



Decision Support System for Internet Service Provider Selection with Weight Product Method

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ABSTRACT

People's need for internet connection is a must nowadays, as everyone surely performs all activities through the internet. All activities require internet connection, be it work, lectures, gaming, household payments, shopping and many other activities that are done online. However, because people still rely on the experiences of other users when choosing Internet providers, it is difficult to find a fiber Internet service provider whose quality of service meets one's needs. The decision support system can help people choose an Internet service provider efficiently. The decision support system for fiber optic Internet service provider selection uses the weighted product method, which is one of the methods in the decision support system. The weighted product method is considered suitable to determine the best fiber optic internet service provider in North Jakarta with the appropriate weighting. The stages of the weighted product method include determining the priority value of each criterion, calculating the weight of the criterion, calculating the vector S_i , calculating the vector V_i , and making the decision based on the results of the vector V_i calculations. The largest V_i value is the best alternative option. The results of this study are proven to be able to provide an objective alternative for choosing the best Internet service provider in the North Jakarta area.

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1. Introduction

Rapidly developing information technology makes all the necessities of life available very easily, quickly and efficiently [1]. One of the technological developments is the Internet, which is used for free communication [2]. The use of the Internet is increasing with the growing needs of people in the field of telecommunications and information [3]. Indonesia is the country with the 4th or 64% most internet users in 2020 [4]. The high number of Internet users in 2020 is comparable to the development of cell phones by 90.75% and the increase in Internet service providers (ISP) [5]. Thus, it can be said that the ease of Internet access is due to the large number of Internet package services offered by the provider [6].

Internet Service Provider (ISP) is a company that provides Internet network services to businesses and individuals. The cables commonly used by ISPs are copper and fiber optic cables. The cost of installing copper cables is cheaper, but the efficiency is lower than fiber optics. Although the transmission system using

fiber optic cables is more efficient and faster [7][8]. Internet service providers offer various services, including basic Internet services and Internet services with content [9]. However, it is still difficult for people to find a fiber optic ISP with the quality of service that meets their needs because most people choose ISPs based on experience and advice from other users [10]. By building a decision support system, it can help the community in making more efficient decisions. [11].

The development of ISP decision support systems is mostly carried out by various methods, such as the Analytical Hierarchy Process (AHP) [12], *Analytic Network Process* (ANP)[13], *Elimination and Choice Translation Reality* (ELECTRE)[14], and *Weighted Product* (WP) [15]. Prihartono and Magdalena applied AHP in determining the best ISP in Pangkalpinang. AHP can determine criteria and strategies from the perspectives of ease of use, data transfer speed, type of service, Internet access limitations, network level, and card type. [16]. However, the AHP has weaknesses in giving weighting values because it depends on the subjectivity of the point of view [17]. Hatta used ANP to select ISPs for Internet packages, and 95% of respondents were able to select ISPs appropriately and according to their needs. [18]. In addition, Dahanum et al. implement ELECTRE in the decision support system for selecting Internet service providers used by the community and businesses in Medan City. The criteria used are ISP credibility, cost, security, and customer satisfaction. ELECTRE can provide solutions to the decision priorities by comparing each of the alternative criteria in pairs. However, the weighting of importance cannot be accurately measured because the criteria used are only a few [19]. Marwa Sulehu conducted research in 2015 and used WP to determine the best ISP in STMIK AKBA with objective and accurate weighting as it uses many relevant criteria [20].

Based on the above problem description and previous research, the WP method can be applied to the decision support system for selecting the best fiber optic ISP in North Jakarta, which is expected to help the public determine the fiber optic ISP that meets their needs.

2. Research Method

In determining the best ISP in this study, the weighted product method is used, which involves several steps [21]:

1. Determining criteria and weights.

Determining criteria and weights are criteria that will be used as a reference in decision making based on the nature of each criterion [22]. Several decision-making criteria are set to choose the highest quality fiber optic ISP. The predetermined C_j criteria are:

- C1: ISP Reputation.
- C2: Bandwith Capacity.
- C3: Price.
- C4: Number of grapari.
- C5: Number of user.
- C6: Security level in blocking sites.
- C7: Connection requests.
- C8: Package Variations.
- C9: Subscription terms
- C10: Technical services
- C11: Actual download and upload speeds

2. Assess each alternative (A_i) for each specified C_j .

A_i selection is based on the 3 highest preference values. Data retrieval is taken from fiber optic ISP users in Kelapa Gading area, North Jakarta, a total of 9 ISPs, namely: Indihome, Biznet, FirstMedia, Transvision, CBN, MyRepublic, Oxygen, MNCPlay, XL Home.

3. Calculates the weight of the criteria for producing a weight value (W_j) = 1. Using the equation (1) [23].

$$W_j = \frac{w_j}{\sum w_j} \quad (1)$$

4. Calculates the S_i vector by changing all the predefined W_j . The positive value is used for the benefit criterion and the negative value for the cost criterion. Equation (2) is used to determine the value of the vector S_i . [24]

$$S_i = \prod_{j=1}^n x_{ij}^{w_j} \quad (2)$$

- Calculates the value of the vector V_i by dividing each result of the vector S_i against the total of all Vector S_i . Vector values V can be calculated using formulas in Equations (3)[25].

$$V_i = \frac{\prod_{j=1}^n x_{ij}^{w_j}}{\prod_{j=1}^n (x_j^w)^{w_j}} \tag{3}$$

Vector V_i is an alternative preference used for ranking as the final solution.

3. Result and Discussion

The survey results of 26 respondents for 9 providers (Indihome, Biznet, FirstMedia, Transvision, CBN, MyRepublic, Oxygen, MNCPlay, XL Home), 46.2% use Indihome, 19.2% FirstMedia and 15.4% Biznet. The selection of providers is divided into 5 priorities (Table 1), with all respondents judging according to criteria (Table 2) established by experts with experience in the field of computer networks.

Table 1. Priority Weights

No	Rating	Weight
1	Very Important	5
2	Important	4
3	Usual	3
4	Unimportant	2
5	Very Unimportant	1

Table 2. Priority Criteria

Criteria	Information	Weight
C1	ISP Reputation	4
C2	Bandwith Capacity	4
C3	Price	5
C4	Number of grapari in North Jakarta area	1
C5	Number of user	2
C6	Security level in blocking sites	4
C7	Connection requests	4
C8	Packages variation	4
C9	Subscription terms	3
C10	Technical services	5
C11	Actual download and upload speeds	5

Table 3. Alternative Values and Criteria

Ai	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Indihome	6,1	35	455666	2	12	7,9	2,8	37	7	2,6	7
Biznet	8,5	82,25	429000	5	4	7,5	4	5	9	2,5	8,5
FirstMedia	6,8	23	353935	1	5	8	2,6	9	8,8	3	6,2
Transvision	0	0	0	0	0	0	0	12	0	0	0
CBN	0	0	0	0	0	0	0	6	0	0	0
MyRepublic	0	0	0	1	0	0	0	8	0	0	0
Oxygen	0	0	0	0	0	0	0	4	0	0	0
MNCPlay	0	0	0	4	0	0	0	4	0	0	0
XL Home	0	0	0	0	0	0	0	6	0	0	0

Table 3 shows the priority values of the criteria for each A_i . Biznet has the highest reputation and the largest bandwidth at a cheaper price compared to the other ISP alternatives. It can be concluded that respondents in the North Jakarta area use only 3 ISPs, namely: Indihome, Biznet and Firstmedia.

Table 4. Criteria Weight Value

W_j	Nilai W_j
W_1	0,0930
W_2	0,0930
W_3	0,1162
W_4	0,0465
W_5	0,0465
W_6	0,0930
W_7	0,0930
W_8	0,0930
W_9	0,0930
W_{10}	0,1162
W_{11}	0,1162

Equation 1 yields the weighting values of the criteria in Table 4, indicating that respondents prefer price, technical service, actual download and upload speed compared to the number of grapari and users when choosing an Internet provider in the North Jakarta area, with the highest weighting being 0.1162.

Table 5. Preference Criteria Value

S_j	Value S_j
S_1	1,3158
S_2	1,3119
S_3	1,0926
S_4	0
S_5	0
S_6	0
S_7	0
S_8	0
S_9	0

The preference score of the criteria per alternative using Equation 2 yielded the results of the respondents' evaluation shown in Table 5, with Indihome individually receiving the highest score.

Table 6. Best Fiber Optic ISP Value

Ranking	Alternative	Nilai Vector V_i
1	Indihome	0,3537
2	Biznet	0,3526
3	FirstMedia	0,2937

Based on Equation 3, which is used to compare the preference values of the criteria per alternative, the recommendation of the best fiber optic Internet provider in the North Jakarta region is obtained (Table 6). In order from the largest V_i vector value to the smallest V_i vector value, Indihome is the best ISP with a choice of package options offered to users in North Jakarta, even though Biznet and Firstmedia are priced lower.

4. Conclusion

In this study, the evaluation of Internet service providers was conducted with the help of a decision support system using the weight product method, which is expected to objectively determine the fiber optic ISP of the North Jakarta area according to the needs of the community. It can be concluded that:

1. Based on the priority value criteria for each A_i respondent in North Jakarta using 3 ISPs (Indihome, Biznet, and Firstmedia) with Biznet having a good reputation, the highest bandwidth, and lowest prices.
2. It can be concluded that respondents prioritize price, technical services, actual download and upload speeds compared to the number of grapari and users in choosing an Internet Service Provider in the North Jakarta area.
3. Based on the final results of this study, It was determined that Indihome was the best ISP with the highest recommendation value of 0.3537. Indihome excels at the large variety of packages offered to users in North Jakarta even though in terms of prices Biznet and Firstmedia have cheaper prices.

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