated the quality of service at the Pematangsiantar City Population and Civil Registration Service using ANP [19]. In addition, Surahaman (2019) developed a web-based DSS for salary increase decisions using the TOPSIS method [20]. Najar, Sihombing, and Munandar (2021) focused on recruiting BEM members using the SAW and TOPSIS methods [21]. Wahyuni and Anggoro (2017) discussed employee recruitment using the TOPSIS method in their research [22]. These studies collectively demonstrate the diverse applications of decision support systems in various domains.

This research is related to several previous studies that have implemented decision analysis methods, such as Analytical Hierarchy Process (AHP), Analytic Network Process (ANP), and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), in various decision-making contexts. However, what differentiates this research is its focus on different domains, diverse applications, and the methods that have been applied. One of the main differences is in the domain of use. This research covers various domains such as rice sales, selection of the best teachers, selection of exemplary students, selection of the best e-commerce, and many more. This shows the flexibility and applicability of decision analysis methods in a variety of situations. In addition, this research also differentiates itself through the variety of methods used. Some studies apply the AHP method, while others use ANP, TOPSIS, and even fuzzy AHP methods. These differences reflect research efforts to explore different approaches and select those that best suit a. Next, differences appear in the applications. This research includes selection, assessment, and evaluation such as education, business, public services, etc. This shows that decision analysis methods can be widely used to assist decision making in various aspects of life. This research is related to previous research in terms of the use of decision analysis methods, but differentiates itself through the diversity of domains, applications, and methods applied. This shows the importance of this method in assisting effective and efficient decision making in various cases.

5. Conclusion

From the results of this research, several important conclusions can be drawn. The ANP method has been used to calculate ratings of six criteria elements which include discipline, honesty, responsibility, ability to work in groups, and technical or practical skills. The calculation results show that the element ranked first is Insight into print media, radio, and television with a manual priority of 0.7747 and a system priority of 0.73. On the other hand, the element with the lowest value is Camera Personnel in television media with a value of 0.13 in both manual and system priorities of 0.13. The interesting thing is that changing the value in one of the clusters can impact career recommendations, either up or down, depending on the cluster that is changed. This shows the importance of the factors evaluated in career decision making. A computerized decision support system will help personnel provide career recommendations based on the best grades obtained. This will be very useful for the KPI study program to provide advice to students and alumni in choosing a career that suits the skills and criteria that have been identified. Thus, this research contributes to the development of a system that can support more informational and precise career decision making.

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