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Research paper

The Preference Selection Index Method in Determining the Location of Used Laptop Marketing

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Abstract

The rapid development of laptops has caused users to renew their laptops. This has resulted in many laptops that are still suitable for use, and are still in great demand by the public, even though the laptop is not new anymore. In order for the sale of used laptops to be right on target for those in need, of course, in this case, the marketing area selection must be right. The choice of marketing area is an important thing in sales activities. Many factors are needed in the selection of a marketing area, including rental prices, area, visitors, distance. In order for the decision to choose this marketing area to be effective, a decision support system is needed that can provide the right decision in processing alternatives. In this study, the author uses the Preference Selection Index (PSI) method. It is expected that the PSI method is able to process alternatives according to the specified criteria.

Keywords: *Marketing Location, Used Laptop, PSI, Preference Selection Index, DSS*

1. Introduction

The laptop is a portable computer that is small, lightweight, can be carried easily. The function of a laptop is generally the same as a desktop computer, it's just that its size is reduced, made it lighter and more power efficient. Most laptops use a 10-inch to 17-inch LCD screen (Liquid crystal Display).

At present laptops are a basic need for the community, both education, and daily activities. Today many brands and types of laptops are sold in the market, of course with varying prices. The number of specifications of the laptop so that users become difficult to determine the right choice, according to their needs. Not infrequently also users buy laptops with specifications that are not in accordance with their use from various types of laptop brands, specifications, and functions. The funds that must be spent to buy a new laptop are not small in number, and this is one of the main reasons for people to buy second-hand laptops. The price of used laptops can be obtained at prices that are more tilted when compared to new laptops of the same quality. So that consumers are more interested in buying used laptops, one factor that must be considered in marketing is the location of the sale. The location of sales is a factor that must be considered by sales in used laptop marketing.

Medan is one of the cities that is used as the location for marketing used laptops. Because Medan is the third metropolitan city in Indonesia with very rapid economic growth. It is very well suited as a target location for used laptop marketing, but with the many locations found in the city of Medan, it makes the seller feel the difficulty in determining the most suitable location for the sale of used laptops. To overcome this, a system that can help complete the location of used laptop marketing can be used as the right target marketing location. This system is known as the decision support system (DSS). DSS is a system used by decision-makers to assist in making decisions effective [1][2]. There are many methods in decision support systems, which are very helpful in making decisions effective, including Elimination and Translation Reality Choice (ELECTRE) [3], Simple Addictive Weighting (SAW) [4], EXPROM II, TOPSIS, Fuzzy Tahani, PSI [5]–[7].

Many studies have been carried out specifically related to decision support systems, such as research conducted by Syafrida Hafni Sahir (2017), the application of Fuzzy Tahani helps buyers in determining the best laptop to buy according to the needs of the wearer[5]. Dodi in 2017, examined the application of VIKOR in producing multi-criteria-based decisions [8]. Mesran in the study also discussed the use of COPRAS to determine the best mango seeds that farmers choose to cultivate [9].

In this study, researchers used the Preference Selection Index (PSI) method in solving problems related to multi-criteria in decision making (MCDM) specifically to determine the location of used laptop marketing.

1. Methodology

1.1 Marketing

Marketing is one of the activities in the economy that helps in creating economic value. The economic value itself determines the price of goods and services. Important factors in creating this value are production, marketing, and consumption. Marketing is the link between production and consumption activities.
Marketing is a process in which individuals and groups get what they need and want by creating, offering valuable products to others. The definition of the two opinions above explains that marketing activities cover a very broad scope of activities which starts with determining consumer needs and ends with customer satisfaction. For a consumer-oriented company, it starts and ends with consumer satisfaction. In other words, marketing activities begin and end with consumers. This means starting by determining what consumers want and ending with customer satisfaction.

1.2 Location

The choice of business location is one of the business decisions that must be made carefully. A business located on the main road is a factor that determines business continuity, especially those involved in the informal sector. Pedestrians make use of the merchant's presence and the opposite of the trader gets income from pedestrians .
The location of the business has a real influence on the choice of consumers preferring to buy near their place of residence. The consumer also sees the aspect of business location requires carefulness and carefulness from the merchant to determine it precisely. Factors that must be considered in determining the location of sales, namely:

a. Access, for example, locations that are easy to navigate or easily accessible by public transportation.
b. Visibility, for example, the location can be seen clearly from the edge of the road.
c. Large and safe parking space.
d. Location of rival shops.

By setting a good location, the company will achieve its objectives, because the location is one of the supporting factors for the success of a company in its operations. If the location chosen by the company is not in accordance with the four factors above, it will be bad for the company.

1.3 Used Laptop

A laptop is a portable computer that can be used mobile and does not depend on the place. Laptops are designed to be used on a mobile basis with a small size and are quite light. At a glance, laptops are increasingly in demand by the public, so many laptop companies have sprung up because they are efficient with the place and easy to carry everywhere.

1.4 Preference Selection Index Method

The Preference Selection Index (PSI) method was developed by Maniya and Bhatt in 2010. This method is useful if there are conflicts in determining the relative importance between attributes. In the PSI method, the results are obtained with minimal and simple calculations as they are based on statistical concepts without the need for attribute weights[10]–[12].
Steps in calculating the Preference Selection Index method[12][7], as follows:

a. Define the decision matrix
   Assume m has an alternative to A_i (i = 1, 2 ..., m) to be evaluated against n C_i attribute selection (j = 1, 2 ..., n). Decision matrix D = X_{ij}, i = 1, 2 ..., M; j = 1, 2 ..., N as shown below shows the utility ratings of the alternative Ai in relation to the C_i selection attribute.

$$D=\begin{bmatrix} x11 & x12 & \dots & x1n \\ r21 & r22 & \dots & x2n \\ \vdots & & & \\ xm1 & xm2 & \dots & xmn \end{bmatrix} \quad (1)$$

b. Normalize the decision matrix
   Normalized decision matrices are constructed using equations (2) and (3). If the greater the alternative value the better (benefit), then use equation 2.

$$R_{ij} = \frac{x_{ij}}{xj^{\max}} \quad (2)$$

   If the smaller the alternative value the better (cost), it can use equation 3.

$$R_{ij} = \frac{xj^{\min}}{x_{ij}} \quad (3)$$

c. Determination of the mean value of the normalized matrix

$$N = \frac{1}{N}\sum_{i=1}^{m} R_{ij} \quad (4)$$

d. Calculates the value of preference variation ($\emptyset_j$)

$$\emptyset_{j = \sum_{i=1}^{m}[R_{ij}-N]}2 \quad (5)$$

e. Determine the deviation of preference value Ω_j

$$\Omega_j = 1 - \emptyset_j \quad (6)$$

f. Determine the criteria weight

$$w_j = \frac{\Omega_j}{\sum_{j=1}^{n}\Omega_j} \quad (7)$$

g. Determination the preference selection index

$$\Theta_i = \sum_{j=1}^{n}(R_{ij}W_j) \quad (8)$$

The alternative that has the largest preference selection index is the best alternative

3. Results and Discussion

Completion using the Preference Selection Index method in the decision support system requires alternatives and criteria, as a condition for making a decision. If the marketing location selection is done directly or manually, the results given are less effective. Therefore, it is needed an analysis of the criteria of the alternative marketing locations.
The following is a list of criteria (table 1) and alternatives (table 2) which are specified in the calculation using the Preference Selection Index method.

Table 1:. The Criteria

Criteria	Type
Area (C_1)	Benefit
Similar Seller (C_2)	Benefit
Distances (C_3)	Cost
Price (C_4)	Cost
Visitors (C_5)	Benefit

Table 2:. Location List

Alternative	Location Name
A_1	SUN
A_2	Suzuya Tanjung Morawa
A_3	Medan Fair Plaza
A_4	Suzuya Marelan
A_5	Suzuya Katamso
A_6	Plaza Center Point

Table 3, is a suitability rating data between criteria and alternatives.

Table 3:. List of Alternatives and Criteria

Alternative	C_1	C_2	C_3	C_4	C_5
A_1	9 m^2	9	2,5 km	9,5	950
A_2	13 m^2	4	9 km	5	315
A_3	9 m^2	18	4 km	7,5	650
A_4	9 m^2	3	9 km	5	250
A_5	10 m^2	6	6 km	4	200
A_6	12 m^2	5	0,7 km	12	1250

From the data in table 3, it is taken as a decision matrix like the following table.

Table 4:. Match Rating

Alternative	C_1	C_2	C_3	C_4	C_5
A_1	9	9	2,5	9,5	950
A_2	13	4	9	5	315
A_3	9	18	4	7,5	650
A_4	9	3	9	5	250
A_5	10	6	6	4	200
A_6	12	5	0,7	12	1250

The first step is to calculate the normalized matrix using equation 2 (for benefit criteria) and equation 3 (for cost criteria).

$X_{j1}^{\max}$= [9; 13; 9; 9; 10; 12]
$X_{j1}^{\max}$= 13

$$R_{11} = \frac{X_{11}}{X_{j1}^{\max}} = \frac{9}{13} = 0{,}692$$
$$R_{21} = \frac{X_{21}}{X_{j1}^{\max}} = \frac{13}{13} = 1{,}000$$
$$R_{31} = \frac{X_{31}}{X_{j1}^{\max}} = \frac{9}{13} = 0{,}692$$
$$R_{41} = \frac{X_{41}}{X_{j1}^{\max}} = \frac{9}{13} = 0{,}692$$
$$R_{51} = \frac{X_{51}}{X_{j1}^{\max}} = \frac{10}{13} = 0{,}769$$
$$R_{61} = \frac{X_{61}}{X_{j1}^{\max}} = \frac{12}{13} = 0{,}923$$

$X_{j2}^{\max}$= [9; 4; 18; 3, 6; 5]
$X_{j2}^{\max}$= 18

$$R_{12} = \frac{X_{12}}{X_{j2}^{\max}} = \frac{9}{18} = 0{,}500$$
$$R_{22} = \frac{X_{22}}{X_{j2}^{\max}} = \frac{4}{18} = 0{,}222$$
$$R_{32} = \frac{X_{32}}{X_{j2}^{\max}} = \frac{18}{18} = 1{,}000$$
$$R_{42} = \frac{X_{42}}{X_{j2}^{\max}} = \frac{3}{18} = 0{,}167$$
$$R_{52} = \frac{X_{52}}{X_{j2}^{\max}} = \frac{6}{18} = 0{,}333$$
$$R_{62} = \frac{X_{62}}{X_{j2}^{\max}} = \frac{5}{18} = 0{,}278$$

The 3rd and 4th criteria are solved using the 3rd equation while for the 5th criterion uses the 2nd equation. The result of normalized matrix (x_{ij}^*) is found in table 4.

Table 5:. Normalized matrix

Alternative	C_1	C_2	C_3	C_4	C_5
A_1	0,692	0,500	0,280	0,421	0,760
A_2	1,000	0,222	0,078	0,800	0,252
A_3	0,692	1,000	0,175	0,533	0,520
A_4	0,692	0,167	0,078	0,800	0,200
A_5	0,769	0,333	0,117	1,000	0,160
A_6	0,923	0,278	1,000	0,333	1,000

The next step is calculating the mean value using equation 4.
N_1= 0,7949
N_2=0,4167
N_3=0,2879
N_4=0,6480
N_5=0,4820

After the mean value is obtained then calculating the variation preference value ($\emptyset_j$) using equation 5.
$\emptyset_1$ = 0,0907
$\emptyset_2$ = 0,4738
$\emptyset_3$ = 0,6375
$\emptyset_4$ = 0,3338
$\emptyset_5$ = 0,5832

Then calculate the deviation using equation 6.
Ω_1 = 0,9093
Ω_2 = 0,5262
Ω_3 = 0,3625
Ω_4 = 0,6662
Ω_5 = 0,4168

The next step is using equation 7, to determine the weight of each criterion. The results are as follows:
W_1 = 0,3156
W_2 = 0,1827
W_3 = 0,1258
W_4 = 0,2312
W_5 = 0,1447

The final step is to determine the value of the preference selection index by using equation 8.

Table 6:. Alternative ranking

Alternative	θ_i	Rank
A_1	0,55238	5
A_2	0,58743	3
A_3	0,62173	2
A_4	0,47265	6
A_5	0,57273	4
A_6	0,68964	1

It can be obtained that A6> A3> A2> A5> A1>A4, so it was decided that the location of Plaza Center Point (A6) is the best location for marketing used laptops.

4. Conclusion

The results of the discussion obtained that the Preference Selection Index method is a method of decision making that does not specify the weight of each criterion by the decision maker. So that makes it easier for decision makers to make decisions maximally.

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