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IMPLEMENTATION OF THE SAW METHOD TO DISCOVER THE OPTIMUM INTERNET SERVICE RECOMMENDATIONS FOR ONLINE GAMING

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Abstract

Currently, the development and use of the Internet have a more complex function so that it can change the paradigm of people's lives, including in aspects of entertainment, especially games. With the rise of numerous ISPs in Indonesia, different internet service packages are now available, particularly for gamers, such as Indihome, Biznet, First Media, and My Republic. The variety of services makes it difficult for users to choose an internet package that suits their needs. Therefore, this research aims to build a decision support system that can facilitate users in choosing the ideal internet service for gamers based on five criteria: quota, network speed, connection, cost, and the number of users using the SAW method. The data collection methods used are observation, questionnaires, and interviews. The research results obtained from data processing using the SAW method through Microsoft Excel are then implemented into a website-based program. With this program, it is hoped that it can be a tool for users in determining the service package to be purchased.

Keywords: Internet Provider; Gamers; SAW Method

Abstrak

Saat ini perkembangan dan penggunaan internet telah memiliki fungsi yang lebih kompleks sehingga dapat memberikan dampak terhadap perubahan paradigma kehidupan masyarakat termasuk dalam aspek hiburan khususnya game. Munculnya berbagai ISP di indonesia menawarkan berbagai jenis paket layanan internet khususnya bagi para gamers dengan karakterisktik yang berbeda seperti Indihome, Biznet, First Media, dan My Republic. Dengan beragamnya layanan tersebut menyebabkan para pengguna kesulitan dalam memilih paket internet yang sesuai dengan kebutuhannya. Oleh karena itu, tujuan dibuatnya penelitian ini adalah membangun sistem pendukung keputusan yang dapat memudahkan pengguna dalam memilih layanan internet paling ideal bagi para gamers berdasarkan 5 kriteria yang terdiri dari kuota, kecepatan jaringan, koneksi, biaya, dan jumlah pengguna dengan menggunakan metode SAW. Adapun metode pengumpulan data yang digunakan yaitu dengan cara observasi, angket dan wawancara. Dari hasil penelitian diperoleh proses pengolahan data menggunakan metode SAW dengan Ms. Excel yang kemudian diimplementasikan menjadi sebuah pogram berbasis website. Dengan adanya program ini, diharapkan dapat menjadi alat bantu bagi para pengguna dalam menentukan paket layanan yang akan dibeli.

Kata kunci: Internet Provider; Gamers; Metode SAW

INTRODUCTION

Currently, the development and use of the Internet are not just for communication, social interaction, and business transactions (Haryadi & Hery, 2023) but also has a more complex function so that it can have an impact on changing the paradigm of people's lives, including in the aspect of entertainment (Hibaturrakhman & Pradana, 2021). One form of entertainment that is quite popular among children, teenagers, and even adults to have fun in their spare time is playing online games. (Muhammad Alwi, Ninis Anggraini, & Rodia, 2023). This game in cyberspace can be played locally,

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between countries, and even globally through devices connected to the internet network. (Tantoni, Zaen, & Imtihan, 2019). Based on the results of a report from Newzoo (Global Games Market Report) states that in 2018, there were 2.3 billion online game users in the world. (Mais, Rompas, & Gannika, 2020).

In Indonesia itself, internet users increased by 10.2% in 2021, so they are ranked as the 4th largest internet users in the world and have become one of the largest e-sports industry countries in Southeast Asia with 43.7 million active players (Hibaturrakhman & Pradana, 2021). Of course, this can happen because it is supported by optimal internet network quality, so the need for the bandwidth for each online game is an essential factor in determining the comfort of gamers, especially in terms of the speed and stability of the internet connection used (Tantoni et al., 2019).

An Internet Service Provider (ISP) is a company that provides Internet services, and the majority are telecommunication operators (Azhar & Destari, 2019). Each type of ISP in Indonesia has various characteristics regarding network quality, bandwidth, connection stability, price, and service maintenance (Nurajizah, Ambarwati, & Muryani, 2020). Many well-known ISPs among the public provide internet services, especially for gamers, including Indihome, Biznet, First Media, and My Republic. These internet services compete to provide the best service by offering different types of criteria and packages, and bandwidths (Aritonang & Cahyadi, 2023).

With the variety of packages each telecommunication operator offers, internet service users find it challenging to choose an internet package that suits their needs (Setyo Wira Rizki, 2019). Errors result from choosing inappropriate internet services, resulting in the purchased package not matching the usage time and relatively high price (Sopian & Ermatita, 2021). Therefore, users need to consider several criteria before choosing a service provider and buying an internet service package they will use (Saputra & Nugraha, 2020). These problems can be overcome using a decision support system, an information system capable of making various alternative decisions that can assist management in dealing with issues in an organized manner (Nurajizah et al., 2020).

One method that can be used in a decision support system is the Simple Additive Weighting (SAW) method. Several previous studies have used the SAW method to make the system, including research (Agustine & Seimahuira, 2023) that applies the SAW method in determining the results of comparing web server performance in the PHP programming language. Furthermore, research from (Dinar, Kuswara, Schaduw, & Utami, 2020) dan (Ristiana & Jumaryadi, 2021) have similarities, namely that both produce decisions in choosing a product to be used based on several criteria in the scope of the research object. Then, research was conducted to determine the best and most competent trucking services according to the standards required by PT Yicheng Logistics (Dameria & Nursyanti, 2022). Finally, (Kusumantara, Putra, Mukaromah, & Ayyubi, 2021) research resulted in the conclusion that the SAW method approach was considered more relevant than the Analytic Hierarchy Process (AHP) method in the case study of choosing an online learning media platform in the UPN Veterans Information Systems study program environment in East Java.

Based on the above explanation, this research aims to create a decision support system by applying the SAW method to determine the best internet service recommendations for online gaming. With this research, it is expected to provide an output contribution in the form of a decision support system as a tool in facilitating gamers determine the ideal internet service objectively based on the criteria used, including the type of quota, connection, cost, and network speed, as well as the number of users.

RESEARCH METHODS

This research has the following research flow:

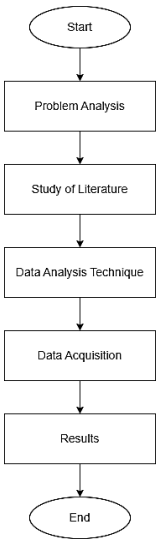

Figure 1. Research Flow

Figure 1 illustrates the stages or steps taken to achieve the results of this study. This stage begins with problem analysis, namely conducting an

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incident analysis to find out and learn more about the situation in the field. The next step is a literature study, namely steps related to data collection and finding solutions to problems by studying existing sources. Next is the data analysis technique, which is a technique or method for processing data to produce effective and easily understood information by the general public. Next is data acquisition, which is collecting sample data so that the calculation process can be carried out using a predetermined method. The final step is implementing the data processing results into a website-based program.

Data, Instruments, and Data Collection Techniques

Data collection was carried out using observation, questionnaires, and interviews. In the observation technique, the researcher directly observes the place and object to be studied. The objects of this research are game users and internet service provider marketing. For further data collection, a questionnaire was distributed to 30 game users. As well as conducting interviews with marketing internet service providers to find information about internet service packages.

Data Analysis Technique

The next step is to analyze the data obtained from the data collection results in the early stages of research. At this stage of analysis, the simple adaptive weighting (SAW) method is used with the following stages:

1. Determine the criteria used as a reference in decision-making, namely Ci.
2. Determine an alternative internet service that has packages for gamers.
3. It is entering the attributes into each criterion that has an alternative.
4. We are determining the percentage priority weight of the needs of gamers for internet services.
5. Determine the categories of benefits and costs.
6. Assigns a value to criteria that have fuzzy numbers.
7. Normalize the criteria attribute by using the following formula:

If j is a cost

$$r_{ij} = \frac{x_{ij}}{\max x_{ij}} \quad \text{.....(1)}$$

If j is a benefit

$$r_{ij} = \frac{\min x_{ij}}{x_{ij}} \quad \text{.....(2)}$$

Description:
r_{ij} = Normalization matrix
X_{ij} = Criteria
Max X_{ij} = The most significant value of the criteria
Min X_{ij} = The smallest value of the criteria

8. Rank the criteria by calculating the normalized data results with the priority percentage weights with the following formula:

$$V_i = \sum_{j=1}^{n} w_j \, r_{ij} \quad \text{.....(3)}$$

Description:
V_i = Alternate value of calculation results
W_j = Predefined percentage weight
r_{ij} = Normalization matrix

Data Acquisition

In this study, the determination of criteria and alternatives was carried out by observation and literature study by looking for information directly in the field, meeting Internet service providers for special game packages available, and looking for additional information via the Internet by visiting the Internet service provider's website.

Based on the data collection and analysis that has been carried out, information has been obtained about several providers that provide game package services (See Table 1.).

Table 1. Internet Service Data Games Package

Package Name	Quota	Network Speed	Connection	Cost	Total Users
Indihome Gamer 3P (Indihome)	Unlimited	100 Mbps	Fiber Optic	Rp. 965.000	12
Home Gamers (Biznet)	Unlimited	250 Mbps	Fiber Optic	Rp. 700.000	40
Paket Stream (First Media)	Unlimited	250 Mbps	Fiber Optic	Rp. 695.000	15
MyGamer (My Republic)	Unlimited	250 Mbps	Fiber Optic	Rp. 794.550	20

Based on these data, it can be concluded that the selection of internet services for games can be seen by the five criteria used: quota, network speed, connection, cost, and total users. Then the five

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criteria are given a weight to determine the priority of each criterion.

Table 2. Criterion weight

Criteria	Bobot
Quota	15%
Network Speed	25%
Connection	20%
Cost	30%
Total Users	10%

Based on the weight percentage in Table 2, it shows that the highest priority is owned by the cost criteria with a percentage of 30%, and the lowest weight is owned by the number of users criteria with a percentage of 10%. Alternatives obtained from observations for the Sukabumi location with the following data:

Table 3. Game Package Alternative

Alternative	Internet Game Packages
A1	Indihome Gamer 3P (Indihome)
A2	Home Gamers (Biznet)
A3	Paket Stream (First Media)
A4	MyGamer (My Republic)

Table 3 shows the types of alternatives consisting of four internet service providers that have game packages, namely Indihome with the name Indihome Gamer 3P Package, Biznet with the title Home Gamers Package, First Media with the Stream package, and My Republic with the Mygamer Package.

The next step is to assign a value to each criterion used. For quota criteria, network speed, connection, and costs will be assigned a value from lowest to highest to facilitate normalization.

Table 4. Criteria Value in Each Category

Criteria	Crips	Weight of Crips
Quota (C1)	Limited	1
	Unlimited	2
Network Speed (C2)	< 10 Mbps	1
	10,1 – 30 Mbps	2
	30,1 Mbps - 50 Mbps	3
	50 Mbps - 100 Mbps	4
	> 100 Mbps	5
Connection (C3)	Wireless	1
	Fiber Optic	2
Cost (C4)	< Rp. 200.000	1
	Rp. 200.001 – Rp. 300.000	2
	Rp. 300.001 – Rp. 500.000	3
	Rp. 500.001 – Rp. 900.000	4
	> Rp. 900.001	5
Total Users (C5)	-	-

Criteria with fuzzy data have been given values to show the data obtained in Table 5.

Table 5. Criteria After Being Given a Value

Alternative	C1	C2	C3	C4	C5
A1	2	4	2	5	12
A2	2	5	2	4	40
A3	2	5	2	4	15
A4	2	5	2	4	20

These criteria must be given categories before normalization is carried out by looking at the value of each criterion, whether it is a benefit or a cost, and the results are shown in Table 6.

Table 6. Category of Criteria

Criteria	Category
Quota	Benefit
Network Speed	Benefit
Connection	Benefit
Cost	Cost
Total Users	Benefit

RESULTS AND DISCUSSION

The results of this research are in the form of calculation results using the Simple Additive Weighting (SAW) method and have been implemented into a program.

Simple Additive Weighting (SAW)

Based on Table 5 in the data acquisition, a normalization matrix is then made that is adjusted to the benefit and cost attributes, as follows:

$$X = \begin{vmatrix} 2 & 4 & 2 & 5 & 12 \\ 2 & 5 & 2 & 4 & 40 \\ 2 & 5 & 2 & 4 & 15 \\ 2 & 5 & 2 & 4 & 20 \end{vmatrix}$$

From the normalization results, the normalization matrix is obtained as follows:

$$r = \begin{vmatrix} 1{,}0 & 0{,}8 & 1{,}0 & 0{,}8 & 0{,}3 \\ 1{,}0 & 1{,}0 & 1{,}0 & 1{,}0 & 1{,}0 \\ 1{,}0 & 1{,}0 & 1{,}0 & 1{,}0 & 0{,}4 \\ 1{,}0 & 1{,}0 & 1{,}0 & 1{,}0 & 0{,}5 \end{vmatrix}$$

Furthermore, it will look like Table 7 if converted into a table.

Table 7. Normalized Criteria

Alternative	C1	C2	C3	C4	C5
A1	1,0	0,8	1,0	0,8	0,3
A2	1,0	1,0	1,0	1,0	1,0
A3	1,0	1,0	1,0	1,0	0,4
A4	1,0	1,0	1,0	1,0	0,5

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After obtaining the normalized matrix, a calculation is carried out for each weight percentage determined at the beginning of Table 2. From these calculations, the following results are obtained:

Table 8. The calculation results

Internet Games Package	Results
Indihome Gamer 3P (Indihome)	0,8
Home Gamers (Biznet)	1,0
Paket Stream (First Media)	0,4
MyGamer (My Republic)	1,0

The results of calculations using the SAW method for selecting game package internet services can be seen in Table 8, with the highest recommendation being the Home Gamers package from Biznet and MyGamer from My Republic.

User Interface

No	Kode	Nama Alternatif
1	A1	Indihome Gamer 3P (Indihome
2	A2	Home Gamers (Biznet)
3	A3	Paket Stream (First Media)
4	A4	MyGamer (My Republic)

Figure 2. Alternative Input

Figure 2. is a user interface display of alternative inputs. On this page, the user can manage the alternatives used through various buttons, starting from the add, refresh, print, edit, and delete buttons.

The alternatives inputted on the page will be used as a user guide in determining the selection of Internet game packages. Users must input attributes or criteria for each alternative by selecting the edit button. Each attribute or criterion on this page will have its respective properties, which will then be given a weight.

Normalisasi

Nama Paket	C1	C2	C3i	C3	C4
Indihome Gamer 3P	1,0	0,8	1,0	0,8	0,3
Home Gamers	1,0	1,0	1,0	1,0	1,0
Paket Stream	1,0	1,0	1,0	1,0	0,4
MyGamer	1,0	1,0	1,0	1,0	0,5

#	Kuota	Kecepatan Jaringan	Koneksi	Biaya	Jumlah Pengguna	Total	Rank
Bobot	0,15	0,25	0,20	0,30	0,10		
Indihome Gamer 3P	Unlimited	100 Mbps	Fiber Optic	Rp965.000	12	0,8	4
Home Gamers	Unlimited	250 Mbps	Fiber Optic	Rp700.000	40	1,0	1
Paket Stream	Unlimited	250 Mbps	Fiber Optic	Rp695.000	15	0,9	2
MyGamer	Unlimited	250 Mbps	Fiber Optic	Rp749.550	20	1,0	1

Figure 3. Ranking Page

Figure 3. shows the user interface of the ranking page. This page displays the calculation results from the SAW method based on alternatives that have been processed to become normalized values for each criterion. The table in Figure 3 contains the requirements attributes and the total calculation after being given a weight. Meanwhile, the far right column shows the number of measures and ratings for each criterion.

CONCLUSIONS

Based on the research results from data collection to data analysis, it can be concluded that the SAW method is suitable for decision support systems by considering the selected criteria. The criteria include Quota, Network Speed, Connection, Cost, and Total Users. The calculation results from this method display a rating for each internet gamers package from the highest to the lowest. The research results found that Home Gamer and My Gamer were the best alternatives for recommendations for internet gamers' packages. This is proven based on the normalized criteria results, which show that the two internet packages have the most prominent value compared to the others.

Some suggestions for future research include adding alternatives and other attributes so that the decision results obtained by users become more varied. In addition, other decision support methods, such as AHP and TOPSIS, should be used to maximize the performance of SAW in the built system.

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