



A Four-Parameter Model of Makeup Adaptation as an Alternative to Ethnicity-Based Approaches

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Abstract

This article addresses the problem of makeup adaptation in a multicultural environment. Particular attention is given to the limitations of ethnicity-based approaches, which remain widely used in professional makeup practice. A comprehensive analysis of contemporary studies on skin characteristics, facial morphology, appearance perception, and personalized beauty technologies was conducted. The application of ethnic classifications was examined within the context of Central Asia, where Kazakh, Uyghur, Korean, Slavic, and mixed appearance types are regularly encountered in professional practice. The findings indicate that as facial appearance becomes more diverse and variability within ethnic groups increases, the practical value of ethnic origin as a basis for makeup adaptation gradually decreases. It is demonstrated that the selection of makeup techniques and cosmetic products is more strongly influenced by skin characteristics and features of the eye area than by a client's ethnic background. Based on the analysis, the author developed the Four-Parameter Makeup Adaptation Model, which integrates eye shape, eyelid structure, skin structure, and color type into a unified framework for professional decision-making. The proposed model extends existing perspectives on the principles of makeup adaptation and may be applied in professional makeup practice, beauty education programs, and digital systems for personalized cosmetic recommendations. The article may be of interest to makeup artists, beauty educators, beauty industry professionals, and developers of Beauty Tech solutions.

Keywords: Makeup Adaptation, Four-Parameter Model, Beauty Personalization, Eye Shape, Skin Structure, Color Type, Central Asia.

INTRODUCTION

In recent years, the cosmetics industry has witnessed the rapid development of digital skin analysis systems, virtual makeup try-on technologies, and artificial intelligence-based algorithms for cosmetic product selection [11]. The general principle underlying these technologies is the assessment of skin tone, pigmentation characteristics, skin texture, facial morphology, and other appearance-related parameters. However, makeup practice still relies heavily on recommendations based on ethnic classifications. Separate guidelines are commonly proposed for Asian, Slavic, European, or Middle Eastern appearance types, despite the substantial variation that exists within each of these groups [7]. For example, two women of Kazakh origin may have different eyelid structures, different skin densities, and entirely different facial correction requirements, whereas clients of different nationalities may sometimes require nearly identical makeup techniques.

This issue is particularly evident in the multicultural market of Central Asia. In Almaty, a makeup artist works daily with clients of Kazakh, Uyghur, Korean, Slavic, and mixed ethnic backgrounds. In practice, the choice of technique is more often determined by eye shape, eyelid characteristics, skin condition, and skin color than by the client's nationality. Similar conclusions are gradually emerging in the scientific literature. Numerous studies indicate that cosmetic outcomes are more closely associated with skin and facial characteristics than with an individual's membership in a particular ethnic group. Nevertheless, a universal makeup adaptation model that integrates the most significant appearance parameters into a single decision-making framework is still largely absent [5].

The aim of this study is to develop and theoretically substantiate a four-parameter makeup adaptation model based on facial and skin characteristics as an alternative

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to ethnicity-oriented approaches. To achieve this aim, the following research objectives were formulated:

- to analyze the limitations of ethnicity-based approaches in cosmetology and makeup practice;
- to investigate the role of objective skin and facial characteristics in shaping the visual perception of appearance;
- to identify the most stable parameters influencing makeup adaptation.

The research hypothesis is that eye shape, eyelid structure, skin characteristics, and color type exert a greater influence on the selection of cosmetic solutions than an individual's ethnic background. Therefore, makeup adaptation can be effectively implemented on the basis of these parameters.

The scientific novelty of the study lies in demonstrating the limited applicability of ethnicity-oriented approaches to makeup adaptation and in substantiating a transition toward a parametric analysis of appearance. Unlike traditional frameworks based on an individual's origin, the proposed approach considers facial and skin characteristics as independent factors in the selection of cosmetic solutions, thereby expanding the possibilities for their application in multicultural environments.

MATERIALS AND METHODS

The study was conducted as an analytical literature review followed by conceptual modeling. The focus was placed on studies examining makeup adaptation, skin characteristics, facial morphology, and factors influencing the visual perception of appearance. Particular attention was given to publications addressing the limitations of ethnicity-based classifications, personalized cosmetic technologies, and artificial intelligence systems applied in the beauty industry.

The literature search was performed using the Google Scholar, ScienceDirect, SpringerLink, Frontiers, and MDPI databases. Various combinations of the following keywords were employed: "makeup adaptation," "skin tone," "skin color," "facial attractiveness," "facial morphology," "ethnicity," "beauty technology," "makeup personalization," "artificial intelligence in cosmetics," "makeup transfer," "Monk Skin Tone Scale," and other closely related terms. Logical operators AND and OR were used to refine the search strategy. The review included studies published between 2022 and 2025 that contained experimental data, analytical reviews, or conceptual developments related to appearance assessment and the personalization of cosmetic solutions. Publications focusing exclusively on cosmetic formulations or on technical aspects of computer vision algorithms without relevance to makeup practice were excluded from further analysis.

At the initial stage, 32 publications were identified. After evaluating their relevance to the research objectives,

the final sample consisted of 15 sources. Comparative analysis revealed that contemporary studies increasingly consider skin tone, skin structure, facial morphology, and other phenotypic characteristics as independent factors influencing cosmetic decision-making. At the same time, relatively few studies propose a unified makeup adaptation framework based on the combination of these parameters. This gap provided the rationale for the development of the author's model.

Several limitations should be acknowledged. Most existing publications examine individual appearance characteristics in isolation. Some authors focus on skin color, whereas others concentrate on facial shape or digital personalization technologies. Studies that integrate these factors into a single makeup adaptation system remain relatively scarce. Nevertheless, the selected body of literature makes it possible to identify a broader trend toward moving beyond ethnic categories and focusing instead on specific facial and skin characteristics, thereby providing a sufficient theoretical foundation for subsequent conceptual modeling.

RESULTS

In multicultural environments, a client's ethnic background does not always explain why certain makeup techniques are effective while others are not. Formally, an individual's appearance may be classified as Kazakh, Uyghur, Korean, Slavic, or mixed ethnic type [6]. In practice, however, skin and facial characteristics play a much more important role. A comparison of different categories of evidence reveals the same pattern: product selection, correction techniques, and final visual outcomes are determined primarily by appearance-related characteristics rather than by a person's origin.

Considerable variation in appearance exists even within a single ethnic group. Individuals assigned to the same ethnic category may differ substantially in eye shape, eyelid structure, skin condition, and skin color characteristics. As a result, applying a uniform makeup approach to an entire ethnic group becomes problematic. The opposite situation can also be observed. Clients from different ethnic backgrounds often share similar appearance characteristics and therefore require nearly identical makeup techniques and cosmetic products.

This pattern is particularly evident in the application of complexion products. In such cases, skin characteristics become the determining factor. Attention is focused on tone uniformity, texture features, the presence of localized color variations, and the way the skin interacts with cosmetic products [3]. These factors ultimately determine the visual effect achieved after makeup application. Table 1 presents indicators of cosmetic performance for products with different levels of coverage.

Table 1. Comparison of cosmetic effects for different coverage levels (Compiled by the author based on the source: [1])

Coverage level	ΔE	αHF	βSF
Low	2.08	4.06	1.15
Medium	0.94	7.39	0.76
High	4.38	9.13	2.97

Note. The ΔE parameter reflects the degree of skin color change after the application of a cosmetic product and is used to quantitatively assess the difference between the initial and resulting skin surface color. The αHF parameter characterizes the level of visual skin uniformity after product application and makes it possible to evaluate the effectiveness of masking color irregularities. The βSF parameter is associated with changes in the textural perception of the skin surface and reflects the degree of visual smoothing of skin texture.

The indicators presented above characterize color changes following product application and the interaction between cosmetic products and the skin surface. The visual outcome depends not only on the degree to which skin color changes after product application. Equally important is the initial condition of the skin. If the skin surface is uneven, contains areas of varying pigmentation, or exhibits pronounced textural features, the response to the same product may differ substantially. Consequently, matching skin tone alone does not guarantee that the same product will produce the same result.

The same pattern can be observed beyond complexion correction. When evaluating facial appearance, attention is typically focused not on an individual's ethnic background but on specific facial characteristics. Factors such as eye shape, eyelid structure, skin condition, and the distribution of color accents are of primary importance [4]. In the eye area, overall eye shape is not the only relevant characteristic. Even when eye shapes are similar, differences in eyelid structure may require different correction techniques. This is particularly evident when working with hooded, heavy, or partially covered eyelids, where the choice of technique is determined by the anatomical characteristics of the eye area rather than by the person's origin. These characteristics

influence whether additional correction is needed, how intensive it should be, and which techniques are most appropriate.

A similar approach is employed in modern digital appearance analysis systems. Such algorithms operate on specific facial and skin characteristics because these factors directly affect the final visual outcome [14]. Within this framework, ethnicity becomes an overly general descriptor. For the selection of cosmetic solutions, it is far more important to understand the particular facial and skin characteristics involved in each individual case.

Moving beyond ethnicity-based classifications requires the identification of features that genuinely influence cosmetic decision-making. Among the characteristics examined, skin-related parameters, particularly skin condition and color attributes, emerged as the most consistent factors [2].

Individuals from different ethnic groups may require very similar cosmetic solutions, whereas substantial differences in skin tone can often be observed within the same ethnic group [9]. For this reason, color type represents a more practical reference point for makeup adaptation than belonging to a particular nationality. Table 2 presents experimental levels of change in skin color parameters.

Table 2. Experimental levels of skin color parameter changes (Compiled by the author based on the source: [8])

Change level	L^*	a^*	b^*
Mean change (+)	-0.9%	+5.3%	-0.5%
1 SD (++)	-2.5%	+17.6%	-4.7%
2 SD (+++)	-4.1%	+29.9%	-8.9%

Note. The L^* parameter represents skin lightness and reflects changes in its visual brightness: higher values correspond to lighter skin, whereas lower values indicate darker skin. The a^* parameter describes the position of color along the green-to-red axis and is used to assess the intensity of reddish skin tones. The b^* parameter reflects the position of color along the blue-to-yellow axis and allows the evaluation of changes in yellow undertones.

Skin color parameters deserve particular attention because they are directly associated with the visual perception of the face. Importantly, these characteristics can be measured independently of an individual's ethnic background. This has practical implications for makeup adaptation. The focus shifts from assigning a person to a specific ethnic group to analyzing the particular features of their appearance.

This is especially relevant for skin condition, skin color

characteristics, eye shape, and eyelid structure. Among the features of the eye area, eye shape and eyelid structure have the greatest practical significance because they determine both the possibilities for correction and the choice of makeup application techniques. Skin characteristics, in turn, influence the selection of complexion products, the intensity of correction, and the distribution of color accents [12].

Despite the considerable diversity of human appearance,

the number of characteristics that consistently influence cosmetic decision-making remains relatively limited. These factors repeatedly affect product selection and the choice of makeup techniques. Their influence persists regardless of an individual's origin, making them suitable candidates for the foundation of a unified makeup adaptation system.

DISCUSSION

Ethnic background cannot be considered a reliable foundation for makeup adaptation. Although such frameworks remain widespread in professional practice, their practical value is limited. Appearance within a single ethnic group often varies more than expected, while individuals from different backgrounds may share similar skin and facial characteristics. Under these conditions, the selection of cosmetic products and correction techniques is determined primarily by appearance-related parameters rather than by a person's origin.

The most significant contradiction is associated with the high variability of appearance within ethnic groups [10]. This does not imply the absence of ethnic differences. Such differences undoubtedly exist and are well recognized by practitioners. However, when working with an individual client, other characteristics become far more important. For example, two women of Kazakh origin may differ substantially in eye shape, the prominence of the eyelid crease, skin tone, and skin texture characteristics. As a result, applying the same makeup framework to both individuals would be ineffective. Conversely, similar makeup solutions may be successfully applied to clients from different ethnic backgrounds when their appearance parameters are comparable.

For practical makeup application, characteristics that directly influence correction techniques are considerably more important. These include eye shape, eyelid structure, skin condition, and skin color characteristics. It is on the basis of these features that makeup artists determine the placement of visual accents, coverage density, correction intensity, and the selection of cosmetic products. Similar combinations of these parameters are regularly observed among individuals from different backgrounds. For this reason, nationality alone rarely provides meaningful guidance for specific professional decision-making.

The same logic is gradually becoming characteristic of digital technologies as well. Modern facial analysis systems operate not with broad categorical classifications but with measurable appearance-related characteristics [15]. Algorithms assess facial shape, skin parameters, eye-area features, and color characteristics. This approach enables more accurate recommendations because it focuses on the individual rather than on their membership in a particular group.

As a result, makeup adaptation is increasingly centered on parameters that can be evaluated before the application process begins. These characteristics influence the

selection of techniques, products, and correction strategies. Importantly, their relevance remains consistent regardless of an individual's origin. From a practical perspective, such a system is more robust because it is based on actual appearance characteristics rather than generalized categories.

The multicultural environment of Almaty provides a valuable context for examining makeup adaptation under conditions of substantial appearance diversity. In everyday practice, makeup artists work with clients representing Kazakh, Uyghur, Korean, Slavic, and mixed appearance types. This diversity creates favorable conditions for evaluating the effectiveness of classification systems used within the beauty industry.

A comparison of different appearance types demonstrates that the boundaries between ethnic groups often do not correspond to the boundaries between cosmetic solutions. For example, certain characteristics of the eye area and skin may be nearly identical in Kazakh and Uyghur clients despite differences in ethnic background. At the same time, considerable variation exists within each of these groups, requiring different correction techniques, different levels of makeup intensity, and different cosmetic products. A similar pattern can be observed when comparing Korean and Slavic appearance types.

As the number of individuals with mixed appearance characteristics continues to increase, this contradiction becomes even more apparent. In such cases, attempts to assign a person to a single ethnic category become largely arbitrary and provide little practical guidance for selecting makeup techniques. Instead, attention shifts to characteristics that can be directly assessed, including eye shape, eyelid structure, skin condition, and skin color attributes.

In practice, the same makeup technique can often be successfully applied to individuals from different backgrounds when their appearance parameters are similar. Conversely, members of the same ethnic group may require entirely different correction approaches [13]. This helps explain why the relationship between ethnic origin and specific cosmetic decisions is considerably weaker than is commonly assumed.

Against this background, an important question arises regarding which characteristics genuinely contribute to professional decision-making. The analysis demonstrated that not all appearance-related features carry equal importance. Some exert only a localized influence, whereas others consistently determine the selection of techniques, products, and correction strategies. The most stable and influential factors were found to be eye shape, eyelid structure, skin characteristics, and skin color attributes. These parameters recur regardless of an individual's background and remain relevant throughout all stages of makeup adaptation.

The identified patterns make it possible to move from the consideration of isolated appearance characteristics toward

a unified decision-making framework. To address this need, a four-parameter makeup adaptation model was developed, integrating the characteristics that most consistently

influence the selection of techniques, cosmetic products, and correction methods. The proposed model is presented in Figure 1.

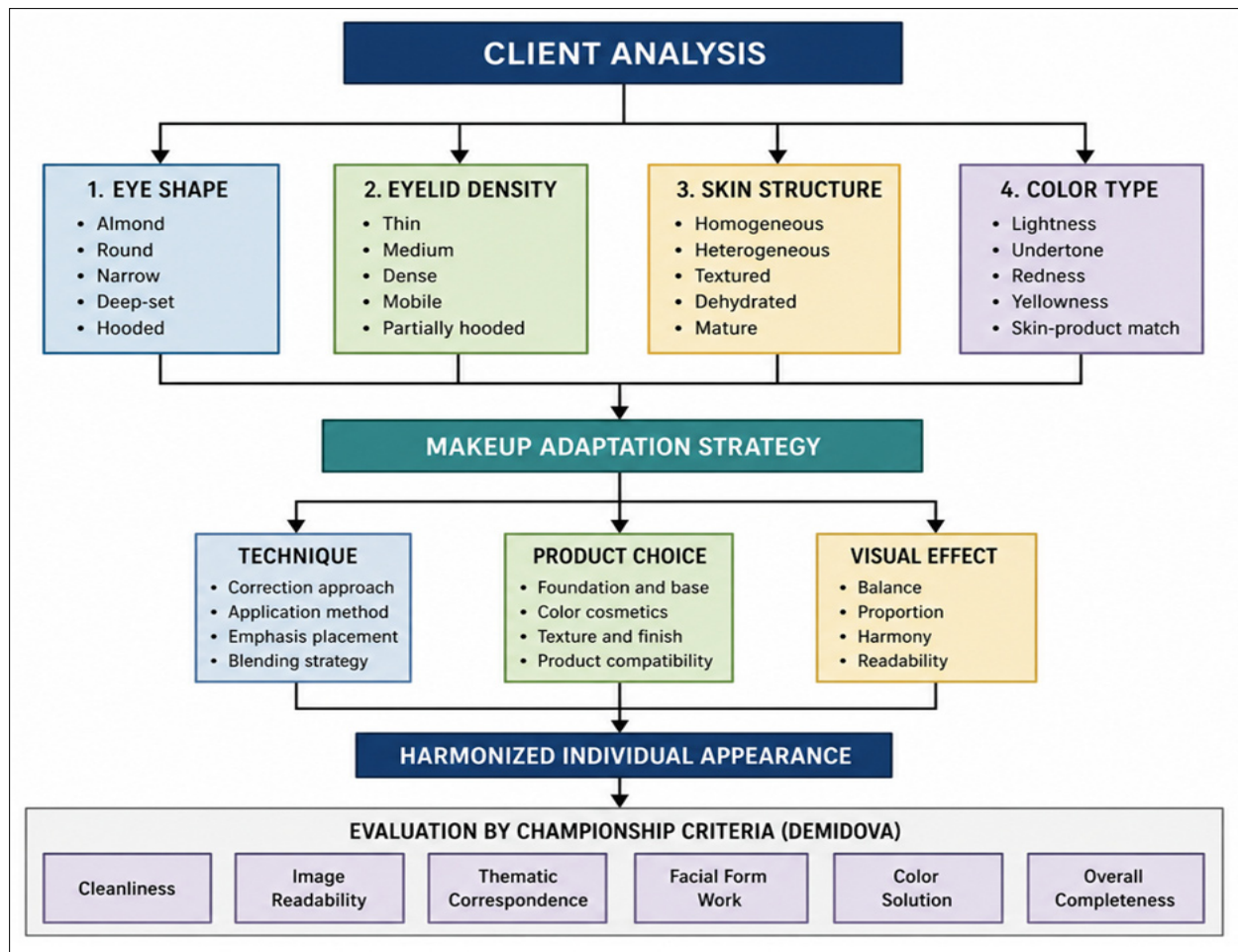


Figure 1. Four-Parameter Makeup Adaptation Model (Author's development)

The model is built around appearance characteristics that directly contribute to professional decision-making. Eye shape determines the direction of correction and the placement of major visual accents. Eyelid structure influences the technical implementation of this correction because it affects makeup visibility, the distribution of highlights and shadows, and the management of volume within the eye area. The use of only one of these parameters does not provide sufficient information for selecting an appropriate technique. For this reason, the eye area is evaluated through the combined consideration of eye shape and eyelid structure.

A similar decision-making logic applies to skin-related characteristics. Skin structure influences the selection of product textures, coverage density, and application methods. Color characteristics serve a different purpose. They enable the selection of appropriate cosmetic shades and help ensure harmony between the makeup and the individual's appearance. Within the proposed model, the skin is considered both as a surface for product application and as a source of color information. Separating these functions into two distinct parameters helps avoid errors that may arise when only a single evaluation criterion is used.

The effectiveness of the model is based on the fact that each of the four parameters is associated with a distinct category of professional decisions and does not duplicate the role of the others. Eye shape determines the direction of correction. Eyelid structure influences how that correction is implemented. Skin structure determines product selection and application techniques. Color type governs the selection of the color palette. Collectively, these parameters encompass the principal stages of makeup adaptation and provide a bridge between appearance analysis and practical cosmetic decision-making.

The omission of any one of the four parameters reduces the completeness of the appearance adaptation profile. Considering eye shape without analyzing eyelid structure does not allow for an accurate assessment of correction possibilities within the eye area. A similar limitation arises when working with the skin. Selecting cosmetic products without considering skin structure increases the likelihood of a mismatch between application techniques and the characteristics of the skin surface. Consequently, the effectiveness of the model depends not on individual characteristics but on their combined use within a unified analytical framework.

The practical value of the model extends beyond the work of professional makeup artists. All four parameters can be assessed before makeup application begins and are based on observable appearance characteristics. Unlike ethnic categories, these parameters possess clearly identifiable visual features and do not require assigning an individual to a particular group. This makes the model applicable not only to manual makeup adaptation but also to digital facial analysis systems, where cosmetic recommendations are based on the characteristics of a specific individual rather than on their ethnic background.

The use of ethnicity-based frameworks often leads to situations in which individuals within the same category require different cosmetic solutions. A single ethnic group may include a wide range of combinations of eye shape, eyelid structure, skin characteristics, and color attributes. As a result, one ethnic category may encompass clients who require entirely different cosmetic approaches. The proposed four-parameter model eliminates this ambiguity by focusing not on an individual's origin but on the appearance characteristics that directly influence technique selection, product choice, and the final visual outcome.

CONCLUSION

The present study demonstrated that the use of ethnic categories as the foundation for makeup adaptation has significant limitations. An individual's ethnic background does not allow for sufficiently accurate predictions regarding the selection of techniques, cosmetic products, and correction strategies because the decisive factors are the specific facial and skin characteristics of the client.

The principal outcome of the study is the development of a four-parameter makeup adaptation model based on the analysis of eye shape, eyelid structure, skin characteristics, and color type. Unlike ethnicity-oriented frameworks, the proposed approach shifts the focus from generalized classifications to the assessment of features that directly contribute to professional decision-making. This reduces the likelihood of inappropriate technique selection and enables a more accurate adaptation of makeup to individual appearance characteristics.

The practical value of the model is particularly evident in the multicultural environment of Central Asia. Experience gained from working with Kazakh, Uyghur, Korean, Slavic, and mixed appearance types demonstrates that a single ethnic category does not correspond to a single set of cosmetic solutions. Under such conditions, the four-parameter model makes it possible to apply a unified appearance assessment framework regardless of a client's background while maintaining a focus on the characteristics that genuinely influence makeup outcomes.

The research hypothesis was confirmed. The findings indicate that the effectiveness of makeup adaptation is determined to a greater extent by objective appearance-related parameters,

including eye shape, eyelid structure, skin characteristics, and color type, than by an individual's ethnic background.

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