Decision support system using PROMETHEE Algorithm

Benget Simamora¹*, A Amril², Indah Wahyu Utami³, Komang Shanty Muni Parwati⁴, Wisnu Rayhan Adhitya⁵, Joli Afriany⁶, Saipul Al Sukri⁷, Desi Asima Silitonga⁸, Siti Aisyah¹,⁹

¹ Politeknik Negeri Media Kreatif, Indonesia
² Management Study Program, Sekolah Tinggi Ilmu Ekonomi LMII, Indonesia
³ Industrial Engineering Study Program, Universitas Duta Bangsa Surakarta, Indonesia
⁴ Institut Pariwisata dan Bisnis Internasional, Indonesia
⁵ Management Study Program, Universitas Potensi Utama, Indonesia
⁶ Management Study Program, Universitas Nahdlatul Ulama Sumatera Utara, Indonesia
⁷ Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia
⁸ STIKOM Tunas Bangsa, Pematangsiantar, Indonesia
⁹ Businness School, Universiti Kuala Lumpur Malaysia, Malaysia

*bengetsimamora@polimedia.ac.id

Abstract. The aim of this study is to analyze contemporary drinks marketing strategy using decision-making support techniques. Drinks are a product that can quench thirst. Nowadays, many beverage businesses have sprung up (the term contemporary drink). Today's drinks are one of the business opportunities for millennials because these drinks can be served practically, creatively, and innovatively. The number of brands and variants of contemporary drinks circulating makes it difficult for consumers to choose delicious contemporary drinks. In addition, this analysis can be used as information for those who want to find opportunities in the beverage business. Sources of data were obtained by conducting interviews and giving random questionnaires to 440 respondents of all ages in Pematangsiantar city. In this case, the decision support system technique used is the PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation) method. The assessment criteria used to assess the best alternative based on consumers are Attractiveness (G1), Product Information (G2), Taste (G3), Packaging (G4). Meanwhile, the alternative drinks that are currently used are Manja Cheese Tea (F1), Nam Nam Thai (F2), Ocha (F3), Es Gandeng (F4), and Es Gak Beres (F5). The results of the study indicate that the F1 alternative (Manja Cheese Tea) with Netflow = 0.08 is the first best alternative, and the F5 alternative (Es Gak Beres) with Netflow = 0.03 is the second-best alternative according to consumer interest. It is hoped that the results of the research can provide information and help consumers in determining current drinks and become information for those who want to find opportunities in the beverage business.

1. Introduction
Drinks are all forms of fluids that generally enter the body through the mouth. Based on the Big Indonesian Dictionary (KBBI), a drink is something that is drunk, while contemporary means the
current or current state, so in general, contemporary drinks can be interpreted as something that is drunk in the form of innovative and popular drinks that are processed with various unique flavors. Today's drinks have high business opportunities every year. In the millennial era, enjoying drinks with various variants and types cannot be separated from your lifestyle. With these conditions, of course, this is a big enough opportunity for business actors to develop various variants of drinks and develop them continuously in the local market. Lately, the beverage business has increased due to consumer interest, attracting this business is considered quite promising, even some of these beverage entrepreneurs have opened business outlets in several cities, one of which is Pematangsiantar. With the development of the industrial sector in the food and beverage sector, it can improve the economy of the surrounding community [1], [2].

Based on this, the aim of the study was to analyze the marketing strategy of contemporary drinks using the decision support system (DSS) technique. This needs to be done considering the results of research analysis can be used as information for those who want to find opportunities in the beverage business and the types of contemporary drinks that are of interest to consumers. There are many SPK techniques that can be used in the ranking [3]–[13]. Among them is the PROMETHEE method.

This method is a methodology for evaluating alternatives with given criteria and ranking alternatives for the final decision [14]. This method is also called the outranking method because it compares several possible alternatives (on the criteria) with the basic criteria [15]. In addition, this method can also handle qualitative and quantitative criteria simultaneously [16]. Apart from the advantages of the PROMETHEE method, several studies have been conducted [5] regarding the best unit recommendation in PDAM Tirta Lihou.

This paper proposes the PROMETHEE method in determining the best production unit in PDAM Tirta Lihou, Simalungun Regency. The results showed that the PROMETHEE method could be applied with the best unit is Tanah Jawa (Net Flow value 0.16274). It is hoped that the results of the research can provide information and help consumers in determining current drinks and become information for those who want to find opportunities in the beverage business.

2. Methodology

This research uses the PROMETHEE approach to analyze marketing techniques with the principle of decision support for the collection of contemporary drinks. The source of data used quantitative data by carrying out interviews and supplying 440 people of all ages with random questionnaires. The steps in calculating the PROMETHEE method in the outline are 1) determining several alternatives, 2) determining several criteria, 3) determining the type of assessment (MAX / MIN), and 4) determining the type of preference for each of the most suitable criteria based on data and consideration of decision-makers.

The data consists of four criteria and five alternatives. The items used to conduct the assessment are Attractiveness (G1), Product Information (G2), Taste (G3), Packaging (G4). Meanwhile, the alternative drinks that are currently used are Manja Cheese Tea (F1), Nam Nam Thai (F2), Ocha (F3), Es Articulated (F4), and Es Gak Beres (F5). The profit criteria preferences are G1, G2, and G3. The cost criterion preference is G4. The following is a flowchart of the solution using the decision support system and the complete steps of the PROMETHEE method.
3. Results and Discussion

The marketing strategy analysis process in the selection of contemporary drinks uses the concept of a decision support system where the determination of alternatives using five alternatives can be seen in Table 1, and the four assessment criteria can be seen in Table 2.

**Table 1. Alternative**

| Drink               | Information |
|---------------------|-------------|
| Manja Cheese Tea    | F1          |
| Nam Nam Thai        | F2          |
| Ocha                | F3          |
| Es Gandeng          | F4          |
| Es Gak Beres        | F5          |

**Table 2. Criteria**

| Information         | Initials |
|---------------------|----------|
| Attractiveness       | G1       |
| Product Information  | G2       |
| Taste                | G3       |
| Packaging            | G4       |

The appropriateness rating for each alternative is shown in Table 3 for each criterion. Because in each criterion, each value given to each alternative is the value where the highest value is the best.

**Table 3. Criteria Match Rating**

| Alternative | G1   | G2   | G3   | G4   |
|-------------|------|------|------|------|
| F1          | 2,90625 | 2,875 | 2,304688 | 2,742188 |
| F2          | 0,125 | 0,125 | 0,9375 | 0,9375 |
| F3          | 1,0625 | 1,03125 | 0,492188 |
| F4          | 0,8125 | 0,8125 | 0,8125 | 0,8125 |
| F5          | 1,21875 | 1,1875 | 1,25 | 0,257813 |

In the stage of calculating the preference value by comparing each available alternative, the results of the comparison are shown in Table 4.

**Table 4. Preference Value**

| G1 | G2 | G3 | G4 |
|----|----|----|----|
| F2, F1 | 0 | 0 | 0 | 0 |
| F3, F1 | 0 | 0 | 0 | 0 |
| F4, F1 | 0 | 0 | 0 | 0 |
| F5, F1 | 0 | 0 | 0 | 0 |
After looking for the preference value for each alternative, they are then calculating the preference index by adding the preference value divided by the number of criteria. After calculating the preference index value, then enter the ranking stages of Leaving Flow, Entering Flow, and Net Flow. Here are the results of the calculation of Leaving Flow, Entering Flow, and Net Flow.

| Alternatives | Leaving Flow | Entering Flow | Netflow |
|--------------|--------------|---------------|---------|
| F1           | 0.083        | 0             | 0.083   |
| F2           | 0            | 0.083         | -0.083  |
| F3           | 0.166        | 0.166         | 0       |
| F4           | 0.22         | 0.25          | -0.03   |
| F5           | 0.25         | 0.22          | 0.03    |

Based on the results of calculations using PROMETHEE, the results of the assessment are in the form of a ranking as seen from the net flow value (highest), so that in this case, the determination of the current drink according to consumer interest as in Table 5 is the alternative F1 (Manja Cheese Tea) as the first best recommendation. With a net flow value of 0.083 and an alternative F5 (Es Gak Beres) as the second-best recommendation with a net flow of 0.03.

4. Conclusion
On the basis of the research carried out, the decision support system for the selection of modern drinks can be used by using the PROMETHEE process. F1 (Manja Cheese Tea) and F5 (Es Gak Beres) alternatives are obtained as the best-packed drink based on consumers with NetFlow values of 0.08 and 0.03 by using four evaluation parameters and five alternative drinks.

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