

A Related Survey and Research on the Development of the Global Artificial Intelligence (AI) Customized Cosmetics Industry-Centered on the South Korean Market

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Abstract. COVID-19 After the pandemic swept the world, consumers quickly adapted to a digital lifestyle, and many countries issued beneficial policies related to the development of digitalization. Companies are also continuously developing safe, convenient, and contactless consumption methods to cope with the impact of the pandemic. With the improvement of people's living standards, the cosmetics market in the beauty industry continues to expand. Artificial Intelligence (AI) has empowered the development of cosmetics, reshaping the connection between consumers and businesses, bringing a more convenient, targeted, and safer new service experience to consumers. AI cosmetics mainly include skincare products, hair care products, makeup, perfumes, and other products. The market structure of AI cosmetics can be summarized as three combination models: "product + device," "product + software," and "product + device + software." In the global AI cosmetics market, Europe has the highest market share, followed by the United States and the Asia-Pacific region. In 2023, South Korea's cosmetics production, import, and export market ranks fourth globally, maintaining the highest ranking among Asian countries. The development of the beauty industry has always attracted widespread attention from the international beauty market. South Korea values the development of intelligent technology to empower industrial development, issuing the world's first legal policy related to the customized cosmetics industry, and helps the development of related industries in enterprises in terms of legal policy and talent support, supporting the research and development of products and technology upgrades. The development of AI customized cosmetics will be the development trend of the industry in recent years.

Keywords: Artificial Intelligence(AI), Customized Cosmetics, Korean Beauty Market

1 Introduction

1.1 Research Purpose and Method

Artificial Intelligence (AI) has permeated many fields in modern life. With consumers' increasing attention to personal skin health and the pursuit of personalized beauty, AI is playing an increasingly important role in the development and application of the cosmetics industry, with new technologies continuously driving innovation and upgrades in the industry. The convenience, specificity, and safety of customized cosmetics have led to a growing market demand, and it is expected to become a trend in the innovation and development of cosmetics in the near future. This study investigates and organizes the development of the global market and the Korean market through literature, news, and policy document surveys. It is hoped that this research can provide some reference for the future application and development of AI-enabled customized cosmetics.

1.2 Artificial Intelligence (AI) Customized Cosmetics Definition

Customized cosmetics generally refer to cosmetics and related services provided to meet consumers' customized consumption needs on the international market, with various terms such as "Customized Cosmetic," "Personalized Cosmetic," and "Bespoke Cosmetic." The global customized cosmetics industry mainly consists of three major industries: cosmetic products (skin care, makeup, hair care, and related products), beauty devices, and software services (Figure 1). The market structure of artificial intelligence (AI) cosmetics can be summarized into three combination models: product + device, product + software, and product + device + software.

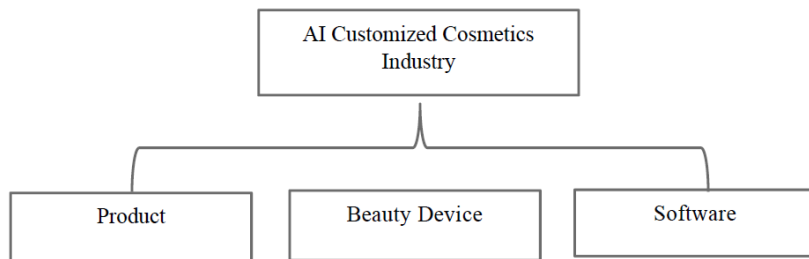


Fig. 1. Industrial Structure of Customized Cosmetics.

COVID-19 The global cosmetics industry has been significantly impacted, with the lifestyle of home isolation prompting the rapid development of non-contact shopping models such as online shopping and takeout services. Consumers have quickly adapted to a digital lifestyle. Traditional customized cosmetics consumption methods can no longer fully meet the needs of this era. The development of convenient and precise artificial intelligence (AI) customized cosmetics will be a social development trend in recent years.

1.3 Global Market Size

According to the 2022 Global Beauty and Cosmetics Market Artificial Intelligence Research Report by the market research agency Insight Ace Analytics, the global AI beauty and cosmetics market was valued at \$2.7 billion in 2021 and is expected to reach \$13.34 billion by 2030. The global AI beauty and cosmetics market is projected to achieve a compound annual growth rate (CAGR) of 19.7% between 2021 and 2030^[1], with the application of artificial intelligence (AI) technology in the beauty and cosmetics industry increasing significantly worldwide. The global customized cosmetics market size is expected to grow from \$43.66 billion in 2021 to \$58.16 billion by 2025. The market for customized cosmetics (excluding devices) will also expand from \$1.144 billion (approximately 1.41 trillion KRW) in 2021 to \$4.005 billion by 2025 (Figure 2)^[2]. The global home beauty device market size is expected to grow from 30 trillion KRW in 2017 to 42 trillion KRW by 2022. At the 6th China International Import Expo, "intelligent customization" has become a focal point of industry attention. Many internationally renowned cosmetic brands' booths are equipped with skin analysis devices, skin health management, smart makeup, high-tech beauty devices, and other AI intelligent beauty products. Artificial intelligence personalized customization of cosmetics has become an important track^[3].

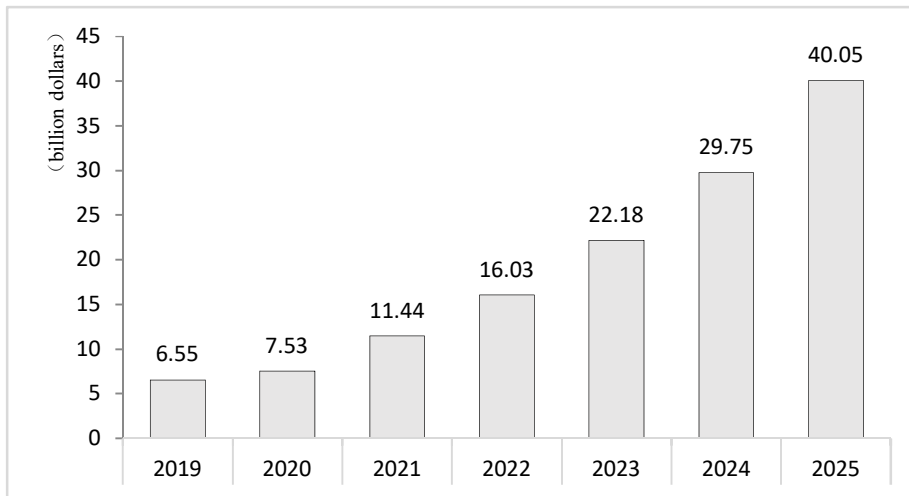


Fig. 2. Global Market Development Scale of Customized Cosmetics Industry (Excluding Devices).

As the global market for customized cosmetics grows, cosmetic companies are becoming more active in entering the market. WWD Beauty Inc, known as the "beauty industry practitioner's guide," found in its 2022 survey of the top 100 global cosmetics companies that the European market has the highest market share in the global AI cosmetics market, followed by the United States and the Asia-Pacific region. The development potential of artificial intelligence (AI) technology in the global beauty industry is enormous.

2 Characteristics of South Korean Artificial Intelligence (Ai) Customized Cosmetics Industry

2.1 Industrial Development

In 1962, custom-made cosmetics in South Korea were mainly sold through door-to-door recommendations, with salespeople observing customers' skin conditions to make suggestions. By 1986, Korean companies had developed functional products tailored to different skin types for consumers to choose from. It wasn't until 2015 that the South Korean company Amorepacific pioneered the development of online custom-made cosmetics services among Korean enterprises (Figure 3). Amorepacific collaborated with 3D printer development company Lincsolution in 2017 to develop a customized 3D-printed facial mask (Lab Tailored 3D Mask) (Figure 4) which was awarded the CES Innovation Award in the 3D printing category. Following this accolade, the innovative technological development of Korean cosmetic companies has garnered international industry attention. The technology involves an application developed by Amorepacific that captures facial images, detecting the area and position of facial features such as the eyes and mouth to design a suitable 2D mask template for the customer. Subsequently, a hydrogel containing functional ingredients suitable for the user's skin condition is selected based on this information, and finally, a high-speed 3D printer is utilized to print and manufacture a personalized facial mask in real time.

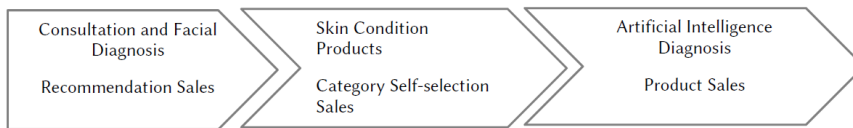


Fig. 3. The Development Process of the South Korean Customized Cosmetics Industry.

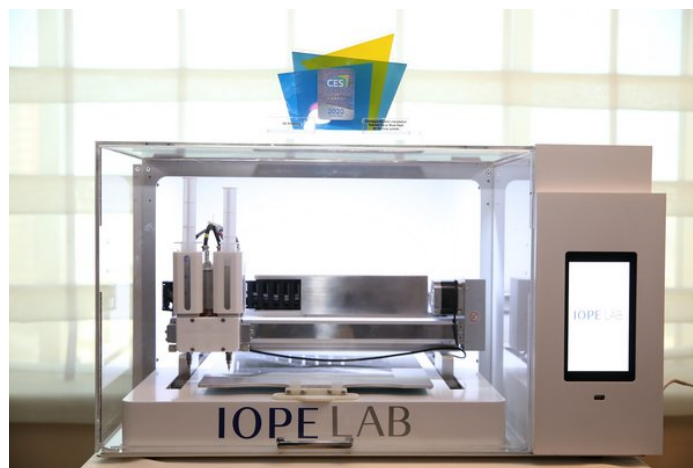


Fig. 4. The production process images of the "Lab Tailored 3D Mask" product by Amorepacific at CES 2020. (<https://tech.huanqiu.com/article/3wY1ZrSzYoL>)

The modern customized cosmetics market technology is primarily a combination of Internet Communication Technology (ICT) and Bio Technology (BT)^[4]. After AI diagnosis, a personal beauty system is established, which can customize cosmetics suitable for the user based on different skin conditions, fragrances, and shapes. With the arrival of the fourth industrial revolution, the needs and purchasing methods of Korean consumers have also changed, and the methods of tailor-made cosmetics have become increasingly diverse.

2.2 Government Policies

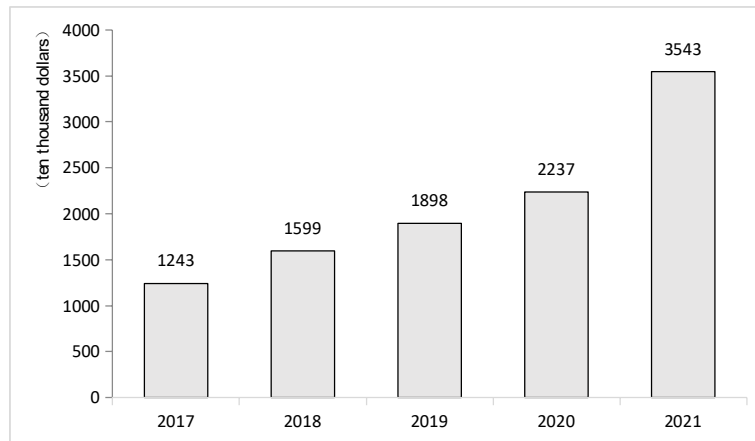
South Korea is a country that has institutionalized customized cosmetics, with a demonstration business model led by private enterprises currently in development. It is the first country in the world to issue laws for the market of customized cosmetics and to take the lead in training cosmetic formulators for customized products. On December 5, 2019, the Ministry of Health and Welfare of South Korea announced the "K-Beauty Future Cosmetics Industry Cultivation Plan," enacting policy systems for the development of customized cosmetics, allowing cosmetic brands to diagnose, manufacture, and sell customized cosmetics based on individual skin diagnoses. It also decided to expand support for research and development of cosmetic basic materials and new technologies. Efforts are being made to domesticate basic materials that are highly dependent on imports and to develop personalized customized cosmetics using intelligent technologies such as genetic analysis. The government plans to build a K-Beauty cosmetics industry cluster that includes production, research and development, education, and promotion^[5]. In 2021, the government selected customized cosmetics as the new growth engine for the K-Beauty industry. The Ministry of Health and Welfare of South Korea decided to develop the manufacturing and safety assessment technologies for customized cosmetics by 2023^[6].

In order to become a powerhouse in artificial intelligence (AI), the South Korean government has formulated a variety of strategic plans. On December 17, 2021, the South Korean government designated the development of artificial intelligence (AI) technology as an innovative project for the economy and society, with the Ministry of Science and ICT and other departments participating in the formulation and release of the "National Strategy for Artificial Intelligence (AI)." The establishment of this strategy has advanced the process of industrialization of AI technology in South Korea^[7]. In order to enhance the international competitiveness of its future cosmetics industry, in February 2020, the South Korean government took the lead globally in improving the relevant legal systems^[8], including the "Cosmetics Act of Korea, No. 18448," as well as the construction of industrial infrastructure. The South Korean government plans to establish a database of skin and genetic information for more than 8,000 individuals across nine national centers by 2025, providing a better platform for the development of customized cosmetics. The Ministry of Food and Drug Safety has begun to ease restrictions, simplifying the temporary sales venue reporting process for customized cosmetics, and has expanded the training of cosmetic compounding managers^[9].

2.3 Market Size

The COVID-19 pandemic in South Korea has had varying impacts on the beauty and personal care market. Compared to 2021, domestic sales of beauty and personal care products in South Korea increased by over 30% in 2020, with exports growing by 13.6%. Due to the pandemic, the demand for online purchases has been steadily rising, and most consumers have shifted their shopping preferences to contactless purchases of customized cosmetics (such as online shopping). Although the South Korean customized beauty market is showing a growth trend, it is still in the early stages in the global market. Based on 2021, the scale of the product and software industry (excluding devices) in the top three industries of South Korea's customized cosmetics is expected to be \$35.43 million (Figure 5)^[10]. South Korea accounts for 3% of the global market for customized cosmetics. The industry of customized cosmetics (excluding devices) in South Korea is in the initial stage of development worldwide.

With the arrival of the fourth industrial revolution, the application of artificial intelligence (AI) technology in beauty devices has seen significant development. Beauty devices utilize AI technology to build a systematic information platform and establish a consumer information database, making it convenient for companies to provide users with more precise and convenient service experiences, and quickly becoming a popular emerging beauty industry in recent years. Since the 1980s, the number of patent applications for beauty devices has been continuously increasing. South Korea is the country with the second-highest number of patent applications in the field of beauty devices after China, accounting for 23.1% of global patents. Starting from the late 1990s, with the increase in technological development and the number of patent applications, there have been about 150-200 patent applications each year after 2000^[11].



Source: Korea Food and Drug Administration, 2022 "Customized Cosmetics World Market Trend Survey and Analysis Material Collection."

Fig. 5. Development Scale of the South Korean Customized Cosmetics Industry (Excluding Devices).

The South Korean beauty device market officially took off after L'Oréal Group launched a vibrating cleaner called "Clarie Sonic" in 2013. According to a survey by the LG Economic Research Institute in 2022, the market size of domestic smart beauty devices in South Korea grew from 8 billion won at the start in 2013 to 50 billion won in 2018, and then to 160 billion won in 2022, which is about 20 times the size of the initial year of 2013 (8 billion won) (Figure 6). The global home beauty device market size is expected to grow from 30 trillion won in 2017 to 42 trillion won in 2022^[12]. The domestic South Korean brand beauty device industry is also developing rapidly.

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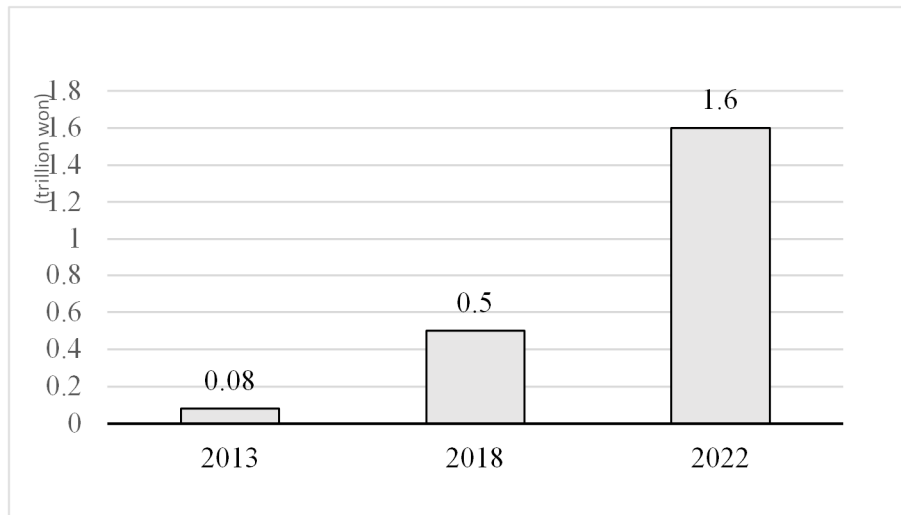


Fig. 6. Development Scale of the South Korean Home Smart Beauty Device Market from 2013 to 2022.

(Source: "2022 Research Report by LG Economic Research Institute, South Korea.")

3 Conclusion

The application of Artificial Intelligence (AI) technology in the production and research and development of cosmetics brings more innovation and opportunities to the cosmetics industry. The integration of AI technology into offline shopping models not only enhances customer engagement and novelty during shopping experiences but also enables businesses to identify products that customers prefer and target, thereby increasing user satisfaction and experience with the products, leading to positive outcomes. It is believed that in the future, more countries and regions will introduce legal policies and

talent support to promote the development of traditional industries empowered by intelligent technology.

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