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Determining the Best Video on Demand Services by Implementing the Analytical Hierarchy Process (AHP) Method and the Multi-Objective Optimization by Ratio Analysis (MOORA) Method

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Abstract

The diversity of platforms that provide various types of Video on Demand makes it quite difficult for users to determine the best platform that can be consumed by the public. This research model focuses on selecting from Video on Demand applications that aim to provide alternative recommendations for quality Video on Demand choices for those who are familiar with VoD or not at all. The problem in determining the best Video on Demand service is because each existing Video on Demand has its own unique value or value that makes each platform valuable according to its purpose. The research method here is through a quantitative approach. Data is obtained by conducting direct observations and literature studies, interviews and distributing questionnaires, to 10 respondents who have been validated to have criteria as expert respondents in the field of video on demand technology. The data is then processed by implementing 2 methods with the flow for weighting criteria using the AHP method and ranking alternatives using the MOORA method. The results of the study show that the criteria that are prioritized and influential in choosing a Video on Demand platform are from System Quality with a weight of = 0.45 produced by the platform. Followed by Variants of = 0.29, Price with = 0.15 and Display with weight = 0.11. Then from the ranking results, the alternative chosen based on the calculation is Netflix with an alternative weight = 0.39, then followed by Disney + Hotstar with an alternative weight = 0.34, VIDIO with a weight = 0.29, Viu with = 0.27 and Youtube Premium with an alternative weight = 0.26. So that from the calculation results it can be concluded and recommended to choose Netflix as the best and quality platform

Keywords: *Decision Support System, MOORA, AHP, Video on Demand Service*

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INTRODUCTION

Background Problem With the development of the times, technology has made many new innovations in cutting barriers to be able to communicate and interact widely. Various kinds of benefits are obtained and felt by humans with the continued development of technology which is also supported by the presence of the internet as a form of modern technology, apart from the existence of gadgets or devices. Based on survey data conducted by the Association of Indonesian Internet Service Providers (APJII), total internet users in Indonesia until the second quarter of 2020 reached 196.7 million people or 73.7% of the total human population in Indonesia (Lipipress Admin, 2021). Meanwhile, based on the We Are Social report, which collected data on February 15, 2022, it noted that in 2022, the number of internet users in Indonesia will continue to increase, reaching 210 million people.

Looking at the increasing use of Video on Demand, most of it consists of several factors, with the main reason being the flexibility of using Video on Demand services which can be used at any time with a percentage of 84%. The next reason is the choice of various films by 77%, wanting to find entertainment (74%), the choice of new film variations by 68%, VoD is easy to use by 63%, then the next reason is not being bothered by advertisements (57%), affordable subscription fees (47%), and are still worried about going to the cinema (13%) (Populix, 2022 in databox (2022)).

Seeing this potential, more and more streaming service providers are competing to create platforms to watch videos on demand, for example Netflix, Iflix, VIU, Iqiyi, We TV, Mola TV, Disney+ Hotstar and so on. The following is the popularity of the 5 video on demand platforms most used in Indonesia, where this data is taken from application reviews on Google Playstore, Social blade, Ahref and from each Video on Demand application.

In addition, based on the results of a survey conducted by Fimela.com of 1,000 respondents in mid-May 2022, it was stated that there are 5 platforms currently dominating the video on demand streaming service market, such as Netflix (69%), Disney+ Hotstar (62%), Youtube (52%), Viu (36%) and Vidio (25%). This is also supported by the results of the interviews which state that the average respondent chooses Netflix based on the quality of its system.

LITERATURE REVIEW

2.1 Streaming.

Streaming is a process of sending data that contains content in the form of video and audio which is sent via the internet in real time so there is no need for a download process if you want to watch (Jatimtech Team, 2021). Video streaming or what is commonly called video and audio streaming is also the use of external devices to speed up a video and audio transmission over the internet (Kurniawati, 2019). Streaming works by files used for streaming encoded and highly compressed to use as little bandwidth as possible. This helps process files faster so users can enjoy them in real time (Resa Risyan, 2021).

2.2 Subscription Video on Demand.

Of the many video streaming platforms in Indonesia, there are five platforms that are relatively open in the context of data access, including Netflix, HBO, Disney+ Hotstar, iTunes and Google. In accessing movies and videos provided by Google, people still have to rent the films they want to watch, not paying a month or year subscription fee like on the Netflix, Disney+ Hotstar and HBO platforms. The subscription to the video on demand platform can be called a video on demand subscription (Data Driven Storytelling, 2021). The growth of video on demand subscriptions can be seen in the following graph.

Estimated Development of Subscription Video on Demand in Indonesia Source: (Data Driven Storytelling, 2021)

Fig.1 Subscription Video on Demand

2.3 Decision Support System

According to Yanifa, Arifanto and Nilogiri in their research in 2017 with the title Implementation of MOORA on scholarship acceptance at the Muhammadiyah University of Jember Web-Based (Yanifa et al., 2019), concluded that a decision support system is a system that assists decision making in complementing information from data that has been processed is relevant and needed to make a decision about an issue so that it becomes fast and accurate.. Some of the benefits of the Decision Support System include (Maya Utami Dewi M.Kom, 2021):

1. Support an effective decision-making process and focus on reception-based management systems.
2. Display interface that controls and controls the decision-making process.
3. Having subsystems that are well integrated with each other so that they become one unit with items or components.

2.4 Analytical Hierarchy Process (AHP) Method

The AHP method is one of the most commonly used problem solving methods / decision support models. Developed by Thomas L. Saaty in the 1970s, this model uses multi-criteria decision making that can help human thinking, where the main tool of AHP is a functional hierarchy whose main input is human perspective or perception. AHP helps solve complex problems by compiling a hierarchy of criteria which will be assessed subjectively and then various considerations are drawn to develop weights or priorities (conclusions).

2.5 AHP Procedure

According to Saaty, there are several main principles in solving problems using the AHP method. These main principles are (Muchlisin Riadi, 2020):

- Decomposition Problem

Decomposition of the problem is to describe a step for a goal systematically into a structure which will be arranged in the form of a series of systems so that the goal can be achieved rationally. The hierarchical structure of the decision can be said to be complete and incomplete.

- Comparative Judgment

This principle provides an assessment of elements with relative importance at a certain level in relation to the level above it. The assessment is displayed in the form of a pairwise comparison matrix, namely a pairwise comparison matrix that contains the preference levels of several alternatives for criteria.

2.6 Multi-Objective Optimization on the Basis of Ratio Analysis (MOORA) Method

The MOORA method is a multiobjective system that optimizes two or more attributes simultaneously, this definition was found in 2006 which was introduced by Brauers and Zavadskas (Andy Nugroho, 2021). MOORA was originally by Brauers in 2004 used to solve various complex decision selection cases in the scope of factory work.

2.7 MOORA Calculation Steps

a. Identify evaluation attributes and input criteria values.

b. Create a decision matrix with alternatives as rows and criteria as columns (Cahya Dsn,
2021).

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1i} & \cdots & x_{1n} \\ \vdots & & \vdots & & \vdots \\ x_{j1} & \cdots & x_{ij} & \cdots & x_{jn} \\ \vdots & & \vdots & & \vdots \\ x_{m1} & \cdots & x_{mi} & \cdots & x_{mn} \end{bmatrix}$$

Fig.2 Decision Matrix

With Description:
xij = Alternative response j on criterion i
i = 1,2,3,..n is the attribute or criterion order number
j = 1,2,3,..,n are alternative sequence numbers
X = decision matrix

2.8 Normalization on the matrix

By normalizing the matrix, all elements will be unified so that each element in the matrix has the same value. Brauers concludes that for the denominator, where is the square root of the sum of the squares of each alternative per attribute. Formulated with (Cahya Dsn, 2021).

$$X^*ij = \frac{x_{ij}}{\sqrt{[\sum_{j=1}^{m} x_{ij}^2}}$$

Fig. 3 Normalization Matrix

With Description:
xij = Alternative matrix j on criterion i
i = 1,2,3,..n is the number of attributes or criteria
j = 1,2,3,..,n is the number of alternatives
X = alternative normalization matrix j on criterion i

2.9 Optimization value calculation

Perform a search for the minimum and maximum values of each criterion. Where this maximum value is for the criteria that are profitable (benefit) and this minimum value is for the criteria that are not profitable (cost) (Cahya Dsn, 2021).

The calculation stage starts from adding up the values of the criteria that are profitable (from j to g), then subtracting them with unfavorable criteria values (g + 1 to n) for each alternative, the equation is as follows (Nugroho, 2018):

$$y_i = \sum_{j=1}^{g} x_{ij} - \sum_{i=g+1}^{n} x_{ij}$$

Fig. 4 Optimazion value

With description:

j = 1,2,…, g is the number of types of maximized criteria

i = g+1, g+2, … , n is the number of types of minimized criteria

y_i = the value of the normalized assessment of alternative i against all criteria

x_ij = value of alternative i on criterion j.

2.10 Previous Research

Tabel 8. Previous Research

No	Author	Research Title	Research Purpose	Result of Researh
1	Agustini F, Khoirun N. (2021)	Penerapan Model AHP Pada Pemilihan Aplikasi Streaming Drama Korea	To help users find out how to choose a streaming application to watch Korean dramas as desired.	The results showed that VIU is the best alternative for selecting Korean drama streaming applications using the Analytical Hierarchy Process (AHP) which gets a weight of 0.499 or equivalent to 49.9% of the other alternatives.
2	Advent Prasetyo Nugroho (2018)	Sistem Pendukung Pengambilan Keputusan Pemilihan SMA Swasta dengan metode MOORA	To provide convenience in choosing a school by using a computerized application and helping prospective students get school recommendations that suit their wishes.	SPPK Selection of Private High Schools has the ability to recommend high schools that match the desired criteria and has information about the school. The results of the trial analysis show that the use of this application is very easy and useful.

3	M.Irvan Irianto, Yolanda Okta Ria, Setya Khusna Rossy Pertiwi (2020)	Analisis Keputusan Pemilihan Aplikasi Streaming Film dan Drama menggunakan metode TOPSIS	To find out what applications are favored by UNAND Industrial Engineering Students.	The film and drama streaming application most chosen by Ahmad Dahlan University students is VIU with a percentage of 0.84917 compared to the others. The TOPSIS method approach can be used for cases of selecting online streaming applications with 4 criteria, namely subscription fees, variety of films, attractive appearance and services provided.
4	Cindy Asdya Ariadna (2019)	Pemilihan Aplikasi Streaming Film Terbaik Dengan Hybrid Entropy-Promethee II (Studi Kasus : Mahasiswa Universitas Brawijaya)	To choose a film streaming application that is used for Brawijaya University students.	The results of the analysis using the Entropy method found that there were 5 criteria used, namely: internet speed, film completeness, subscription price, storage capacity and speed in presenting new films. While the best streaming application obtained from the results of the analysis of the Entropy criteria and the Promethee II method for UB students is IFLIX.
5	Era Yunianto dan Ari Putra Wibowo (2020)	Implementasi Metode AHP dan MOORA untuk Pemeringkatan Marketplace Indonesia Tahun	To rank e-marketplaces in Indonesia in 2020 in the second quarter. Choosing the right e-marketplace can	The AHP method is used to weight criteria while MOORA is to rank alternatives. The criteria used are service quality,

		2020 Kuartal Kedua	improve profitabilitas bisnis.	system quality, vendor quality and information quality with alternative rankings namely Shopee (0.618), Tokopedia (0.568), and Bukalapak (0.542).
6	Alfiarini, Yoga Primadasa (2019)	Sistem Pendukung Keputusan Penilaian Kinerja Karyawan Menggunakan Pembobotan AHP dan MOORA	To assist agencies in providing optimal employee performance appraisals	The AHP method is used as a weighting criterion and MOORA as an alternative ranking with superior criteria, namely attendance and the priority alternative to be rewarded, namely Mr. Slamet.

RESEARCH METODELOGY

3.1 Research Framework

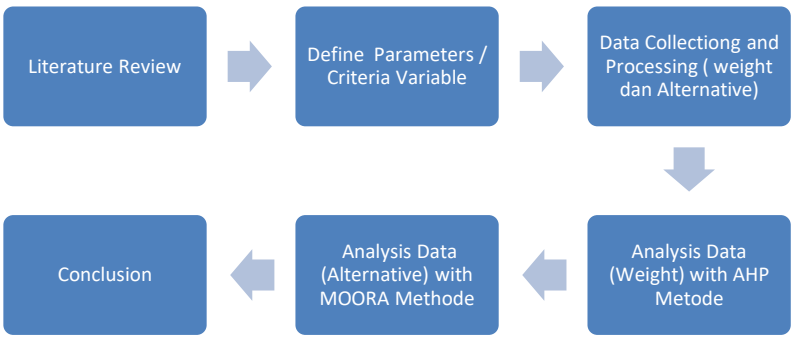
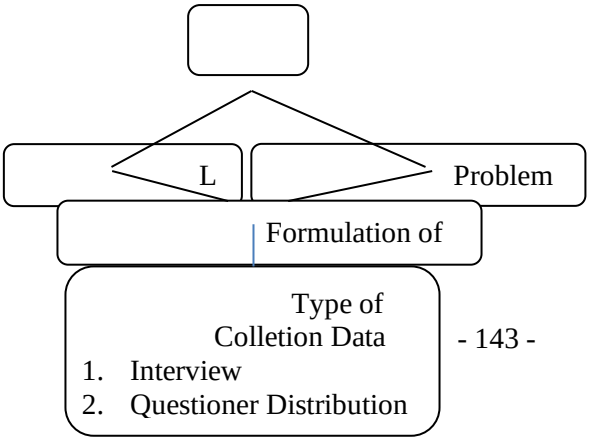
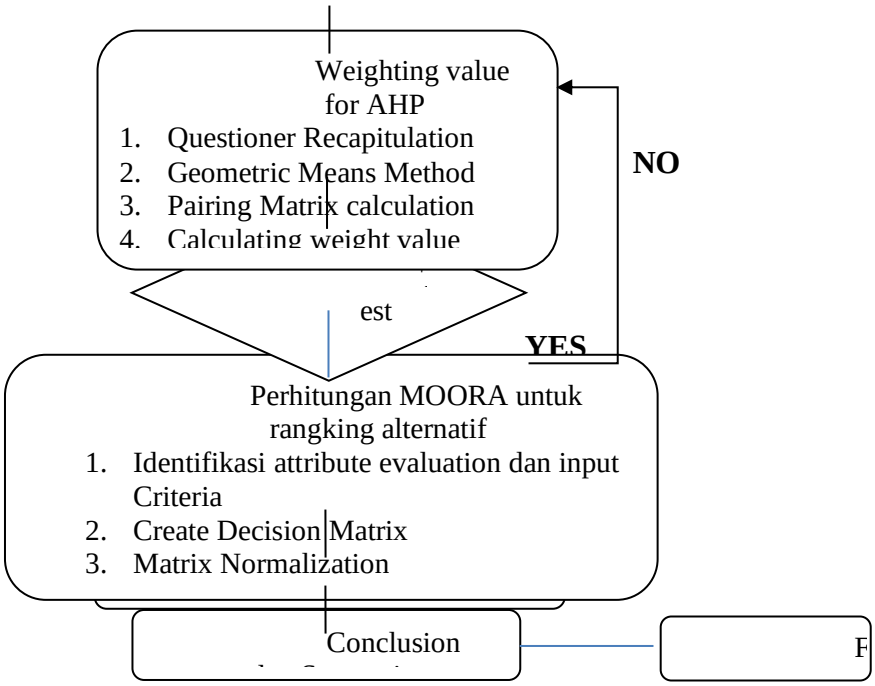


Fig 9. Research Framework

3.2 Problem Solving Framework





3.3 Moora Calculation Example

A user wants to find a good video on demand by selecting the video on demand platform and entering the weight of the criteria. Alternatives and criteria can be seen in the following table:

Table 1. Match rating data

No	Alternatif	Criteria			
		Price	Interface	Varian	Service
1.	Netflix	IDR 54.000	Clear	Very Complete	Easy
2	Disney+ Hotstar	IDR 39.000	Clear	Complete	Quite Easy
3	VIU	IDR 33.000	Unclear	Very Complete	Quite Easy
4	Iflix	IDR199.000	Very Clear	Complete	Not Easy
5	Vidio	IDR 199.000	Clear	Not Complete	Very Not Easy

1. Determine alternatives, criteria and weights.

Table 2. Criteria data

Kriteria	Information	Weights	Type
C1	Price	0.14	Cost
C2	Interface	0.17	Benefit
C3	Varian	0.20	Benefit
C4	Service	0.49	Benefit

1.a Criteria Price (C1)

Table 3. Price Criteria Weighting

Price	Weights	Value
180.000 – 200.000	Very Low	1
153.000 – 186.000	Low	2
120.000 – 153.000	Medium	3
54.000 – 120.000	High	4
0 – 54.000	Very High	5

1.b Criteria Interface (C2)

Table 4. Interface Criteria Weighting

Interface	Weights	Value
SD / 140p / UnClear	Low	1
HD / 720p / Clear	Medium	3
Ultra HD / 4K / Very Clear	High	5

1.c Criteria Variants (C3)

Table 5. Variant Criteria Weighting

Variant	Weights	Value
Not Complete	Low	1
Complete	Medium	3
Very Complete	High	5

1.d Criteria System (C4)

Table 6. Service Criteria Weighting

Service	Bobot	Nilai
Very Not Easy	Very Low	1
Not Easy	Low	2
Quite Easy	Medium	3
Easy	High	4
Very Easy	Very High	5

After doing the weighting of each criterion, then start entering the compatibility data against the weight value.

Table 6. Changing Data Values

No	Alternatif	Kriteria			
		C1	C2	C3	C4
1	Iflix	5	3	5	4
2	WeTv	5	3	3	3
3	VIU	5	1	5	3
4	Genflix	1	5	3	2
5	Vidio	1	3	1	1

The following are the steps for completing the MOORA method:

2. Create a decision matrix Xij.

$$Xij = \begin{pmatrix} 5 & 3 & 5 & 4 \\ 5 & 3 & 3 & 3 \\ 5 & 1 & 5 & 3 \\ 1 & 5 & 3 & 2 \\ 1 & 3 & 1 & 1 \end{pmatrix}$$

3. Matrix Normalization

- Criteria C1 (Price)
  $\sqrt{5^2 + 5^2 + 5^2 + 1^2 + 1^2} = \sqrt{77}$ = 8.77496 = 8.7750
- Criteria C2 (Interface)
  $\sqrt{3^2 + 3^2 + 1^2 + 5^2 + 3^2} = \sqrt{53}$ = 7.2801
- Criteria C3 (Varian)
  $\sqrt{5^2 + 3^2 + 5^2 + 3^2 + 1^2} = \sqrt{69}$ = 8.3066
- Criteria C4 (Sistem)
  $\sqrt{4^2 + 3^2 + 3^2 + 2^2 + 1^2} = \sqrt{39}$ = 6.2449

Based on the above normalization calculations, the following is the normalized performance matrix

$$Xij = \begin{pmatrix} 0.5698 & 0.4120 & 0.6019 & 0.6405 \\ 0.5698 & 0.4120 & 0.3611 & 0.4803 \\ 0.5698 & 0.1373 & 0.6019 & 0.4803 \\ 0.1139 & 0.6868 & 0.3611 & 0.3202 \\ 0.1139 & 0.4120 & 0.1203 & 0.1601 \end{pmatrix}$$

4. Weight normalized matrix (calculating optimization values)

Weight Normalized matrix value from Calculation each Criteria (C) and Alternatif (A), so that we get value from that calculation as show in table 7, below.

Calculate for yi value = Max – Min

Table 7. Optimization Value Calculation

Alternative	Max (C2 + C3 + C4)	Min (C1)	Yi = Max – Min
A1	(0.0700 + 0.1203 + 0.3138)	0.0797	0.3371
A2	(0.0700 + 0.0722 + 0.2353)	0.0797	0.2978
A3	(0.0233 + 0.1203 + 0.2353)	0.0797	0.2992
A4	(0.1167 + 0.0722 + 0.1568)	0.0159	0.3298
A5	(0.0700 + 0.0240 + 0.0784)	0.0159	0.1565

5. Alternative Ranking

Tabel 8 . Alternative Rangking

Alternative	Yi	Ranking
Iflix	0.3371	1
WeTv	0.2978	4
VIU	0.2992	3
Genflix	0.3298	2
Vidio	0.1565	5

ANALYSIS AND DISCUSSION

4.1 Determination and Assessment of Criteria with AHP

In selecting and setting criteria, data sources were obtained from various sources such as scientific journals, respondent interview data and articles. The alternatives chosen here are 5 of the biggest video on demand streaming platforms in Indonesia, namely Netflix, Disney+ Hotstar, Youtube (Premium), VIU and VIDIO. From the results of interviews with respondents, as well as data collection from scientific journals were analyzed so that the dominant factors were obtained which were the criteria for selecting the best video on demand service. The following table shows the criteria and sub criteria used in this study.

1. Geometric Means

Data taken from 10 respondens. After obtaining the value of each respondent in the pairwise comparison form for the criteria, then a calculation will be carried out in the form of the geometric mean of the 10 respondent assessment matrices. Here's the calculation:

Calculation :

GM11 = $\sqrt[10]{1}$ =1 GM22= $\sqrt[10]{1}$ =1

GM12= $\sqrt[10]{1/43008}$ = 0,34 GM23= $\sqrt[10]{84015792}$ = 6.20

GM13= $\sqrt[10]{19600/9}$ = 2.16 GM24= $\sqrt[10]{80/7}$ =1.28

GM14= $\sqrt[10]{7/196830}$ = 0.36 GM31= $\sqrt[10]{19000/600}$ = 0.46

GM21= $\sqrt[10]{43008}$ = 2.91 GM32= $\sqrt[10]{1/84015792}$ = 0.16

GM33= $\sqrt[10]{1}$ =1 GM43= $\sqrt[10]{45/2}$ = 1.37

GM34= $\sqrt[10]{2/45}$ = 0.73 GM44= $\sqrt[10]{1}$ = 1

GM41= $\sqrt[10]{196830/7}$ = 2.79

GM42= $\sqrt[10]{7/80}$ =0.78

After calculating, the Geomean results, namely a single matrix, are then inputted into the table below:

Table 11. Single Matrix of Pairwise Comparison of Criteria

Kriteria	Harga	Kualitas Sistem	Tampilan	Varian
Harga	1.00	0.34	2.16	0.36
Kualitas Sistem	2.91	1.00	6.20	1.28
Tampilan	0.46	0.16	1.00	0.73
Varian	2.79	0.78	1.37	1.00
Jumlah	**7 .16**	**2 .29**	**1 0.72**	**3 .37**

2. Normalizing the Matrix to Obtain Criteria Weight

Table 12. Normalisasi Matriks dan Bobot Kriteria

Kriteria	Harga	Kualitas Sistem	Tampilan	Varian	Bobot Kriteria

Harga	0.14	0.15	0.20	0.11	**0.15**
Kualitas Sistem	0.41	0.44	0.58	0.38	**0.45**
Tampilan	0.06	0.07	0.09	0.22	**0.11**
Varian	0.39	0.34	0.13	0.30	**0.29**
Jumlah	**1.00**	**1.00**	**1.00**	**1.00**	**1,000**

3. Consistency Test

Table 13. Eigen Vector Results

Criteria	Price	System Quality	Display	Variant	*Eigen Vector*
Price	0.15	0.15	0.24	0.10	**0.65**
System Quality	0.43	0.45	0.69	0.37	**1.94**
Display	0.07	0.07	0.11	0.21	**0.47**
Variant	0.42	0.35	0.15	0.29	**1.21**

4.2 Calculate for Yi Value = Max – Min

Table 9. Yi Value

Alternatif	Max (C2 + C3 + C4)	Min (C1)	Yi = Max – Min
A1	(0.23 + 0.06 + 0.16)	0.06	0.39
A2	(0.22 + 0.06 + 0.14)	0.08	0.34
A3	(0.18 + 0.04 + 0.11)	0.07	0.26
A4	(0.20 + 0.04 + 0.12)	0.06	0.29
A5	(0.17 + 0.04 + 0.12)	0.06	0.27

4.3 Alternative Ranking

Table 10. Alternative Ranking

Alternatif	Yi	Ranking
Netflix	0.39	1
Disney+ Hotstar	0.34	2
Youtube Premium	0.26	5
Vidio	0.29	2
VIU	0.27	4

CONCLUSION

Based on the discussion that is counted in Chapter IV, conclusions are then drawn related to the problems that have been discussed. The conclusions that can be drawn from the calculations and data processing above are as follows:

1. The AHP and MOORA methods can be calculated in this study by calculating the weight of the criteria with AHP, where the determining criteria are Price with a criterion weight of 0.15, System Quality with a criterion weight of 0.45, Display with a criterion weight of 0.11 and finally Variant with a criterion weight of 0.29. The main criterion that excels in considering the selection of Video on Demand is the System Quality of the platform.

2. Calculations in this study calculate the ranking of alternatives using MOORA, where the chosen alternative is a platform that is often used by the community. The ranking value for the selected alternative is Netflix with a value of 0.39, followed by Disney+ Hotstar with a value of 0.34 then VIDIO which gets a value of 0.29, VIU with a value of 0.27 and finally, Youtube Premium with a value of 0.26. A quality platform recommendation to choose from is Netflix.

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