JOBSHEET 3
ANALYTIC HIERARCHY PROCESS (AHP)

Arranged By:

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PROGRAM STUDI D-IV TEKNIK INFORMATIKA

JURUSAN TEKNOLOGI INFORMASI

POLITEKNIK NEGERI MALANG

Experiment 1: Understand the AHP method and create a hierarchy

Purpose : Students understand the problem to be solved using the AHP DSS method

Experiment Procedure:

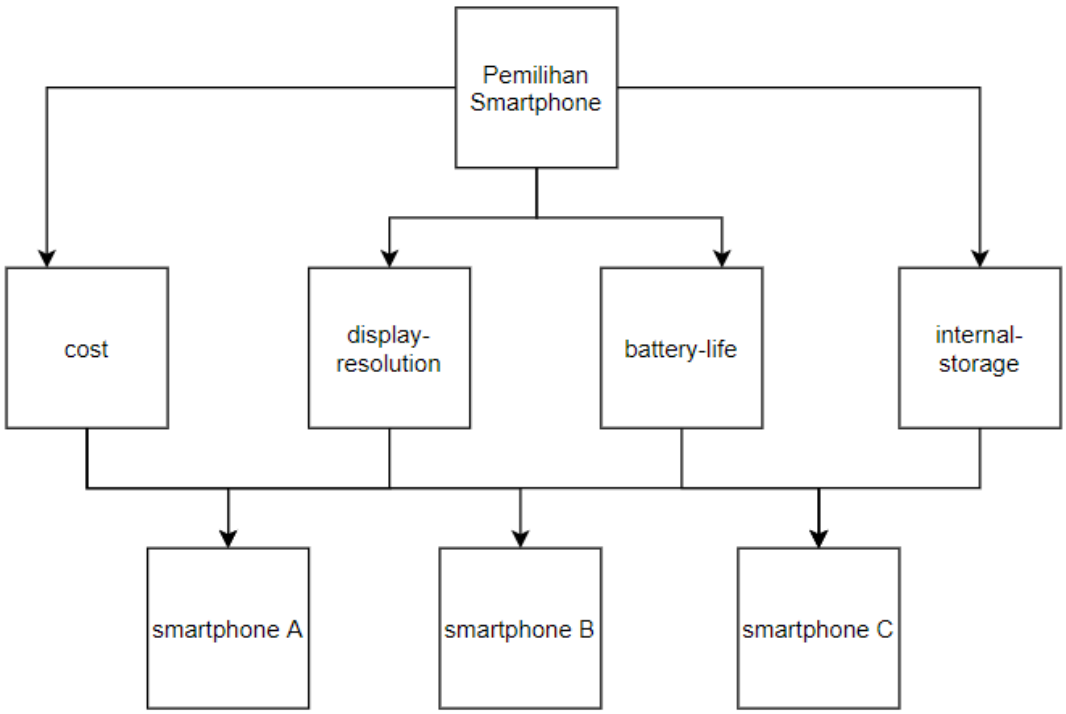
1. Pay attention to the following questions:
   Romi is a final year POLINEMA student who wants to renew his smart phone. There are four determining criteria for buying a new smart phone, namely cost, display-resolution, battery-life, and internal-storage. These will be used to choose 3 types of smart phones that he likes.
2. Make a hierarchical chart of attributes for all the alternatives!

Questions :

1. Based on the chart, make a list of the steps for completing your smartphone recommendation using the AHP method!
2. Why is it necessary to compare the CI with the RI method in the AHP method?

Experiment Procedure

Hierarchical Chart



Questions

1) a. Develop a pair comparison matrix for each decision alternative (location) based on criteria.
   b. Synthetic:
      - Sum the values in each column in the pair comparison matrix.
      - Divide the value of each column in the pair comparison matrix by the number of the corresponding column (normalized matrix)
      - Calculate the average value of each row in the normalized matrix called preference vector
      - Combine the preference vectors for each criterion into a preference matrix that shows the preferences of each location based on each criterion

c. Create a pair comparison matrix for criteria
d. Calculates the normalized matrix by dividing each value in each column of the matrix by the number of related columns
e. Create a preference vector by calculating the row average of the normalized matrix
f. Calculate the overall score for each decision alternative by multiplying the criterion preference vector by the criteria matrix
g. Ranking of decision alternatives based on alternative values

2) Comparison of CI with RI is done to check the consistency of the criteria scores per alternative or the criteria between criteria

Experiment 2 : Calculating Paired Eigen Vector Matrix Between Criteria

Purpose : Students know and are able to calculate paired eigenvector matrices between criteria.

Experiment Procedure:

1. Pay attention to the questions below:
   Based on the questions in experiment 1, it is known that the comparison matrix between criteria is

Criteria	COST	DISPLAY-RESOLUTION	BATTERY-LIFE	INTERNAL-STORAGE
COST	1.00	0.33	0.25	0.50
DISPLAY-RESOLUTION	3.00	1.00	3.00	4.00
BATTERY-LIFE	4.00	0.33	1.00	3.00
INTERNAL-STORAGE	2.00	0.25	0.33	1.00

2. Calculate the Eigen Vector using the AHP method!
3. Do the iteration of the eigenvector calculation up to 3 times!

Questions :

1. After doing iterations, calculate the difference between the eigenvectors in the 1st and 2nd iterations and the difference between the 2nd and 3rd iterations. What is the result?
2. Is it still necessary to calculate the eigenvector in the 4th iteration? what is the reason?
3. Which criteria are the biggest determinants in purchasing a smart phone that Romi will buy?

Experiment Procedure

Calculate Eigen Vector Using AHP Method

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage
Display-Resolution	1	3	4
Battery-life	0,33	1	3
Internal-Storage	0,25	0,33	1

Normalisasi

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage	Eigen Vector
Display-Resolution	0,632911392	0,692840647	0,5	0,608584013
Battery-life	0,208860759	0,230946882	0,375	0,271602547
Internal-Storage	0,158227848	0,076212471	0,125	0,11981344
Total	1	1	1	1

Normalisasi

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Battery-life	0,208860759	0,230946882	0,375	0,271602547
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Total	1	1	1	1

Calculate Eigen Vector 3 Times

Iterasi Pertama

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage	SUM	Eigen Vector
Display-Resolution	0,62	0,64	0,64	1,90	0,63
Battery-life	0,24	0,23	0,24	0,70	0,23
Internal-Storage	0,14	0,14	0,12	0,40	0,13
Total				3	1

Iterasi Kedua

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage	SUM	Eigen Vector
Display-Resolution	0,63	0,63	0,63	1,89	0,63
Battery-life	0,24	0,24	0,24	0,71	0,24
Internal-Storage	0,13	0,13	0,13	0,40	0,13
Total				3	1

Iterasi Ketiga

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage	SUM	Eigen Vector
Display-Resolution	0,63	0,63	0,63	1,89	0,63
Battery-life	0,24	0,24	0,24	0,71	0,24
Internal-Storage	0,13	0,13	0,13	0,40	0,13
Total				3	1

Question

1.

Calculate Eigen Vector 3 Times

Iterasi Pertama

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage	SUM	Eigen Vector
Display-Resolution	0,62	0,64	0,64	1,90	0,63
Battery-life	0,24	0,23	0,24	0,70	0,23
Internal-Storage	0,14	0,14	0,12	0,40	0,13
Total				3	1

Iterasi Kedua

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage	SUM	Eigen Vector
Display-Resolution	0,63	0,63	0,63	1,89	0,63
Battery-life	0,24	0,24	0,24	0,71	0,24
Internal-Storage	0,13	0,13	0,13	0,40	0,13
Total				3	1

Iterasi Ketiga

Kriteria	Display-Rosolution	Battery-Life	Internal-Storage	SUM	Eigen Vector
Display-Resolution	0,63	0,63	0,63	1,89	0,63
Battery-life	0,24	0,24	0,24	0,71	0,24
Internal-Storage	0,13	0,13	0,13	0,40	0,13
Total				3	1

Difference 1 & 2
0,004099107
- 0,001667744
- 0,002431363

Difference 2 & 3
-0,00005
0,00003
0,00003

2. It is necessary, as long as the result of the difference from the current iteration is smaller than the result of the previous iteration
3. Display Resolution

Experiment 3 : Compute Eigen Vector Matrix Paired Criteria on All Alternatives

Purpose : Students know and are able to calculate the eigenvector matrix paired criteria on all alternatives.

Experiment Procedure

1. Pay attention to the questions below:
   Based on the questions in experiment 1, it is known that the criteria comparison matrix for all alternatives is

Smart Phone	COST		
	1	2	3
1	1.00	0.33	1.00
2	3.00	1.00	4.00
3	1.00	0.25	1.00

Smart Phone	DISPLAY-RESOLUTION		
	1	2	3
1	1.00	2.00	0.50
2	0.50	1.00	0.33
3	2.00	3.00	1.00

Smart Phone	BATTERY-LIFE		
	1	2	3
1	1.00	3.00	2.00
2	0.33	1.00	0.33
3	0.50	3.00	1.00

Smart Phone	INTERNAL-STORAGE		
	1	2	3
1	1.00	1.00	0.25
2	1.00	1.00	0.25
3	4.00	4.00	1.00

2. Calculate the Eigenvectors of the three alternatives for each criterion using the AHP method!
3. Perform ranking calculations using the AHP method using the eigenvector calculation results of the comparison criteria matrix in the third iteration according to experiment 2!
4. Calculate the ratio of CI to RI value!

Experiment Procedure

Calculate Eigen Vectors Using AHP Method

Smart Phone	COST			Eigen Vektor
	1	2	3	
1	1	0,33	1	0,78
2	3	1	4	2,67
3	1	0,25	1	0,75
Total				4

Smart Phone	BATTERY-LIFE			Eigen Vektor
	1	2	3	
1	1	3	2	2,00
2	0,33	1	0,33	0,55
3	0,5	3	1	1,50
Total				4,1

Smart Phone	DISPLAY-RESOLUTION			Eigen Vektor
	1	2	3	
1	1	2	0,5	1,17
2	0,5	1	0,33	0,61
3	2	3	1	2,00
Total				4

Smart Phone	INTERNAL-STORAGE			Eigen Vektor
	1	2	3	
1	1	1	0,25	0,75
2	1	1	0,25	0,75
3	4	4	1	3,00
Total				5

Total	3,8	Total	4,5

Rangking Calculations using AHP Method From Eigen Vektor above

Smart Phone	COST	Display-Rosolution	Battery-Life	Internal-Storage	Antar Kriteria
1	0,78	1,17	2,00	0,75	0,63
2	2,67	0,61	0,55	0,75	0,24
3	0,75	2,00	1,50	3,00	0,13

Smart Phone	SKOR BASED COST	SKOR WITHOUT COST	RANKING
1	1,68	1,31	2
2	0,23	0,62	3
3	2,69	2,02	1

Calculation results of the comparison criteria matrix in the third iteration according to experiment 2!

Iterasi Ketiga	Eigen Vector
	0,63
	0,24
	0,13

Questions :

1. Based on the eigenvector values, which is the highest recommendation for a smart phone for each criterion?
2. Based on the ranking that has been done, which smart phone has the highest ranking?
3. Do the results of the CI/RI comparison show consistent results? If not, what should be done or if consistent what next step should take?

1.

Highest Recommendation Phone Based Eigen Vektor	
Display-Rosolution	PHONE 3
Battery-Life	PHONE 1
Internal-Storage	PHONE 3
COST	PHONE 2
AVERAGE	PHONE 3

2. **PHONE 3**

Rangking Calculations using AHP Method From Eigen Vektor above

Smart Phone	COST	Display-Rosolution	Battery-Life	Internal-Storage	Antar Kriteria
1	0,78	1,17	2,00	0,75	0,63
2	2,67	0,61	0,55	0,75	0,24
3	0,75	2,00	1,50	3,00	0,13

Smart Phone	SKOR BASED COST	SKOR WITHOUT COST	RANKING
1	1,68	1,31	2
2	0,23	0,62	3
3	2,69	2,02	1

Highest Recommendation Phone Based Eigen Vektor	
Display-Rosolution	PHONE 3
Battery-Life	PHONE 1
Internal-Storage	PHONE 3
COST	PHONE 2
AVERAGE	PHONE 3