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Moisturizer Selection System According To Skin Type Using The Weighted Product Method

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ABSTRACT

Choosing the right moisturizer for your skin type is an important aspect of skin care to maintain health and avoid problems such as irritation, dryness, or excess oil production. However, users often have difficulty finding the right choice due to the wide variety of products available on the market. Therefore, this study aims to develop a Decision Support System that can help users choose the most suitable moisturizer based on their skin type, by utilizing the Decision Tree method. This method is used because it is able to classify skin types based on various parameters, such as moisture level, sensitivity, oil content, and tendency towards acne. This system is built by processing a dataset containing skin characteristics and the appropriate moisturizer content. The results of the study show that the developed system has a high level of accuracy in providing recommendations according to needs. With this system, users can easily find the right moisturizer for their skin type, thus supporting more optimal skin care.

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1. Introduction

Cosmetic products are a range of ingredients used to enhance the appearance of facial skin. In this case, skincare falls into the category of cosmetics because it is a series of skin treatments that use skincare products to help keep the skin healthy or maintain good skin condition. Skincare has been a part of human life since ancient times. Various civilizat ions have developed natural methods and materials to maintain skin health. A number of companies are starting to create moisturizers with various lighter and non-greasy formulas. Ingredients like lanolin, glycerin, and collagen began to be used in moisturizing products [1].

Maintaining healthy and beautiful facial skin requires optimal care, as it plays an important role in treating skin conditions. As a key product in skincare, moisturizers serve to hydrate, protect, and increase water content in the skin's layers. Moisturizers help prevent the skin from becoming dry, rough, cracked, or irritated by forming a protective layer that reduces water evaporation from the skin's surface. Moisturizers have evolved into various types such as creams, gels, lotions, and serums, tailored to different skin types. Active ingredients such as hyaluronic acid, ceramide, niacinamide, and SPF are added for additional benefits like hydration, UV protection, and anti-aging. Skincare has now become an essential part of beauty and skin health routines worldwide. Moisturizer is a skincare product that plays an important role in maintaining skin moisture and health. Choosing the right moisturizer depends heavily on an individual's skin type. This product falls into the category of basic skincare and should be used daily to ensure moisture is maintained and to strengthen the skin barrier [2].

Also known as a moisturizer, it not only helps retain moisture but also maintains skin elasticity and addresses potential damage to the face. This product helps maintain skin hydration, improve dry skin conditions, provide sun protection, and enhance skin texture to keep it healthy and radiant [3]. In this study, the selection of moisturizers was based on ingredients suitable for each skin type. The brand used as a reference is Gla2Glow. Gla2Glow products were chosen because they are generally known as a skincare brand that focuses on brightening the skin, improving texture, and moisturizing with high-quality active ingredients, at a mid-range price with premium quality.

However, choosing the right moisturizer is not easy, as each individual has a different skin type, such as dry skin, oily skin, easily irritated skin, and combination skin. Errors in choosing a moisturizer can lead to various skin problems, such as irritation, acne, or an imbalance in skin moisture. Therefore, a system is needed that is designed to make it easier for users to determine the moisturizer that is suitable for their skin type more accurately and effectively [4].

A Decision Support System (DSS) is a computer-based system created to support the decision-making process. This system works by processing data and presenting important information that can help in making more accurate decisions. Although DSS does not function as a substitute for human decision-making, it assists with various options and provides recommendations based on available data [5] [6].

One method of a Decision Support System is Weighted Product, which is used to make the best determination based on predetermined criteria by considering the weight of each criterion. This method works by multiplying the value of each criterion raised to its power by its weight, resulting in a preference value, and then ranking the alternatives to determine the optimal one [7] [8] [9] [10]. This research aims to generate and build a system that can recommend moisturizers based on skin type, using the Weighted Product method. With this system, it is hoped that users can receive more accurate product recommendations, thereby improving the effectiveness of skincare and reducing the risk of product incompatibility.

2. Research Method

This research uses a quantitative approach with the Weighted Product method to determine the most suitable moisturizer based on facial skin type. WP is effective for product selection like skincare because it can proportionally process differences in values between criteria and produce objective rankings based on user preferences.

A. Criteria and Alternatives

Five types of facial skin are used as decision-making criteria: normal skin, dry skin, oily skin, sensitive skin, and combination skin. These skin types were identified thru a literature review. As an alternative option, eight moisturizing products from the Glad2Glow brand were selected [11].

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Table 1. List of Glad2glow Moisturizer Alternatives

No	Nama Produk	Gambar	Jenis Kulit	Kandungan	Tekstur
1	Glad2Glow Centella Allantoin Soothing Gel Moisturizer		Normal, Berminyak,Sensitif	Centella Asiatica, Allantoin	Gel
2	Glad2Glow Blueberry 5% Ceramide		Normal, Kering, Sensitif	Blueberry, Ceramide	Lotion
3	Glad2Glow Yuja SymWhite 377		Berminyak	Yuja Extract, SymWhite 377	Lotion
4	Glad2Glow Pomegranate 5% Niacinamide		Normal, Berminyak,Kombinasi	Niacinamide 5%, Ekstrak Delima	Lotion
5	Glad2Glow Peach Retinol Moisturizer		Kering, Sensitif, Berminyak	Retinol, Extract Peach	Lotion

6	Glad2Glow Kiwi 3D Acid		Normal, Berminyak	Salicylic Acid, Kiwi Extract	Lotion
7	Jeju Tangerine Vita C Power Bright Glow Moisturizer		Kombinasi	Jeruk Tangerine, Vitamin C	Lotion
8	Glad2Glow Tremella Vita B5 Sensitive Calming Moisturizer		Normal, Sensitif	Tremella Extract, Vitamin B5	Lotion

B. Data Collection

Data collection was conducted thru structured interviews with beauty advisors in skincare stores to determine the importance weight of each criterion. Additionally, researchers conducted direct observations of moisturizer products available in stores to assess their characteristics based on ingredients, benefits, and suitability for various skin types.

3. Result and Discussion

A. Global Priority Result from Weighted Product

In the Weighted Product (WP) method, the process of determining the priority of alternatives is done by calculating the preference value of each product based on the weights of the criteria and the scores of the alternatives against each criterion. Unlike ANP, which uses pairwise comparisons, WP directly processes the numerical values of each alternative using power multiplication operations.

The first step is to normalize the criteria weights so that the total weight becomes 1.0. These weights are then applied to the value of each alternative by raising the criteria value (x_{ij}) to the corresponding weight w_j. The entire contribution of the criteria for each product is multiplied to produce the value of S_i, which is the total WP score before normalization.

The value of S_i is then normalized to produce the value of V_i, which is the final preference value for each alternative. The value of V_i represents the relative effectiveness of each moisturizer in meeting skin needs based on the five evaluation criteria used in this study.

The final result is a global ranking for all moisturizer alternatives, indicating the best-performing product based on a combination of criteria weights and evaluation scores. These global priority values are presented in Table 2 and serve as the basis for recommending the most suitable product for user needs.

Tabel 2. Global Priority Score of Moisturizer Alternatives

Alternatif	Nama Produk	Vektor V	Peringkat
M1	Glad2Glow Centella Allantoin Soothing Gel Moisturizer	0,1473	1
M2	Glad2Glow Blueberry 5% Ceramide	0,1278	5
M3	Glad2Glow Yuja SymWhite 377	0,1014	8
M4	Glad2Glow Pomegranate 5% Niacinamide	0,1285	4
M5	Glad2Glow Peach Retinol Moisturizer	0,1180	6
M6	Glad2Glow Kiwi 3D Acid	0,1311	3
M7	Glad2Glow Jeju Tangerine Vita C Power Bright Glow Moisturizer	0,1314	2
M8	Glad2Glow Tremella Vita B5 Sensitive Calming Moisturizer	0,1146	7

Glad2Glow Centella Allantoin Soothing Gel Moisturizer (M1) achieved the highest global score, making it the most suitable moisturizer based on the criteria weight.

B. Analysis and Interpretation

The top-rated moisturizer is the Glad2Glow Centella Allantoin Soothing Gel Moisturizer. This product takes the top spot because it excels in several key criteria such as soothing, calming, and suitability for sensitive or oily skin. The Centella and Allantoin content provide a calming effect and repair the skin barrier, making it suitable for normal and sensitive skin.

The second-ranked product, Glad2Glow Jeju Tangerine Vita C Power Bright Glow Moisturizer, excels in the criteria of brightening and skin lightening. The Vitamin C content from Jeju Tangerine makes it highly effective for brightening, making it suitable for dry and combination skin.

Products like Glad2Glow Kiwi 3D Acid (ranked third) were chosen because they offer mild exfoliation and revitalization benefits thru their acid and kiwi extract content. Their value is quite high as they are good for improving skin texture, making them suitable for oily skin.

C. System Implementation

A web-based system prototype was developed to implement the Weighted Product (WP) decision-making method using PHP and MySQL. This system allows users to select their skin type and preferences, and then the system automatically calculates the preference value of each alternative using WP calculations. Moisturizer recommendations are provided in real-time based on the V_i values generated from the normalization process. Figure 3 shows the interface used to collect input data from the user before the system performs the weight calculation and ranking process using the WP method.

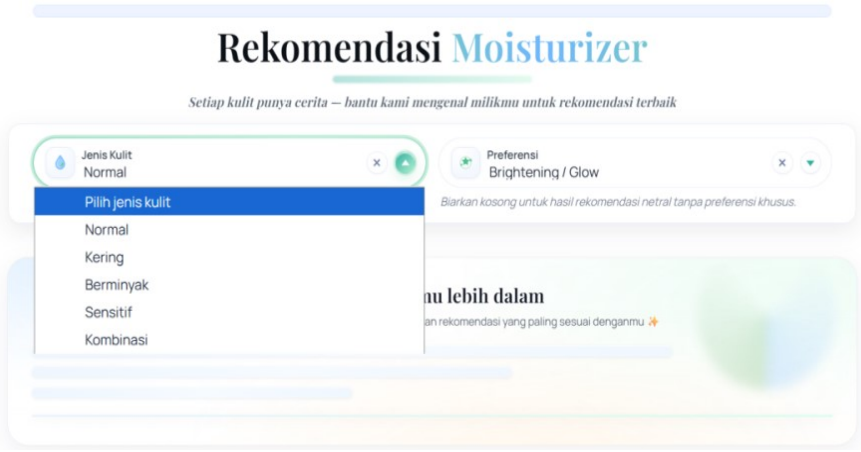

Figure 1. Selection Form in the Moisturizer Recommendation System

The calculation results in the final V_i value for each product, which is used as the basis for objectively ranking Glad2Glow moisturizers. Figure 2 presents a bar graph visualization of the V_i values for each product, showing the differences in relative effectiveness levels among the alternatives based on the criteria used.

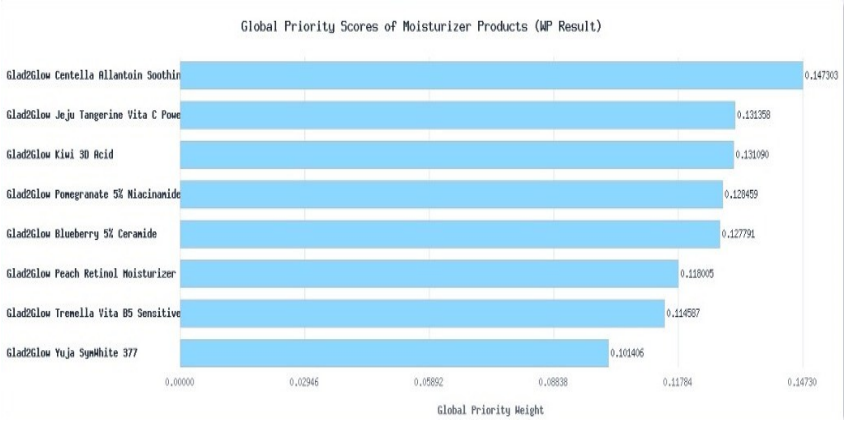

Figure 2. Global Priority Score Bar Chart

4. Conclusion

This research successfully applied the Weighted Product (WP) method in the process of determining the appropriate moisturizer based on five facial skin types: normal, dry, oily, sensitive, and combination. Eight moisturizer products from the Glad2Glow brand were analyzed because their products contain good active ingredients. The calculation results for WP show that Glad2Glow Centella Allantoin Soothing Gel

Moisturizer (M1) obtained the highest global priority value of 0.147303 and is the main recommendation. The web-based decision support system developed using PHP and MySQL is capable of automatically providing product recommendations based on the data entered by the user. This finding proves that the WP method is effective in addressing the often interconnected relationships between skin problems and is capable of generating more personalized and systematic recommendations. Practically, this research presents a web-based system that the public can use to choose the right moisturizer. However, this research still has limitations, namely that user acceptance testing has not been conducted, nor has a sensitivity analysis been performed on changes in criterion weights.

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