

PERTEMUAN 21

STUDI KASUS METODE PROMETHEE

A. TUJUAN PEMBELAJARAN

- Mampu memahami menyelesaikan studi kasus pada sistem penunjang keputusan dengan menggunakan metode Promethee

B. URAIAN MATERI

1. CONTOH KASUS

Hardisk merupakan ruang simpan utama dalam sebuah komputer. Bukan hanya dokumen, tapi juga gambar, musik, dan video. Program-program komputer, sistem operasi semuanya disimpan dalam hardisk komputer. Hardisk merupakan media penyimpanan yang didesain untuk dapat digunakan menyimpan data dalam kapasitas yang besar.

Hardisk eksternal adalah hardisk yang berdiri sendiri, terhubung dengan kabel ke port USB (Universal Serial Bus) ke unit komputer, sama seperti hardisk internal (Vermaat, 2008). Selain itu volume serta desainnya yang simpel memudahkan untuk dibawa dan disimpan tanpa menghabiskan ruang dan tempat. Permasalahannya ialah bagaimana cara user memilih hardisk eksternal yang sesuai diantara hardisk eksternal yang ada sehingga penggunaan terhadap hardisk eksternal sesuai dengan kebutuhan user.

Memilih hardisk eksternal yang tepat sesuai dengan kebutuhan user bukan hal yang mudah, banyaknya pilihan tersedia dipasaran bisa jadi membuat user sulit untuk memilihnya. Masalah utama yang di angkat dari studi kasus ini adalah bagaimana mengimplementasikan Algoritma Preference Ranking Organization For Enrichment Evaluation (PROMETHEE) untuk memecahkan permasalahan Sistem Pendukung Keputusan untuk Pemilihan Hardisk Eksternal.

Kriteria yang digunakan ialah Kapasitas, Kecepatan Transfer, Dimensi dan Tipe USB (Universal Serial Bus) dari Hardisk eksternal. Di sini kriteria dibagi menjadi sub kriteria, antara lain: Kriteria Kapasitas dibagi menjadi menjadi sub kriteria Kapasitas Hardisk dan System Requirements, kriteria Kecepatan Transfer dibagi menjadi sub kriteria Write Speed dan Read Speed, kriteria Dimensi dibagi menjadi sub kriteria Height dan Width, dan kriteria Tipe USB dibagi menjadi sub kriteria Interface dan FileSystem. Sedangkan

alternatif yang diperhitungkan meliputi 5 Hardisk Eksternal; yaitu : Spectra Flash RapidStore (A1), Hitachi Touro Mobile (A2), Transcend StoreJet (A3), Toshiba Canvio Simple (A4), dan Fujitsu (A5)

2. PENYELESAIAN DENGAN MENGGUNAKAN METODE PROMETHEE

Disini kita asumsikan untuk bobot pada masing-masing kriterianya adalah sama, sehingga tidak perlu diperhitungkan dalam prosesnya.

Contoh nilai data dari bobot kriteria/sub-kriteria, tipe kriteria, dan nilai preferensinya ditunjukkan pada Tabel 1 berikut ini:

Tabel 1. Contoh Data

Kriteria	Min/Max	Alternatif					Tipe	Threshold		
		A ₁	A ₂	A ₃	A ₄	A ₅		p	q	s
Kapasitas										
HDD Capacity	Max	7	7	7	7	7	Linear Quasi	7	1	0
System Requirement	Max	6	6	7	7	4	Quasi	7	5	0
Kecepatan Transfer										
Write Speed	Max	4	1	5	2	3	Linear Quasi	7	1	0
Read Speed	Max	2	4	5	2	3	Linear	7	0	0
Dimensi										
Height	Max	7	7	6	7	7	Level	7	1	0
Width	Max	6	6	6	7	7	Level	7	1	0
Tipe USB										
Interface	Max	6	5	6	6	6	Gaussian	0	0	1
File System	Max	7	7	7	7	7	Usual	0	0	0
Lain-lain										
Harga	Min	6	5	4	4	5	Linear	7	0	0

Pada Tabel 1 tersebut nilai Min/Max menunjukkan kecenderungan data, dimana jika kecenderungannya Min maka menunjukkan nilai yang semakin kecil adalah semakin baik, sedangkan jika Max maka nilainya semakin baik jika nilainya semakin tinggi.

Berdasarkan data yang disajikan dalam Tabel 1, dilakukan perhitungan dengan menggunakan metoda PROMETHEE sebagai berikut:

- a. Penentuan Nilai Deviasi berdasarkan Perbandingan Berpasangan d_j (a,b)

Sebagai contoh nilai deviasi perbandingan antara alternatif A1 dengan alternatif A4 yaitu d_j (1,4) dapat dicari sebagai berikut: Rincian perhitungannya adalah sebagai berikut:

Nilai Deviasi d_j (A1,A2)

$$d_{\text{HDD Capacity}}(1,2) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$d_{\text{System Requirement}}(1,2) = 6 - 6 = 0 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$$d_{\text{Write Speed}}(1,2) = 4 - 1 = 3 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.5$$

$$d_{\text{Read Speed}}(1,2) = 2 - 4 = -2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$$

$$d_{\text{Height}}(1,2) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$d_{\text{Width}}(1,2) = 6 - 6 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$d_{\text{Interface}}(1,2) = 6 - 5 = 1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$$

$$d_{\text{File System}}(1,2) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$$

$$d_{\text{Harga}}(1,2) = 6 - 5 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$$H(d_j(1,2)) = 1/9 * (0+0+0.5+0.286+0.5+0.5+0.393+0+0.143) = 2.322$$

Nilai Deviasi d_j (A1,A3)

$$d_{\text{HDD Capacity}}(1,3) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$d_{\text{System Requirement}}(1,3) = 6 - 7 = -1 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$$d_{\text{Write Speed}}(1,3) = 4 - 5 = -1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$d_{\text{Read Speed}}(1,3) = 2 - 5 = -3 \rightarrow \text{linear} \rightarrow H(d) = 0.429$$

$$d_{\text{Height}}(1,3) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$$

$$d_{\text{Width}}(1,3) = 6 - 6 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$d_{\text{Interface}}(1,3) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$$

$$d_{\text{File System}}(1,3) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$$

$$d_{\text{Harga}}(1,3) = 6 - 4 = 2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$$

$$H(d_j(1,3)) = 1/9 * (0+0+0+0.429+0+0.5+0+0+0.286) = 1.214$$

Nilai Deviasi d_j (A1,A4)

$$d_{\text{HDD Capacity}}(1,4) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$d_{\text{System Requirement}}(1,4) = 6 - 7 = -1 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$dWrite\ Speed(1,4) = 4 - 2 = 2 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.333$
 $dRead\ Speed(1,4) = 2 - 2 = 0 \rightarrow \text{linear} \rightarrow H(d) = 0$
 $dHeight(1,4) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(1,4) = 6 - 7 = -1 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dInterface(1,4) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$
 $dFile\ System(1,4) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(1,4) = 6 - 4 = 2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$
 $H(d_j(1,4)) = 1/9 * (0+0+0.333+0+0.5+0.5+0+0+0.286) = 1.619$

Nilai Deviasi dj (A1,A5)

$dHDD\ Capacity(1,5) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(1,5) = 6 - 4 = 2 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(1,5) = 4 - 3 = 1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.167$
 $dRead\ Speed(1,5) = 2 - 3 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $dHeight(1,5) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(1,5) = 6 - 7 = -1 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dInterface(1,5) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$
 $dFile\ System(1,5) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(1,5) = 6 - 5 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $H(d_j(1,5)) = 1/9 * (0+0+0.167+0.143+0.5+0.5+0+0+0.143) = 1.452$

Nilai Deviasi dj (A2,A1)

$dHDD\ Capacity(2,1) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(2,1) = 6 - 6 = 0 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(2,1) = 1 - 4 = -3 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dRead\ Speed(2,1) = 4 - 2 = 2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$
 $dHeight(2,1) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(2,1) = 6 - 6 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dInterface(2,1) = 5 - 6 = -1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$
 $dFile\ System(2,1) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(2,1) = 5 - 6 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$

$$H(dj(2,1)) = 1/9 * (0+0+0+0.286+0.5+0.5+0.393+0+0.143) = 1.822$$

Nilai Deviasi dj (A2,A3)

$$dHDD Capacity(2,3) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$dSystem Requirement(2,3) = 6 - 7 = -1 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$$dWrite Speed(2,3) = 1 - 5 = -4 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$dRead Speed(2,3) = 4 - 5 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$$dHeight(2,3) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$$

$$dWidth(2,3) = 6 - 6 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$dInterface(2,3) = 5 - 6 = -1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$$

$$dFile System(2,3) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$$

$$dHarga(2,3) = 5 - 4 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$$H(dj(2,3)) = 1/9 * (0+0+0+0.143+0+0.5+0.393+0+0.143) = 1.179$$

Nilai Deviasi dj (A2,A4)

$$dHDD Capacity(2,4) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$dSystem Requirement(2,4) = 6 - 7 = -1 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$$dWrite Speed(2,4) = 1 - 2 = -1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$dRead Speed(2,4) = 4 - 2 = 2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$$

$$dHeight(2,4) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$dWidth(2,4) = 6 - 7 = -1 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$dInterface(2,4) = 5 - 6 = -1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$$

$$dFile System(2,4) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$$

$$dHarga(2,4) = 5 - 4 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$$H(dj(2,4)) = 1/9 * (0+0+0+0.286+0.5+0.5+0.393+0+0.143) = 1.822$$

Nilai Deviasi dj (A2,A5)

$$dHDD Capacity(2,5) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$dSystem Requirement(2,5) = 6 - 4 = 2 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$$dWrite Speed(2,5) = 1 - 3 = -2 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$dRead Speed(2,5) = 4 - 3 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$dHeight(2,5) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(2,5) = 6 - 7 = -1 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dInterface(2,5) = 5 - 6 = -1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$
 $dFile\ System(2,5) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(2,5) = 5 - 5 = 0 \rightarrow \text{linear} \rightarrow H(d) = 0$
 $H(dj(2,5)) = 1/9 * (0+0+0+0.143+0.5+0.5+0.393+0+0) = 1.536$

Nilai Deviasi dj (A3,A1)

$dHDD\ Capacity(3,1) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(3,1) = 7 - 6 = 1 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(3,1) = 5 - 4 = 1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.167$
 $dRead\ Speed(3,1) = 5 - 2 = 3 \rightarrow \text{linear} \rightarrow H(d) = 0.429$
 $dHeight(3,1) = 6 - 7 = -1 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(3,1) = 6 - 6 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dInterface(3,1) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$
 $dFile\ System(3,1) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(3,1) = 4 - 6 = -2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$
 $H(dj(3,1)) = 1/9 * (0+0+0.167+0.429+0.5+0.5+0+0+0.286) = 1.881$

Nilai Deviasi dj (A3,A2)

$dHDD\ Capacity(3,2) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(3,2) = 7 - 6 = 1 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(3,2) = 5 - 1 = 4 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.667$
 $dRead\ Speed(3,2) = 5 - 4 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $dHeight(3,2) = 6 - 7 = -1 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(3,2) = 6 - 6 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dInterface(3,2) = 6 - 5 = 1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$
 $dFile\ System(3,2) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(3,2) = 4 - 5 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $H(dj(3,2)) = 1/9 * (0+0+0.667+0.143+0.5+0.5+0.393+0+0.143) = 2.346$

Nilai Deviasi dj (A3,A4)

dHDD Capacity(3,4) = 7 - 7 = 0 -> linear quasi -> H(d)= 0

dSystem Requirement(3,4) = 7 - 7 = 0 -> quasi -> H(d)= 0

dWrite Speed(3,4) = 5 - 2 = 3 -> linear quasi -> H(d)= 0.5

dRead Speed(3,4) = 5 - 2 = 3 -> linear -> H(d)= 0.429

dHeight(3,4) = 6 - 7 = -1 -> level -> H(d)= 0.5

dWidth(3,4) = 6 - 7 = -1 -> level -> H(d)= 0.5

dInterface(3,4) = 6 - 6 = 0 -> gaussian -> H(d)= 0

dFile System(3,4) = 7 - 7 = 0 -> usual -> H(d)= 0

dHarga(3,4) = 4 - 4 = 0 -> linear -> H(d)= 0

H(dj(3,4)) = 1/9 * (0+0+0.5+0.429+0.5+0.5+0+0+0) = 1.929

Nilai Deviasi dj (A3,A5)

dHDD Capacity(3,5) = 7 - 7 = 0 -> linear quasi -> H(d)= 0

dSystem Requirement(3,5) = 7 - 4 = 3 -> quasi -> H(d)= 0

dWrite Speed(3,5) = 5 - 3 = 2 -> linear quasi -> H(d)= 0.333

dRead Speed(3,5) = 5 - 3 = 2 -> linear -> H(d)= 0.286

dHeight(3,5) = 6 - 7 = -1 -> level -> H(d)= 0.5

dWidth(3,5) = 6 - 7 = -1 -> level -> H(d)= 0.5

dInterface(3,5) = 6 - 6 = 0 -> gaussian -> H(d)= 0

dFile System(3,5) = 7 - 7 = 0 -> usual -> H(d)= 0

dHarga(3,5) = 4 - 5 = -1 -> linear -> H(d)= 0.143

H(dj(3,5)) = 1/9 * (0+0+0.333+0.286+0.5+0.5+0+0+0.143) = 1.762

Nilai Deviasi dj (A4,A1)

dHDD Capacity(4,1) = 7 - 7 = 0 -> linear quasi -> H(d)= 0

dSystem Requirement(4,1) = 7 - 6 = 1 -> quasi -> H(d)= 0

dWrite Speed(4,1) = 2 - 4 = -2 -> linear quasi -> H(d)= 0

dRead Speed(4,1) = 2 - 2 = 0 -> linear -> H(d)= 0

dHeight(4,1) = 7 - 7 = 0 -> level -> H(d)= 0.5

dWidth(4,1) = 7 - 6 = 1 -> level -> H(d)= 0

$dInterface(4,1) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$
 $dFile\ System(4,1) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(4,1) = 4 - 6 = -2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$
 $H(dj(4,1)) = 1/9 * (0+0+0+0+0.5+0+0+0+0.286) = 0.786$

Nilai Deviasi dj (A4,A2)

$dHDD\ Capacity(4,2) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(4,2) = 7 - 6 = 1 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(4,2) = 2 - 1 = 1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.167$
 $dRead\ Speed(4,2) = 2 - 4 = -2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$
 $dHeight(4,2) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(4,2) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$
 $dInterface(4,2) = 6 - 5 = 1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$
 $dFile\ System(4,2) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(4,2) = 4 - 5 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $H(dj(4,2)) = 1/9 * (0+0+0.167+0.286+0.5+0+0.393+0+0.143) = 1.489$

Nilai Deviasi dj (A4,A3)

$dHDD\ Capacity(4,3) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(4,3) = 7 - 7 = 0 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(4,3) = 2 - 5 = -3 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dRead\ Speed(4,3) = 2 - 5 = -3 \rightarrow \text{linear} \rightarrow H(d) = 0.429$
 $dHeight(4,3) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$
 $dWidth(4,3) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$
 $dInterface(4,3) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$
 $dFile\ System(4,3) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(4,3) = 4 - 4 = 0 \rightarrow \text{linear} \rightarrow H(d) = 0$
 $H(dj(4,3)) = 1/9 * (0+0+0+0.429+0+0+0+0+0) = 0.429$

Nilai Deviasi dj (A4,A5)

$dHDD\ Capacity(4,5) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$

$dSystem\ Requirement(4,5) = 7 - 4 = 3 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(4,5) = 2 - 3 = -1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dRead\ Speed(4,5) = 2 - 3 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $dHeight(4,5) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(4,5) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dInterface(4,5) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$
 $dFile\ System(4,5) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(4,5) = 4 - 5 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $H(dj(4,5)) = 1/9 * (0+0+0+0.143+0.5+0.5+0+0+0.143) = 1.286$

Nilai Deviasi dj (A5,A1)

$dHDD\ Capacity(5,1) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(5,1) = 4 - 6 = -2 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(5,1) = 3 - 4 = -1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dRead\ Speed(5,1) = 3 - 2 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $dHeight(5,1) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(5,1) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$
 $dInterface(5,1) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$
 $dFile\ System(5,1) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$
 $dHarga(5,1) = 5 - 6 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $H(dj(5,1)) = 1/9 * (0+0+0+0.143+0.5+0+0+0+0.143) = 0.786$

Nilai Deviasi dj (A5,A2)

$dHDD\ Capacity(5,2) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$
 $dSystem\ Requirement(5,2) = 4 - 6 = -2 \rightarrow \text{quasi} \rightarrow H(d) = 0$
 $dWrite\ Speed(5,2) = 3 - 1 = 2 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.333$
 $dRead\ Speed(5,2) = 3 - 4 = -1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$
 $dHeight(5,2) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$
 $dWidth(5,2) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$
 $dInterface(5,2) = 6 - 5 = 1 \rightarrow \text{gaussian} \rightarrow H(d) = 0.393$
 $dFile\ System(5,2) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$

$$d\text{Harga}(5,2) = 5 - 5 = 0 \rightarrow \text{linear} \rightarrow H(d) = 0$$

$$H(dj(5,2)) = 1/9 * (0+0+0.333+0.143+0.5+0+0.393+0+0) = 1.37$$

Nilai Deviasi dj (A5,A3)

$$d\text{HDD Capacity}(5,3) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$d\text{System Requirement}(5,3) = 4 - 7 = -3 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$$d\text{Write Speed}(5,3) = 3 - 5 = -2 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$d\text{Read Speed}(5,3) = 3 - 5 = -2 \rightarrow \text{linear} \rightarrow H(d) = 0.286$$

$$d\text{Height}(5,3) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$$

$$d\text{Width}(5,3) = 7 - 6 = 1 \rightarrow \text{level} \rightarrow H(d) = 0$$

$$d\text{Interface}(5,3) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$$

$$d\text{File System}(5,3) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$$

$$d\text{Harga}(5,3) = 5 - 4 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$$H(dj(5,3)) = 1/9 * (0+0+0+0.286+0+0+0+0+0.143) = 0.429$$

Nilai Deviasi dj (A5,A4)

$$d\text{HDD Capacity}(5,4) = 7 - 7 = 0 \rightarrow \text{linear quasi} \rightarrow H(d) = 0$$

$$d\text{System Requirement}(5,4) = 4 - 7 = -3 \rightarrow \text{quasi} \rightarrow H(d) = 0$$

$$d\text{Write Speed}(5,4) = 3 - 2 = 1 \rightarrow \text{linear quasi} \rightarrow H(d) = 0.167$$

$$d\text{Read Speed}(5,4) = 3 - 2 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$$d\text{Height}(5,4) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$d\text{Width}(5,4) = 7 - 7 = 0 \rightarrow \text{level} \rightarrow H(d) = 0.5$$

$$d\text{Interface}(5,4) = 6 - 6 = 0 \rightarrow \text{gaussian} \rightarrow H(d) = 0$$

$$d\text{File System}(5,4) = 7 - 7 = 0 \rightarrow \text{usual} \rightarrow H(d) = 0$$

$$d\text{Harga}(5,4) = 5 - 4 = 1 \rightarrow \text{linear} \rightarrow H(d) = 0.143$$

$$H(dj(5,4)) = 1/9 * (0+0+0.167+0.143+0.5+0.5+0+0+0.143) = 1.452$$

b. Perhitungan Nilai Leaving Flow

Perhitungan Leaving Flow A1

$$\phi_1^+ = \frac{1}{(5-1)} * (2.322 + 1.214 + 1.619 + 1.452)$$

$$\phi_1^+ = \frac{1}{4} * (6.608)$$

$$\phi_1^+ = 1.652$$

Perhitungan Leaving Flow A2

$$\phi_2^+ = \frac{1}{(5-1)} * (1.822 + 1.179 + 1.822 + 1.536)$$

$$\phi_2^+ = \frac{1}{4} * (6.36)$$

$$\phi_2^+ = 1.59$$

Perhitungan Leaving Flow A3

$$\phi_3^+ = \frac{1}{(5-1)} * (1.881 + 2.346 + 1.929 + 1.762)$$

$$\phi_3^+ = \frac{1}{4} * (7.917)$$

$$\phi_3^+ = 1.979$$

Perhitungan Leaving Flow A4

$$\phi_4^+ = \frac{1}{(5-1)} * (0.786 + 1.489 + 0.429 + 1.286)$$

$$\phi_4^+ = \frac{1}{4} * (3.989)$$

$$\phi_4^+ = 0.997$$

Perhitungan Leaving Flow A5

$$\phi_5^+ = \frac{1}{(5-1)} * (0.786 + 1.37 + 0.429 + 1.452)$$

$$\phi_5^+ = \frac{1}{4} * (4.036)$$

$$\phi_5^+ = 1.009$$

c. Menghitung Nilai Entering Flow

Perhitungan Entering Flow A1

$$\varphi_1^- = 1/(5-1) * (1.822 + 1.881 + 0.786 + 0.786)$$

$$\varphi_1^- = 1/4 * (5.274)$$

$$\varphi_1^- = 1.3186054303099$$

Perhitungan Entering Flow A2

$$\varphi_2^- = 1/(5-1) * (2.322 + 2.346 + 1.489 + 1.37)$$

$$\varphi_2^- = 1/4 * (7.526)$$

$$\varphi_2^- = 1.8815645783826$$

Perhitungan Entering Flow A3

$$\varphi_3^- = 1/(5-1) * (1.214 + 1.179 + 0.429 + 0.429)$$

$$\varphi_3^- = 1/4 * (3.251)$$

$$\varphi_3^- = 0.81265304935756$$

Perhitungan Entering Flow A4

$$\varphi_4^- = 1/(5-1) * (1.619 + 1.822 + 1.929 + 1.452)$$

$$\varphi_4^- = 1/4 * (6.822)$$

$$\varphi_4^- = 1.7055101922147$$

Perhitungan Entering Flow A5

$$\varphi_5^- = 1/(5-1) * (1.452 + 1.536 + 1.762 + 1.286)$$

$$\varphi_5^- = 1/4 * (6.036)$$

$$\varphi_5^- = 1.5090816207861$$

d. Menghitung Nilai Net Flow

Perhitungan Net Flow A1

$$\varphi_{(1)} = \varphi_{(1)}^+ - \varphi_{(1)}^-$$

$$\varphi_{(1)} = 1.652 - 1.319$$

$$\varphi_{(1)} = 0.333$$

Perhitungan Net Flow A2

$$\varphi_{(2)} = \varphi_{(2)}^+ - \varphi_{(2)}^-$$

$$\varphi_{(2)} = 1.59 - 1.882$$

$$\varphi_{(2)} = -0.292$$

Perhitungan Net Flow A3

$$\varphi_{(3)} = \varphi_{(3)}^+ - \varphi_{(3)}^-$$

$$\varphi_{(3)} = 1.979 - 0.813$$

$$\varphi_{(3)} = 1.167$$

Perhitungan Net Flow A4

$$\varphi_{(4)} = \varphi_{(4)}^+ - \varphi_{(4)}^-$$

$$\varphi_{(4)} = 0.997 - 1.706$$

$$\varphi_{(4)} = -0.708$$

Perhitungan Net Flow A5

$$\begin{aligned}\Phi_{(5)} &= \Phi_{(5)}^+ - \Phi_{(5)}^- \\ \Phi_{(5)} &= 1.009 - 1.509 \\ \Phi_{(5)} &= -0.5\end{aligned}$$

e. Perangkingan

rangking 1 : A3 = 1.167

rangking 2 : A1 = 0.333

rangking 3 : A2 = -0.292

rangking 4 : A5 = -0.5

rangking 5 : A4 = -0.708

Sehingga dipilih alternatif Harddisk External A3 (Transcend StoreJet) dengan nilai Net Flow sebesar 1.167.

C. LATIHAN SOAL/TUGAS