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THE PERSONALISATION REVOLUTION: HOW ARTIFICIAL INTELLIGENCE IS TRANSFORMING THE COSMETICS INDUSTRY, MAKING CONSUMERS THE SOURCE OF INNOVATION

Hanna Sobolieva[1], Anastasia Ivanova[2]

Abstract. The article *focuses on* the use of artificial intelligence (AI) in driving personalisation within the cosmetics industry, emphasising its potential to shift from mass-market production to highly customized skincare solutions tailored to individual consumer needs. The *purpose* of the paper is to examine how AI-powered personalisation can redefine business strategies, enhance consumer satisfaction, and establish competitive advantages for cosmetic brands. *Methodology*. The research employs a comparative analysis of current market practices and strategic forecasts for AI adoption in cosmetics. The study draws upon a range of sources, including case studies, industry reports, and technological advancements, in addition to the beauty market, in order to assess the viability and the challenges associated with the implementation of AI-driven personalisation. *Results*. The article concludes that AI-driven personalisation offers significant opportunities to revolutionise the cosmetics industry, enabling brands to meet individual consumer demands efficiently. The necessity of localized manufacturing, flexible production processes, and adaptive logistics to address challenges is highlighted. The findings emphasise the transformative capacity of consumer-driven innovations in shaping global beauty market dynamics. The analysis demonstrates that AI-driven personalisation facilitates a transition in cosmetic brands from mass-market strategies to individualised product development, thereby fostering enhanced consumer engagement. However, the research identifies key challenges, including the need for adaptable production processes, streamlined logistics, and localized manufacturing to meet rapidly evolving consumer demands. *Practical implications*. The findings suggest that brands adopting AI-driven personalisation can achieve a competitive advantage by offering tailored skincare solutions, enhancing consumer loyalty, and capturing niche market segments. Investment in local production facilities and flexible supply chains is critical for the efficient delivery of customised products. Furthermore, brands are able to leverage their technological and beauty innovation expertise to gain a dominant position in global markets by aligning personalisation strategies with diverse consumer preferences. *Value / Originality*. This study provides a unique perspective on the integration of AI into the cosmetics industry, emphasising the strategic importance of consumer-driven innovation. By focusing on the potential for leadership in this transformation, the research offers valuable insights for industry stakeholders aiming to harness AI for market differentiation. The originality of this study lies in its exploration of how AI-powered customisation can redefine traditional business models and establish new standards in the global beauty industry.

Keywords: cosmetics industry, brand strategies, marketing transformation, consumer-driven innovations, market differentiation.

JEL Classification: O33, L66, M31, D12

1. Introduction

Cosmetic products are defined as a broad spectrum of goods designed to meet the multifarious needs of consumers. These products encompass various categories, ranging from skincare to decorative cosmetics.

The production of these products is subject to stringent regulation at both national and international

[1] O. M. Beketov National University of Urban Economy, Ukraine *(corresponding author)*
E-mail: soboliva.ag@gmail.com
ORCID: https://orcid.org/0000-0003-2375-3665
[2] O. M. Beketov National University of Urban Economy, Ukraine
E-mail: ivanastasia2503@gmail.com
ORCID: https://orcid.org/0009-0004-1120-6888

levels, with the aim of ensuring the highest standards of quality and safety for consumers.

During the initial six-month period of 2024, the global cosmetics market demonstrated notable dynamism, attaining a total value approximating 290 billion USD. During this period, growth amounted to 7.5% in comparison with the same period in 2023. The Asia-Pacific region demonstrated the highest rate of growth, with an increase of 9.2%, while North America recorded a 6.8% increase. The European market demonstrated stability, with a growth of 4.5%, while regions such as Africa and South America exhibited only marginal increases in sales volumes.

A significant factor contributing to the advancement of the industry is the escalating competition among prominent entities such as L'Oréal SA, Estée Lauder Inc., Unilever, Shiseido, and Procter & Gamble, in conjunction with regional small and medium-sized enterprises. The strong demand for new products that align with current trends is a key motivator for companies to invest in advanced technologies (Swifterm, 2024).

A salient trend in 2024 has been the adoption of innovative technologies in cosmetic production. The development of safer and more effective skincare products is facilitated by nanotechnology, biotechnology and artificial intelligence. Innovations such as "smart" formulas that adapt to specific skin requirements have emerged as a primary competitive advantage in the market (Wifitalents, 2024).

The personalisation of cosmetics represents a multifaceted phenomenon that is inextricably linked to the strategic objectives of brands. However, it is also indicative of profound moral and psychological trends that are shaping modern society.

In contemporary society, where the individual and the unique are held in high esteem, consumers are increasingly drawn to products that take their personal attributes, such as skin type, lifestyle, and preferences, into consideration.

Contemporary culture has witnessed an increasing emphasis on self-care and self-love, with self-care exhibiting a direct correlation with self-worth and a sense of individuality. The utilisation of personalised cosmetic products, meticulously tailored to individual requirements, fosters a sense of uniqueness, thereby enhancing self-esteem and psychological well-being. The concept of personalisation has been demonstrated to engender a sense of moral satisfaction in customers by making them feel valued and recognised for their uniqueness, rather than being expected to conform to broad standards.

The notion of personalised skincare has been demonstrated to support the concept of self-actualisation, serving as a potent instrument for fostering trust between a brand and a consumer. When a product meets a person's unique needs and characteristics, it engenders an emotional connection and fosters brand loyalty. It has been demonstrated that consumers experience a sense of being listened to and comprehended, which in turn fosters a state of psychological comfort and satisfaction with the acquisition.

From a business perspective, personalisation opens up new horizons for brands. In a highly competitive and saturated market, the ability to offer a unique product that caters to specific consumer requests becomes a competitive advantage. This strategy has been shown to attract new audiences while also retaining loyal customers, thereby fostering long-term relationships (Harvard Business Review, 2024).

It is evident that brands that can integrate advanced AI and Big Data technologies to analyse their customers' needs and tailor products accordingly will find themselves in a strong position in the market.

Furthermore, personalisation provides opportunities for brand differentiation and the creation of unique marketing strategies that reflect an individual approach.

It is evident that personalisation in the cosmetics industry functions not solely as a business objective, but also as a manifestation of profound societal transformations (Forbes, 2023).

The following hypothesis is put forward for consideration: what if, in the future, it will no longer be brands setting trends and dictating fashion, but consumers themselves, creating demand for individualised solutions? Imagine a change in the way the cosmetics market works, where each customer can use artificial intelligence to tailor a product to their specific needs. For example, the customer undergoes an AI skin diagnosis, and based on this information, an automated factory creates a product with a unique formulation that is perfectly suited to that individual.

This process may be compared to an ice cream machine that creates the desired flavour combination based on selected options. However, in the domain of cosmetics, the product is meticulously tailored to the customer's specific requirements, encompassing factors such as skin type, condition, age, and even the prevailing climatic conditions. Consequently, the cosmetic product would be phased out of mass production, becoming instead entirely personalised, thereby effecting a transformation of the industry's very concept.

2. Artificial Intelligence in the Cosmetics Industry

The field of artificial intelligence (AI) has already had a considerable impact on the cosmetics industry, with major advances being made in the areas of product development and the enhancement of brand-consumer interactions. AI technologies enable

companies to analyse extensive consumer data, including preferences and skin characteristics, thereby facilitating the creation of more accurate and personalised products (Deloitte, 2024).

For example, AI algorithms can create personalised skincare solutions using data such as age, skin type, climate, lifestyle and even genetic information. With the help of AI, brands can deliver products specifically tailored to individual consumers, rather than producing one-size-fits-all solutions.

Skin analysis can be conducted in two ways for customers: through smart devices available in stores or more conveniently via smartphone apps.

The following discussion will examine the utilisation of smart devices from both technological and economic viewpoints.

Modern artificial intelligence (AI) technologies have significantly enhanced the analysis of customers' skin conditions, providing high precision and personalised skincare solutions. This analysis employs a combination of sensors, machine learning algorithms, and big data analytics, thereby creating a comprehensive profile of each user's skin. The following discussion will explore the intricacies of this process in greater detail (InsightAce Analytic, 2024).

The first step in skin analysis is data collection using various sensors. Typically, the following types of sensors are used:

1. The first type is built-in cameras. A significant number of smart devices are equipped with high-precision camera equipment capable of capturing high-resolution images of the skin. These professionals possess the ability to discern subtle characteristics such as skin texture, pore presence, acne, wrinkles, pigmentation, and other such nuances.

2. The second type of sensor measures moisture and sebum levels. These devices incorporate sensors that assess the moisture and sebum levels present on the skin's surface. These sensors are designed to make contact with the skin and transmit information about its condition in real-time.

3. The third type of sensor is the ultraviolet (UV) light sensor. It has been established that certain skin analysis systems are equipped with UV sensors that are capable of detecting deep layers of skin damage caused by sun exposure. This facilitates the identification of potential problems that are not visible under regular lighting conditions.

The second stage involves transferring the data collected by the sensors to artificial intelligence algorithms for analysis. Machine learning algorithms, including deep neural networks, need to process this data in the following ways:

1. The initial step in this process is the recognition and classification of skin features. The algorithms have the capacity to utilise computer vision technologies in order to identify various skin characteristics, including but not limited to wrinkles, pigmentation, acne, enlarged pores, and other imperfections. The classification of these features and the subsequent assessment of their severity (for example, mild pigmentation or deep wrinkles) is of paramount importance.

2. The second step is to analyse skin texture and colour. AI also analyses skin texture to identify areas that may be dry, oily or a combination. Colour analysis helps to identify areas of redness, hyperpigmentation or dullness.

3. The third step is the measurement of skin health indicators. Based on the sensor data (e.g., moisture and sebum levels), AI takes measurements and determines key skin health indicators. The algorithms compare these indicators to optimal levels and identify which aspects need improvement.

In order to facilitate accurate analysis of skin conditions and the provision of effective recommendations, artificial intelligence (AI) systems require extensive data sets. During the development of algorithms, extensive databases of images featuring various skin types, ages, conditions, and ethnic characteristics should be utilised. This will assist the algorithms in acquiring the capability to recognise and differentiate the nuances of skin problems and features.

This technological approach has the potential to radically reshape business models, streamline production processes, optimise supply chains, and boost profitability. The integration of AI into production facilitates the real-time customisation of products, thereby ensuring the personalisation of goods according to individual customer requests. This has the effect of reducing expenses associated with mass production and the storage of excess inventory. In contradistinction to conventional models that rely on substantial warehousing facilities for the accumulation of products, artificial intelligence (AI) facilitates on-demand manufacturing, thereby reducing the requirement for storage space and concomitantly lowering costs. This approach has been shown to reduce the risk of write-offs due to unsold items. Furthermore, it facilitates the rapid adaptation of brand offerings to evolving consumer preferences by analysing purchasing data, ensuring expedited product launches and maintaining a competitive advantage.

The collection and analysis of data on skin conditions and consumer preferences enables companies to develop marketing strategies that are more focused and effective. The utilisation of artificial intelligence in marketing and advertising campaigns has been demonstrated to yield valuable insights, thereby optimising the efficacy of these campaigns. By conducting AI-driven skin analysis, brands can obtain comprehensive insights into customer requirements, facilitating the creation of targeted

advertising that caters to particular concerns and preferences within each audience segment. Precision marketing has been demonstrated to enhance conversion rates and the return on advertising investments. Furthermore, the provision of personalised products fosters a more robust brand-customer connection, as consumers perceive the product to be tailored specifically for them, thereby engendering trust and loyalty. Conversely, a high level of brand loyalty has been demonstrated to result in increased repeat purchases, thereby aiding the brand in reducing customer acquisition costs (Harvard Business Review, 2023).

It is imperative to acknowledge that this paradigm shift in approach will have a substantial impact on the business model. It is proposed that brands should consider the introduction of subscription services, in which customers undergo regular skin analysis. In addition, AI could be used to curate personalised product kits, which would be automatically delivered to customers. This approach engenders a consistent revenue stream and enhances the overall value of the customer over time. Alternatively, brands might offer AI-driven skin diagnostics as a standalone service, providing tailored skincare advice and product recommendations. This could result in the emergence of a novel monetisation channel and serve to enhance brand appeal (Harvard Business Review, 2022).

Moreover, this solution has been demonstrated to reduce research and development costs. The utilisation of artificial intelligence (AI) enables companies to develop virtual skin models for the purpose of evaluating novel formulations, thereby diminishing the necessity for costly clinical trials and human volunteers.

In order to provide a more comprehensive analysis, it is necessary to consider a scenario in which the consumer does not utilise a smart device in the brand store, but rather a conventional music application. These applications empower users to perform skin diagnostics by leveraging the camera functionality of their smartphones.

Users are instructed to take a well-lit photograph of their face and to follow the instructions carefully in order to achieve the best possible results. The application then employs artificial intelligence and computer vision algorithms to process the image, thereby facilitating the assessment of various skin condition parameters. These applications are reliant upon the utilisation of deep learning models that have undergone extensive training through the analysis of a substantial number of images representing a wide range of skin types and conditions. The algorithms are capable of detecting even the most subtle changes in skin texture, which are imperceptible to the human eye, and of categorising them according to their severity.

The training of the algorithm, working with data sets, and processing will be analogous to those previously discussed in the context of smart devices in stores. Nevertheless, there are several advantages to this approach.

Users have the capability to scan their skin from the comfort of their own homes, at times of their choosing. This facilitates the process of sharing results and providing feedback to brands directly via the app. This approach fosters active engagement and facilitates a more profound understanding of customer needs.

From an economic perspective, the app's convenience and speed have been demonstrated to boost sales volume and pace while lowering customer acquisition costs. Furthermore, mobile applications have been shown to engender new sales channels through subscription models, exclusive offers, and loyalty programs, which have the capacity to drive brand revenue. Furthermore, loyal customers are more likely to return for repeat purchases, thereby increasing the customer lifetime value (CLV).

3. Individualization vs. Mass Production

The present study sets out to compare individualisation and mass production by means of the following key points:

A. Economy

Standardisation facilitates substantial economies of scale, thereby reducing production costs. While the adoption of individualisation may result in increased costs, it also facilitates the development of unique solutions that can appeal to customers willing to pay a premium. Nevertheless, the customisation process necessitates additional time and resources, which may result in elevated production expenses.

B. Adaptation

The appeal of large-scale production lies in its high efficiency and low cost; however, these factors also serve to restrict the capacity to respond promptly to evolving consumer demands. In the context of personalised products, the adoption of agile production methodologies enables the expeditious modification of products to align with customer specifications. Nevertheless, such adaptability can result in increased expenses and a more intricate management of production flows.

C. Stability

Standardised quality control processes have been shown to simplify the task of ensuring product stability. Whilst an individualised approach is able to address the unique needs of customers, it can also result in complications with regard to quality control, given that each product possesses its own unique characteristics.

D. Profitability and Price Competition

Low prices due to high sales volumes in traditional mass production can create a large customer base.

The ability to sell at higher prices due to uniqueness and added value can increase profitability. However, competition from cheaper commodity products can be a risk.

E. Market Demand

Mass production may face the risk of overproduction if demand for standard goods declines.

Personalised products carry a lower risk of overproduction, as they are better aligned with customer needs; however, they also face potential demand risks if not positioned effectively. The primary benefit of a personalised approach over conventional mass production is the capacity to deliver a unique product that is tailored precisely to each customer's needs and preferences. This approach has been demonstrated to enhance customer satisfaction and loyalty, whilst also distinguishing brands within the market by fostering an emotional connection with consumers. In an era of heightened competition and diverse choices, personalisation has been identified as a key factor in achieving sustainable growth and profitability (McKinsey & Company, 2023).

The advent of automated factories that adapt to individual requests has been shown to provide a notable technological and economic advantage for the cosmetics industry over traditional production methods. The integration of these technologies fosters flexibility, ensures superior quality, and facilitates efficient production, thereby enhancing customer satisfaction and augmenting profitability.

In order to facilitate the efficient production of unique cosmetic products by factories, based on personalised requests from AI, there is a necessity to consider and implement several key technological solutions and organisational structures.

The following changes to traditional mass production are hereby proposed in order to implement the idea of customized production, tailored to the specific needs of individual consumers:

The factory should be integrated with an AI system that receives information about the personalised composition from the client. Subsequent to scanning the skin and receiving recommendations, AI transmits data regarding the requisite ingredients and their proportions to the factory's management system. In order to ensure the accuracy and timeliness of data transfer, it is imperative that information flows between the AI system and the factory are synchronised. This encompasses the establishment of APIs and alternative data transfer methodologies.

It is imperative that production lines are designed to be modular and flexible, thus allowing for the reconfiguration of the production process for different formulas. This process entails the implementation of automated lines capable of expeditious configuration modification in accordance with the nature of the product in question. In order to create unique formulas, automated dosing and mixing systems are necessary in order to precisely follow the ingredient proportion instructions provided by AI. The aforementioned systems should be characterised by high levels of accuracy and rapid adjustability.

It is imperative that quality control systems be integrated into each phase of production, utilising sensors and analytical tools to verify that products meet the specifications of personalised formulas. In order to eliminate errors and ensure precision, automated verification systems are utilised to compare real-time results against expected standards.

The efficient management of ingredient inventories is of crucial importance in ensuring the availability of all necessary components for the creation of custom formulas. This encompasses the utilisation of demand forecasting systems and automated inventory replenishment. It is imperative that production lines are equipped with adaptable packaging technologies, thus enabling the customisation of packaging for each individual product.

In addition, logistics must be sufficiently flexible to ensure the effective delivery of personalised items to customers. In order to enhance efficiency, it is recommended that packaging and assembly processes be automated, with robotic systems being utilised for the management of packaging and labelling. The capacity to print or apply personalised labels and packaging that reflect each product's unique traits should be a fundamental consideration.

It is imperative that a centralised production process management system be implemented in order to coordinate all aspects of production, from the receipt of data to the packaging of finished products. The regular analysis of production data and processes is conducive to the identification of bottlenecks and the optimisation of operations, with the ultimate objectives of increasing efficiency and reducing costs.

The following section will consider the potential benefits for brands that are able to implement such an approach. Primarily, the capacity to provide customised products enables the establishment of elevated pricing structures. It has been demonstrated that customers are willing to pay more for individual solutions, which has been shown to increase profitability. The utilisation of automated systems has the potential to diminish the necessity for manual labour, thereby reducing the financial burden associated with the production of personalised products. Furthermore, the enhanced precision and efficiency of automation processes leads to a reduction in expenses associated with manual adjustments and reprocessing. The integration of AI technologies and modular systems facilitates a more precise calculation of ingredient needs, thereby minimising waste and excess. This efficiency is complemented by the flexibility and modularity of the production lines, which allow

them to adapt quickly to changing requirements, reducing the time from order to delivery. Another key benefit is reduced inventory. As products are made to order, less stock is required, reducing warehousing and inventory management costs. In addition, brands that can offer unique, personalised products gain a competitive advantage by attracting consumers who are looking for an individual approach. Finally, investing in personalised production allows brands to capture this growing market segment that is willing to pay premium prices for a tailored approach.

However, it is imperative to acknowledge several critical considerations. The implementation of automated systems and modular production lines necessitates a substantial capital investment, initially encompassing the procurement and installation of advanced technological equipment, which frequently incurs considerable expenses. Furthermore, the development and integration of AI systems and software for the management of personalised requests has been shown to result in increased expenses. In addition to these preliminary investments, the training of operators and managers to utilise the novel systems and technologies introduces both temporal and financial encumbrances. The scaling of personalised production entails a unique set of challenges, particularly for prominent brands that are required to guarantee compliance with each element of the production process on a global scale. Moreover, the necessity of a high degree of personalisation gives rise to the imperative of rigorous quality control. Such control can, however, result in the escalation of costs associated with product inspections and testing. Furthermore, the introduction of such rigorous quality control measures may also give rise to potential risks of product defects.

Despite the considerable capital and effort demands of investment in personalised production, the potential economic benefits of market growth, long-term competitive advantages, increased customer loyalty, inventory optimisation and higher profitability render this approach attractive to brands. The successful implementation of personalised production has the potential to become a strategically significant step for brands, providing both short-term and long-term economic advantages.

4. Impact on Brands and Marketing

In a market characterised by an escalating prevalence of consumer-driven demand, it is incumbent upon brands to meticulously adapt their strategic approaches in order to effectively respond to the evolving preferences of their target demographic. In lieu of reliance upon extensive, indiscriminate advertising strategies, it is incumbent upon brands to concentrate on the provision of personalised offerings. This process entails the utilisation of consumer data to formulate targeted marketing campaigns, presenting products and services that are tailored to the specific needs and preferences of each client. For instance, brands can utilise machine learning algorithms to analyse purchasing behaviours, recommending products aligned with users' interests, or sending personalised emails with tailored promotions based on past purchases and customer behaviour.

The crux of the matter lies in the establishment of continuous, bidirectional communication between the brand and its customer base. It is imperative for brands to proactively engage with consumers on social media platforms, through direct interaction and by soliciting feedback, thereby ensuring that suggestions are given due consideration for the purpose of continually refining their offerings and strategies in real time. The strategic utilisation of comments, mentions, and interactive posts to foster engagement with customers has been demonstrated to yield a concomitant strengthening of brand image. This approach emphasises the establishment of authentic connections, whereby the brand is perceived not only as a provider of products, but as a constituent element of its customers' lives.

It is incumbent upon brands to develop and implement loyalty programmes that reward customers for their loyalty. These may include bonus points, exclusive offers, and personalised discounts. The establishment of clubs or programmes that offer exclusive privileges and bonuses to regular customers is a strategy that should be given due consideration. One potential strategy is to offer personalised bonuses and promotions based on purchasing behaviour.

5. Conclusions

In the imminent future, personalisation is poised to emerge as the prevailing standard within the cosmetics industry. The advent of sophisticated artificial intelligence technologies, the evolution of consumer preferences, and the escalating competitive dynamics within the market have collectively precipitated the emergence of personalised products as a prevailing trend. The advent of AI-driven personalisation has engendered a unique opportunity to engineer products that are tailored to the specific needs and preferences of each customer, thereby enhancing the user experience and unlocking new innovation possibilities in the cosmetics sector.

From a business perspective, personalisation significantly increases customer loyalty, as personalised products better meet individual expectations and needs, fostering a stronger connection to the brand and encouraging repeat purchases. In addition, companies that adopt advanced personalisation technologies can differentiate themselves from the competition,

gaining a competitive advantage and cementing their reputation as industry innovators. Personalised solutions also open up new revenue opportunities, such as subscription services or special offers, which can significantly increase profits.

Nevertheless, this approach is not without its challenges. The implementation of personalised technologies necessitates a substantial financial investment in both the development and production retooling phases. It is important to note that companies may incur significant financial expenditure when upgrading equipment and integrating new technologies into existing workflows. The customisation of production lines for the manufacture of unique products has the potential to introduce complexities and potential disruptions to the supply chain, which may have a detrimental effect on operational efficiency. Concerns have also been raised regarding data security and regulatory compliance, as personalisation relies on the collection and analysis of large volumes of personal data. Finally, there is the risk that personalised products may fail to meet consumer expectations, resulting in dissatisfaction and reduced brand loyalty.

While personalisation is poised to become a key trend in cosmetics, its successful implementation re quires considerable investment and effort. Despite the risks, the advantages – such as enhanced customer loyalty, competitive differentiation, and innovation potential – make it an appealing path for brands. For success, companies must carefully plan the adoption of these technologies, anticipate potential challenges, and adapt their strategies to meet the rapidly evolving market demands.

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