DESIGN DECISION SUPPORT SYSTEM FOR A MARKETPLACE SELECTION USING THE ELIMINATION METHOD ET CHOIX TRADUISANT LA REALITE

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Abstract— The marketplace phenomenon has become exciting, especially for the younger generation actively browsing the internet. In the past, humans had to meet when making buying and selling transactions. With the emergence of a marketplace, it was enough to use smartphone media to make buying and selling transactions. Along with the times, many developers have created marketplaces with different characteristics. So it is necessary to research to provide a good marketplace recommendation following the community's needs. The needs of the average community to fulfil their daily activities, especially in terms of clothing and electronic goods at affordable prices on the marketplace application. The computational method used in this study is the Elimination Et Choix Traduisant La Realite method based on the Decision Support System as a database controller. The research results obtained the highest score in the Shopee marketplace, namely 77.5, followed by the Tokopedia marketplace with a value of 71. Calculations in the ELECTRE method involve a set of concordance and discordance stages that make it different from other methods. The value for each alternative comes from a questionnaire filled out by 63 Z generations. Generation Z is considered a generation that is close to technology.

Keywords: decision support system, electre, internet, marketplace.

Abstrak— *Fenomena marketplace sudah menjadi hal yang menarik. Terutama pada generasi muda yang aktif menyusuri media internet. Dahulu, manusia harus bertemu ketika melakukan transaksi jual beli, dengan munculnya marketplace cukup melalui media smartphone sudah bisa melakukan transaksi jual beli. Seiring dengan perkembangan zaman, banyak pengembang menciptakan marketplace dengan ciri khas yang berbeda. Sehingga perlu dilakukan sebuah penelitian untuk memberikan rekomendasi marketplace yang baik dan sesuai dengan kebutuhan masyarakat. Kebutuhan masyarakat rata-rata untuk mencukupi aktifitas sehari-hari terutama dalam hal pakaian dan barang elektronik dengan harga yang terjangkau pada aplikasi marketplace. Metode komputasi yang digunakan pada penelitian ini adalah metode Elimination Et Choix Traduisant La Realite berbasis pada Decision Support System sebagai pengendali basisdata. Hasil penelitian diperoleh nilai tertinggi pada marketplace Shopee yakni 77,5 kemudian disusul oleh marketplace Tokopedia dengan nilai 71. Perhitungan pada metode ELECTRE melibatkan himpunan concordance dan discordance sebagai tahapan yang membuat berbeda dengan metode lainnya. Nilai untuk setiap alternatif berasal dari kuisioner yang diisi oleh generasi Z sebanyak 63 orang. Generasi Z dianggap sebagai generasi yang dekat dengan teknologi.*

Kata Kunci*: decision support system, electre, internet, marketplace.*

INTRODUCTION

Economics is one of the fields that are closely related to human life. Especially now that technology is part of all daily human activities. Nowadays, most people use marketplace platforms when making buying and selling transactions. The marketplace is an application for buying and selling without meeting face-to-face. The influence of Internet technology is very rapid on all human activities, one of which is the emergence of marketplaces. The goods and prices sold on the market vary greatly. The type of goods is the same, but at different prices, so many people are more interested in using the marketplace than visiting a store.

Users' attractive interface and ease of use make the marketplace a prima donna for the younger generation in Indonesia. The technology generation, or Generation Z, is more familiar with

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the marketplace platform besides being faster and making it easier for them to make transactions. The competitive pricing game makes the competition between marketplace developers even more challenging. Each marketplace developer always creates breakthroughs, such as discounts and free shipping, to attract consumers to buy.

This research aims to make marketplace application users, especially Generation Z, more selective in choosing a marketplace. Some marketplace applications have sellers who could be more disciplined and more active in the marketplace application. So that when transaction activities take place, the buyer or user experiences financial losses because the transaction is not processed immediately.

From this presentation, it is necessary to research the marketplace on phenomena that occur in the field using the ELECTRE computational method based on the Decision Support System. Previous research conducted by Tunga BOZDOGAN et al. stated that they used the ELECTRE method as a multi-criteria decision making to evaluate the financial performance of banks in the Turkish state. As a result of applying the technique, it found the bank's financial performance and success every year. The research results on both methods are presented from a comparative perspective (Bozdoğan, Odabas, & Shegiwal, 2021).

Subsequent research by Liguo Fei et al. stated that the ELECTRE method selected the best supplier using the MCDM (Multi-Criteria Decision Making) technique collaboration and the Dempster–Shafer theory. In this study, the calculation of concordance and discordance values was also carried out, with the final result of the ELECTRE method being feasible to apply to outranking-based research (Fei, Xia, Feng, & Liu, 2019).

Another study by Sathiyaraj Chinnasamy stated that the study used the ELECTRE method based on the MCDM concept by applying subjective and objective weight values. The final result of the study states that the matrix values are synchronous (Chinnasamy, Ramachandran, & Kurinjimalar Ramu, 2022).

Based on several previous studies, the average ELECTRE method collaborated with the Dempster–Shafer theory; besides, the weight values are applied using subjective and objective groupings. In this study, the ELECTRE method was applied without collaborating with other theories, so this study aims to prove the original ELECTRE method from its inventor.

MATERIALS AND METHODS

1. Research Methods

This study used several stages of research—the steps of the analysis outlined in the form of diagrams according to Figure 1.

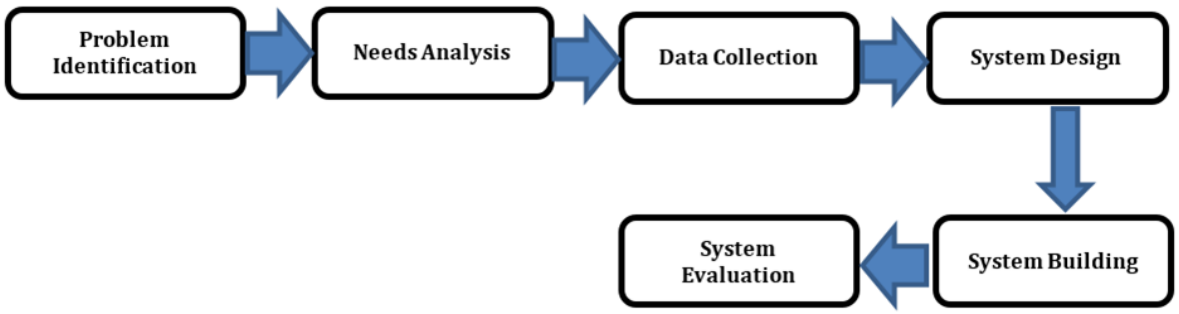

Figure 1. Research Methods

Based on Figure 1, the research begins with identifying the problem. This stage examines the issues that occur and will then be discussed in the analysis. The problem discussed in the study was the selection of a marketplace with Generation Z respondents as actors in the digital world.

The next stage is the analysis of needs. This stage analyzes all the requirements needed to support research activities, both technical needs and conceptual needs support research. Technical needs such as database design and programming languages are used, while the requirements to help research concepts consist of national and international literature.

Data collection is the process of analyzing research data needs. The data used is the data needed in the research process. The data in question is respondent data as well as marketplace data. Specifically, marketplace data is only sampled.

The next stage is the design of the system. System design is the process of designing a database as a storage medium. In addition, it also designs the system or display so that it is easy to use for users.

The creation of the system is the last technical stage. At this stage, explain the process of

coding programs with specific programming languages and translate the mathematical function of the ELECTRE method into coding form.

The last stage is system evaluation, which is a consultation process with decision-makers or an expert in the field of the digital economy.

2. Decision Support System

Decision Support System is a decision-making system for managers or leaders in an organization and institution (R. Ramadhan & Eliyen, 2022) (R. F. Ramadhan, 2023). By utilizing artificial intelligence technology, humans do not need to have difficulty finding a particular decision (R. F. Ramadhan & Eliyen, 2022; R. F. Ramadhan & Widodo, 2022).

Using database technology and mathematical methods, outputs will be generated, making it easier for users to process input data (R. F. Ramadhan, Tolle, & Muslim, 2016) (R. Ramadhan, 2023). In addition, what can integrate the Decision Support System with various desktop and mobile applications? Of course, the application is user-friendly and does not make it difficult for users when operating.

3. Elimination Method et Choix Traduisant La Realite

The Elimination Secret Method Et Choix Traduisant La Realite or better known by the abbreviation ELECTRE is one part of the Multi-Criteria Decision Making (MCDM) method (Liu & Ma, 2021) (Botti, Petit, & Zhang, 2020). The ELECTRE method is often used in Decision Support Systems to provide decision recommendations (Fei et al., 2019) (Valls & Moreno, 2022). The ELECTRE method is a decision-making method based on the concept of outranking by using paired comparisons derived from alternatives based on appropriate criteria (Lin, Lu, Yang, Shen, & Ren, 2021).

An alternative or data is considered to dominate the other if one or more of its criteria exceeds (compared to other criteria) and is equal to the different remaining standards (Zhou, Wan, & Dong, 2022) (Kravchenko, Shevgunov, & Petrakov, 2020).

The stages of the process in the ELECTRE method correspond to Figure 2.

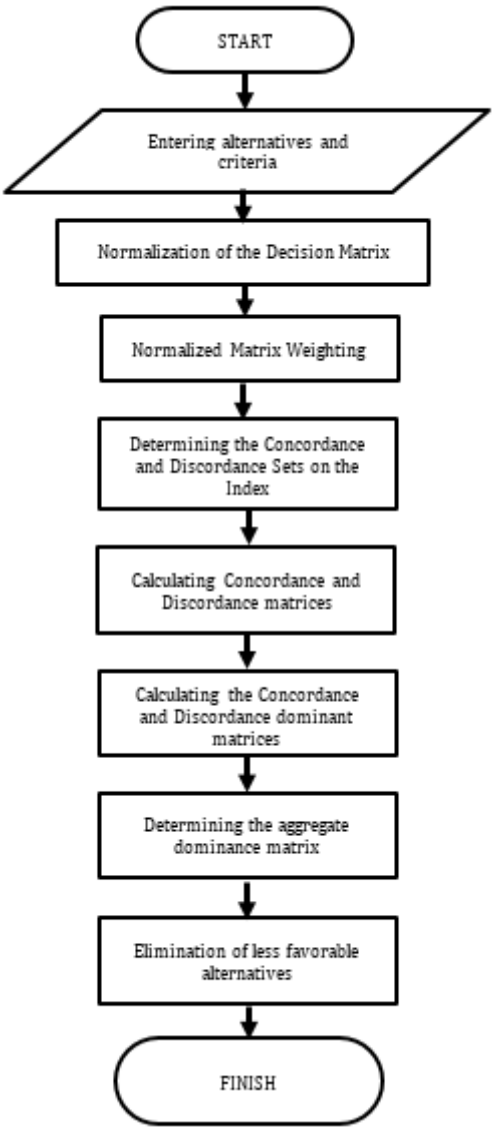

Figure 2. Flowchart Method ELECTRE.

Figure 2 explains that the ELECTRE method's hallmark determines the set of concordance and discordance (Siregar et al., 2021) (Chinnasamy et al., 2022). The calculation process begins with the normalization of the decision matrix according to Equation 1.

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad \text{..... (1)}$$

Where:
r is the normalized result matrix
i and j are worth 1,2,3, ...
x_{ij} is a fundamental matrix

After determining the set of concordance and discordance, the matrix is calculated. The concordance matrix corresponds to equation 2.

$$C_{kl} = \sum_{j \in Ckl} w_j \quad \text{..... (2)}$$

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As for the discordance matrix according to equation 3.

$$d_{kl} = \frac{max\{|v_{kj} - v_{lj}|\}_{j \in D_{kl}}}{max\{|v_{kj} - v_{lj}|\}_{\forall j}} \quad \text{..... (3)}$$

The stage after calculating the matrix is to calculate the concordance and dominant discordance matrices. Before being calculated, you must first know the threshold value. The calculation of the threshold value of the dominant concordance matrix corresponds to equation 4, while the threshold value of the dominant discordance matrix corresponds to equation 5.

$$c = \frac{\sum_{k=1}^{n}\sum_{l=1}^{n} c_{kl}}{m(m-1)} \quad \text{..... (4)}$$

$$d = \frac{\sum_{k=1}^{n}\sum_{l=1}^{n} d_{kl}}{m(m-1)} \quad \text{..... (5)}$$

Calculating the dominant concordance matrix corresponds to equation 6, while the dominant discordance matrix corresponds to equation 7.

$$C_{kl} = \geq_c \quad \text{..... (6)}$$
$$d_{kl} = \geq_d \quad \text{..... (7)}$$

Meanwhile, for the calculation of the aggregate value of the dominant matrix according to equation 8.

$$e_{kl} = f_{kl} \times g_{kl} \quad \text{..... (8)}$$

RESULTS AND DISCUSSION

The alternative data in this study consisted of 5 marketplace samples. The criteria used are seven; each bar has different attributes according to its function. Standards also have different weight values because they adjust to their respective functions. Alternate data is appropriate in Table 1.

Table 1. Alternative Data

No	Alternative
1	SHOPEE
2	BUKALAPAK
3	TOKOPEDIA
4	LAZADA
5	BLIBLI

Table 1 is a research sample from marketplace applications. The reality in the field is that there are other marketplace applications that users, especially Generation Z, quite often use. Still, based on coordination between researchers and experts, they produce alternative data recommendations in the form of marketplace applications, according to Table 1.

As for the criteria data, weights and attributes are appropriate in Table 2.

Table 2. Criteria data

No	Criteria	Weight	Attribute
1	Interface	4	Benefit
2	Product Type	3	Benefit
3	Price	5	Cost
4	Shipping and packaging	2	Benefit
5	Payment Techniques	2	Benefit
6	Service Response	3	Benefit
7	Transaction Security	2	Benefit

Based on Table 2, the weight value for each criterion is determined with a different number of values according to the level of importance. In addition, the types of attributes of each criterion are also determined, which consists of 2 types, namely benefits and costs. The benefit attribute has a meaning when the value is high; it will provide high benefits for others and vice versa for the cost attribute.

Based on Table 2, the data collection process carries out by filling out a questionnaire. Respondents filled out the questionnaire; respondents consisted of Generation Z. Generation Z was the closest to technology. So all buying and selling transactions often are done with the marketplace. Generation Z is respondents aged 19 to 22, with an average gender of 67%. Women are prioritized because they are considered to use marketplace applications more often than men. The average respondent works as a student and worker.

The alternative value derives from the average results of filling out the questionnaire—each alternate data value is based on the Likert scale as per Table 3. The stage begins with the respondent filling out a questionnaire. The range of deals on each criterion corresponds to the Likert scale. Then the alternate data filled with values is calculated on average. What will process the average value to the next stage?

Table 3. Likert Scale

Scale	Information
5	Excellent
4	Good
3	Enough
2	Less
1	Very Less

The initial calculation begins with calculating the value of R. Calculation of the importance of R corresponds to equation 1.

$$r_{11} = \frac{4,0}{\sqrt{8,55}} = 0,467$$
$$r_{21} = \frac{3,6}{\sqrt{8,55}} = 0,42$$

The result of the calculation of the R-value is used to find the decision matrix's normalization value. After the decision matrix forms, the analysis of the V value carries out, namely the result of the multiplication of the V value and the weight value of each criterion.

The next step is to determine the set of concordance and discordance. The process of determining the two groups is characteristic of the ELECTRE method. Determining the location of concordance and discordance corresponds to equations 9 and 10.

$$C_{kl} = \{j \mid v_{kj} \geq v_{ij}\} untuk\ j = 1,2,3,\ldots.n \quad ...(9)$$
$$D_{kl} = \{j \mid v_{kj} < v_{ij}\} untuk\ j = 1,2,3,\ldots.n \quad ...(10)$$

The process determines concordance and discordance by comparing the value V by rows according to each criterion. The location of concordance and discordance differs and adjusts to equations 9 and 10.

The value calculation carries out after determining the set of concordance and discordance. The analysis of the concordance and discordance values corresponds to equation 2. From that value, a matrix will result. Table 4 presents the final result of the value of each alternative.

Table 4. ELECTRE Method Calculation Results

Alternative	Ckl	Dkl	Ckl - Dkl	E	Ranking
SHOPEE	21	0	21	77,5664712	1
	15	0,43352881	14,56647119		
	21	0	21		
	21	0	21		
BUKALAPAK	0	1	-1	24	4
	0	1	-1		
	6	1	5		
	21	0	21		
TOKOPEDIA	9	1	8	71	2
	21	0	21		
	21	0	21		
	21	0	21		
LAZADA	0	1	-1	40	3
	21	0	21		
	0	1	-1		
	21	0	21		
BLIBLI	0	1	-1	16	5
	16	1	15		
	0	1	-1		
	4	1	3		

Based on Table 4, the final results of the calculation of the ELECTRE method are presented involving the Concordance and Discordance sets. These two sets are more characteristic of the ELECTRE method of mathematical calculations than other methods. The final results of the ELECTRE method can be ranked and produce the highest score of 77.5, namely the Shopee marketplace, followed by a score of 71, namely the Tokopedia marketplace.

CONCLUSION

Based on Table 4, the results were that the marketplace's highest value was Shopee. Calculations using the ELECTRE method are considered quite good, with a distinctive feature lying in the computation of concordance and discordance values. The highest score is 77.5 by the Shopee marketplace, while the next score is 71, namely the Tokopedia marketplace. Facts on the ground, the two marketplaces are one of the most popular marketplace applications among

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Generation Z, so the results of the ELECTRE method are appropriate. The calculation process on the ELECTRE method is quite efficient because the values of each row compare. The concept of a Decision Support System can be a breakthrough in producing a decision recommendation for a manager or head of an institution by utilizing information technology. So this research needs to be redeveloped with a different case.

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