Augmented Reality (AR)-Based Beauty Service App Characteristics and Spatial Presence Effects on Immersion

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Abstract

Evidenced by the rising popularity of smartphones, the advancement of mobile communication technology, and the widespread use of mobile social networks, mobile augmented reality (AR) has become a part of our daily lives. This study aims to understand the impact of AR-based beauty service app characteristics and spatial presence on user immersion. A survey of 731 Chinese and Korean users was conducted online, and the data were analyzed using SPSS 26.0. The findings reveal three factors that in AR-based beauty service apps significantly impact immersion in reality, interaction, and information availability. Additionally, spatial presence greatly influences immersion. Specifically, when Korean and Chinese consumers engage with AR beauty service apps, the sense of reality plays a crucial role. This research is expected to help businesses better grasp user psychology in providing AR-based beauty services, offer a realistic and compelling AR experience, enhance brand influence, and positively affect consumers' purchasing decisions. It also aims to serve as foundational research data for the cosmetics industry to develop various marketing strategies using AR experiences tailored to consumer levels and behaviors in the future.

Keywords: Augmented Reality (AR), Beauty Service Apps, Immersion

1. INTRODUCTION

1.1. Background and Purpose of the Study

Evidenced by the widespread use of smartphones, the advancement of mobile communication technology, and the growth of mobile social networks, mobile augmented reality (AR) has become an integral part of our daily lives. The Untact culture, spurred by the prolonged novel coronavirus pandemic, has emerged as a new form of consumption, prompting many companies to accelerate their digital transformation. Yet, promoting products that are crucial to consumers' experiences can be challenging. Consequently, offline brands focusing on experiential marketing are increasingly adopting AR. The market research firm CCS Insight predicts that the virtual reality (VR) and AR market will grow to more than 4 billion US dollars within three years. Forbes, an economic magazine, notes that while VR and AR technologies are currently prevalent in gaming, their application is expected to expand across various life domains, offering substantial future investment potential. Beyond the already utilized sectors like fashion and beauty, the use of AR in diverse areas of our lives is anticipated to increase gradually.

Innovative services that utilize augmented reality (AR) and virtual reality (VR) are rapidly evolving in the cosmetics industry. Particularly, those integrating AR technology with beauty applications to offer virtual makeup services are gaining popularity. These services allow consumers to experience virtual makeup without actually applying any, providing an indirect experience of the products. Cosmetics brands employing AR for virtual makeup trials on beauty apps have surfaced, leading to new marketing strategies that offer product experiences and encourage the purchase of actual products. Due to the rise of online shopping and a new consumer culture, offering consumers experiential opportunities through customized shopping services is increasingly important. Recently, the rapid development of augmented reality (AR) has spurred a significant increase in related research. Studies such as those by Yu Zhihui and Jin Chengren (2020) on the user experience of virtual beauty and makeup applications, and by Chen Tianchen, Dai Mingyue, and Park Hyun-jung (2019) on user experience and satisfaction with augmented reality applications, exemplify this trend. A related study by Han Shengyan (2021) on the impact of augmented reality (AR)-based experiences on cosmetics purchase intentions and Yoon's (2016) research on the use and preference of cosmetics brand apps show that consumers have positive reactions to AR. These studies indicate that after using AR services, consumer behavior changes, leading to an increase in the consumption of beauty products. However, most previous research has focused on the user experience, satisfaction, and purchase intentions of AR beauty apps, with little attention given to the characteristics of the AR beauty apps themselves.

This study empirically examines the characteristics of augmented reality (AR)-based beauty service apps in Korea and China, aiming to understand the impact of these app characteristics and empathy on user immersive experience. Moreover, it seeks to identify the differences in influencing factors between Korean and Chinese apps. This research will offer foundational data for beauty brands utilizing AR-based beauty service apps in the future.

1.2. Scope and Methodology of the Study

This study empirically investigates the characteristics, spatial presence, and immersion of beauty service apps based on augmented reality (AR), building on previous studies. It first reviews the theoretical background and then, informed by literature research, develops a research model and formulates research questions. The methodology combines prior research, literature review, online and offline surveys, and empirical data gathered through questionnaires. The survey targets Korean and Chinese users aged 10-49 who have experience with AR-based beauty service apps and runs from November 17, 2023, to November 28, 2023. Data analysis was performed using SPSS 26.0, employing reliability analysis, factor analysis, and multiple regression analysis.

2. Theoretical Background

2.1 Augmented Reality (AR)

Augmented Reality (AR) involves the interaction between humans and virtual information, achieved by integrating virtual data with 3D virtual information in real time .¹ AR is the technology of inserting virtual objects into the real world, enhancing reality and creating the impression that these objects truly exist .² Specifically, AR refers to the practice of overlaying various virtual elements like objects, text, and sounds that do not exist in the actual environment, thereby creating new visual experiences by superimposing these nonrealistic objects onto real spaces. ³

¹ Azuma, A survey of augmented reality. Presence Teleoperato rs and Virtual Envi-ronments, 6(4), 1997, pp.355-385.

² C. McGarrigle, [Augmented Reality Art], 2018, pp.115-130.

³ Kang Jeongbin & Lee Sangwon. (2018). Visual Effects and Image Type Analysis of AR Based Selfie Applications . The Korean Journal of animation. 14.3. 153-167.

Recently, the cosmetics industry has introduced a marketing method that incorporates augmented reality (AR) technology, attracting increasing attention from consumers eager to experience cosmetics firsthand. Following this trend, many beauty companies are expanding their efforts to introduce AR-based experience spaces at their sales locations.⁴

In addition, South Korea offers apps that feature augmented reality beauty services. PingKing, a popular choice among consumers, has introduced a feature that precisely projects selected cosmetic colors onto the user's face, achieving an effect akin to an actual makeup application. Sephora utilizes an augmented reality platform to allow users to explore a range of makeup products. Artificial intelligence (AI) technology assists users in finding the skin tone that best matches them while they virtually try on makeup. Amore Mall offers a unique virtual makeup experience through its app, utilizing the latest artificial intelligence (AI) technology. It assists users in finding the perfect foundation match for their skin tone and offers real-time skin diagnosis services for those with skin problems .⁵ Additionally, ZamFace leverages AI to analyze and match faces, providing users with cosmetic information and tutorials on how to apply makeup used by celebrities with similar face shapes and skin colors.⁶

In China, beauty services employing augmented reality technology have been introduced across various apps. Vipshop leverages AI technology to match beauty products with users' facial features, offering a virtual makeup experience within the app. Dewu, an app selling trendy shoes and clothing, has secured a market position by incorporating well-known shoe brands. The development of beauty product experience functions extends beyond fashion, allowing users to to try on different color products virtually. This feature simulates the experience of applying makeup, assisting users in purchasing related products if necessary. Taobao, China's comprehensive

⁴ D.J.Shin, 「Korean Journal of Tourism Research」, 2010, pp.259-278.

⁵ Han Seung-yeon. (2022). A study on the effect of augmented reality-based experience on color cosmetics. Master's Thesis. Hanseong University.

⁶ Woo Ji-hye & Kim In-jeong. (2020). A study on User experience of Virtual Beauty Makeup Applications. Journal of Digital Convergence, 18(11), 459-464. <u>http://dx-doi-org.proxy.wsu.</u>ac.kr/10.14400/JDC.20 20.18.11.459

shopping app, has launched a feature enabling users to virtually test the makeup effects of various beauty products and directly purchase them based on the provided product information.



Figure 1: Beauty App Comparisons

2.2. I Presence

The dictionary defines present respect as the cognitive sensation an individual experiences about themselves when unaware of the specific medium they belong to. This phenomenon occurs when the audience, aware of their media consumption, reaches a certain point where they temporarily forget the media's existence.⁷

According to situational cognition theory, augmented reality (AR) can simultaneously provide simulated physical control and environment embedding, thereby inducing spatial presence. This, in turn, improves customer value perception and facilitates more comfortable decision-making. AR has been

⁷ Kim Young Yong (2003). Interpretation of HDTV Presence Media. Communication Books, 2003.

shown to influence an individual's spatial presence, and its quality traits may also affect spatial presence .⁸ Research by Uini (2022) found that the availability of information and the sense of reality in augmented reality (AR) makeup services positively impact spatial presence .⁹

2.3.Indulge

Immersion is defined as a psychological phenomenon where individuals are deeply engaged in a specific situation. It occurs when one is focused on a task or activity, considered the optimal state of mind. Simply, immersion signifies a state of complete focus and enjoyment in a particular activity .¹⁰ In a state of immersion, individuals commonly experience emotions such as loss of self-consciousness, indifference to their surroundings, altered perception of time and space, increased concentration, and effortless engagement. These moments of immersion typically occur spontaneously, without external coercion or the individual's will, leading to satisfaction and happiness .¹¹ The research by Zhao Hee-kyung and Kim Sung-hoon (2017) demonstrates that when augmented reality applications feature satisfactory interaction and reality elements in their content design and usability analysis, user engagement significantly increases.¹²

2.4. Characteristics of Augmented Reality (AR)-Based

Beauty Service Apps

Augmented reality is a technology that overlays virtual images onto real backgrounds, displaying them as a single image.

⁸ Hilken, 「Journal of the Academy of Marketing Science」, 2017, pp.884-889.

⁹ Uini. (2022). The effect of augmented reality based makeup service on e-WOM behavioral intention of female consumers: focusing on mediating effect of spatial presence.Master's Thesis. Chung-Ang University

¹⁰ Wang Yang. (2020). Wang Hong A study on the impact of watching live broadcasts on purchase intentions, Master's Thesis. Dongguk University.

¹¹ Yong Seok-hong .(2016). Study for effect relationship between experience economy factors(4Es) and behavior intention of culture and tourism festival: focused on the experience economy theory of Pine and Gilmore. Ph.D. Thesis. Anyang University.

¹² • Cho Hee-kyung & Kim Sung-hoon.(2018). Visual Effects and Image Type Analysis of AR Based Selfie Applications. Korean journal of animation. 14(3). 153-167.

Beauty applications offering these virtual experiences are known as augmented reality beauty apps .¹³

An Ji-hye (2020) research categorizes the characteristics of augmented reality into three categories: interaction, reality, and immersion. The study confirms that augmented reality advertisements offer higher interaction and immersion compared to traditional advertisements, resulting in more effective persuasion .¹⁴ Kim Hye-kyung(2019) research primarily focuses on the key features of augmented reality technology, including interaction with objects, enhanced information provision, and the ease of manipulating virtual objects realistically. It finds that ease of use, a realistic sense of presence, and information provision are characteristics of augmented reality that positively affect consumers' acceptance of new technologies and media. Studies indicate that, especially for augmented reality-based fashion product applications, interactive features significantly enhance immersion in the experience ¹⁵. Sookyung Yoon (2013) analyzed the characteristics of content provided by beauty applications, categorizing them into information-providing, interactive, and shopping e-commerce linkage forms . ¹⁶ Kwak Beauty Cow(2018) analyzed the effects of augmented reality features on virtual makeup experience satisfaction, finding that a higher preference for augmented reality features—such as 3D stereoscopy, real-time interaction, immersion, and virtual image combination—positively correlates with satisfaction factors.¹⁷

¹³ Sookyoung Yoon. (2013) A study of the beauty application contents composition

on smart phone. Master's Thesis. Seokyung University

¹⁴ Ahn Ji-hye.(2020). The Effect of Augmented Reality-based Fashion Products Application on Intention to Use. Master's Thesis. Soongsil University.

¹⁵ Kim Hye-kyung. (2019). The Effect of Augmented Reality-based Fashion Products Application on Intention to Use. Master's Thesis. Soongsil University.

¹⁶ Sookyoung Yoon. (2013) A study of the beauty application contents composition on smart phone. Master's Thesis. Seokyung University

¹⁷ Kwak Beauty Cow. (2018). Influence of AR Characteristics on the Purchase Behavior of Color Cosmetics : Focused on the mediation effect virtual makeup experience satisfaction. Master's Thesis. Seokyeong University.

This study thoroughly scrutinized previous research to consolidate concepts that refer to the same content but are named differently in each study. It identified that the most commonly mentioned concepts are reality, interaction, and the characteristics of Augmented Reality (AR)-based beauty service apps, specifically their informative availability. The goal is to analyze how these characteristics influence spatial presence and immersion.

3. Research Methods

3.1. Research Models and Research Issues

The research questions set up for this study are as follows:

Research Question 1. Understanding the Sub-dimensions of Augmented Reality (AR)-Based Beauty Service App Characteristics.

Research Question 2. Understanding the sub-dimensions of spatial presence and immersion.

Research Question 3. Exploring the impact of augmented reality (AR)-based beauty service app characteristics on immersion.

Research Question 4. Understanding the influence of spatial present on immersion.

The research model of this study is as follows



Research Model

3.2. Methods of Data Collection and Analysis

This survey, conducted online by a professional survey company, targeted consumers who were experienced in using augmented reality (AR)-based beauty service apps. For the Korean survey, Embrain utilized a panel for a 7-day survey from November 22 to November 28, 2023. The Chinese survey involved translating the questionnaire into Chinese, with Chinese postgraduates fluent in Korean and Chinese reviewing and finalizing it. This survey was conducted using Questionnaire Star's panel over 7 days, from November 17 to November 23, 2023. Excluding incomplete questionnaires, data from 350 Korean and 381 Chinese respondents were analyzed.

The data analysis was performed using SPSS 26.0, employing reliability analysis, factor analysis, and multiple regression analysis.

3.3. Research Tools

Based on previous studies, this study structured the questionnaire to include questions with regard to the characteristics of augmented reality (AR)-based beauty service spatial presence, immersion, and demographic apps, characteristics. The section on AR-based beauty service app characteristics draws on the research of Han Shengyan (2022), Guo Weishao (2019), Jin Huijing (2019), among others. It has been revised and refined by researchers, resulting in 15 questions. The spatial presence section was updated and expanded based on the work of Li Xichang (2015) and Liu Yini (2022), creating 5 questions. Similarly, the immersion section was revised and expanded with contributions from Han Shengyan (2022) and Guo Weishao (2019) to include 5 questions. Demographic characteristics were addressed through nominal scales covering nationality, sex, marital status, age, occupation, education level, and average monthly income, while all other questions were measured on a 5-point Likert scale.

3.4. Demographic Characteristics of the Subjects Surveyed

The demographic characteristics of the survey respondents are presented in Table 2. There are 350 valid responses from Korea and 381 from China, totaling 731 valid samples for the empirical analysis in this study.

The gender distribution was 85.1% female (622 cases) and 14.9% male (109 cases), with a significantly higher proportion of females. Among these individuals, 51.8% (379 people) were unmarried, while 48.2% (352 people) were married. The age distribution was as follows: 10.9% (80 people) were 10 years

old, 40.9% (299 people) were 20 years old, 33.7% (246 people) were 30 years old, and 17.3% (106 people) were 40 years old, with the highest proportion being 20 years old. Regarding education among Korean and Chinese respondents, the lowest percentage was 2.3% (17 people), and the highest was 63.9% (467 people), with high school graduates making up 5.7% (42 students). Occupational distribution was 58.7% (429 people), 24.6% (180 people), 6.6% (48 people), 5.2% (38 people), and 4.9% (36 people). Additionally, 26.8% (196 people) reported their average monthly income (including pocket money for students and part-time jobs) as the most common, 19% (139 people) earned less than 500,000 won, and 17.5% (128 people) earned less than 1.5 million won, followed by 16.6% (121 people), 15.7% (115 people), and 4.4% (32 people).

Item	Frequ	Frequency (%)				
- Within The	Korea	350(47.9%)				
Nationality	China	381(52.1%)				
540	Total	731(100%)				
Gender	Female	622(85.1%)				
	Male	109(14.9%)				
	Total	757(100%)				
0.2252.2	Single	379(51.8%)				
Mantal	Married	352(48.2%)				
Status	Total	731(100%)				
1	10 years old	80(10.9%)				
	20 years old	299(40.9%)				
Age	30 years old	246(33.7%)				
1000	40 years old	106(14.5%)				
	Total	731(100%)				
	Student	180(24.6%)				
	Employee	429(58.7%)				
22 - 57	Self-employed	48(6.6%)				
Occupation	Housewife	38(5.2%)				
	Others	36(4.9%)				
	Total	731(100%)				
1	High School and Below	58(7.9%)				
	High School Graduation	42(5.7%)				
	In College	88(12%)				
Editoria	Graduated from College	467(63.9%)				
Education	In Graduate School	17(2.3%)				
	Graduated from Graduate School	59(8.1%)				
	Total	731(100%)				
	500,000 Won and Below	139(19%)				
Average	500-1 million Won	115(15.7%)				
	1-1.5 million Won	128(17.5%)				
Monthly	1.5-3 million Won	196(26.8%)				
Income	3-6 million Won	121(16.6%)				
	More than 6 million Won	32(4.4%)				
	Total	731(100%)				

Figure 2: Demographic Information of Study Participants.

4. ults and Discussions

4.1 The Characteristics of Augmented Reality (AR)-Based Beauty Service Applications, Including the Subdimensions of Spatial Presence and Immersion

To explore the sub-dimensions of augmented reality (AR)based beauty service apps' characteristics, this study performed a factor analysis using principal factor analysis on 15 questions related to these characteristics. It applied the Varimax rotation method to extract factors. Table 3 presents the results of the factor analysis and reliability verification for the characteristics of AR-based beauty service apps.

The moderation of factor explanatory power was considered, and Cronbach's alpha was calculated to verify the reliability of the measurement items. The analysis results revealed that the characteristics of beauty service apps based on augmented reality (AR) are categorized into three factors, explaining 63.839% of the total variance. Factor 1, named "Reality", pertains to whether users have had vivid experiences on AR-based beauty service apps, akin to real-life experiences. This factor had an intrinsic value of 3.012, explained 44.306% of the variance, and had a confidence level of 0.831. Factor 2, named "Informative", relates to the value of the information provided by AR-based beauty service apps. Its intrinsic value was 2.709, it explained 12.898% of the variance, and had a confidence level of 0.779, indicating reliability. Factor 3, named "Interactive", involves whether the app's features enable real-time user communication and interaction. It had an intrinsic value of 2.558, explained 6.625% of the variance, and had a confidence level of 0.759, also indicating reliability.

Figure 3: The Results of the Factor Analysis and Reliability Verification for the Characteristics of AR-Based Beauty Service Apps

Factor	Question	Factor load	Elgenvalu e	Description Variable (Accumulat ed Variable) (%)	Reliabilit y (a)	
	The augmented reality (AR)-based beauty service app offers a virtual cosmetics experience that feels incredibly real.	f beauty osmetics .833				
Factor 1	In the augmented reality (AR)-based beauty service apps, the cosmetics experience often blurs the line between virtual and real.	.801		44.316		
Real Feeling	The augmented reality (AR)-based beauty service app provides a realistic cosmetics experience.	.765	3.012	(44.316%)	.831	
	The augmented reality (AR)-based beauty service app provides a 3D experience as vivid as the real scene.	.710	-			
	You can move like a real person in the augmented reality (AR) beauty service app's cosmetics experience.	.559				
	Augmented Reality (AR)-based beauty service apps provide users with information they are interested in.	.749		12.898 (57.213%)		
	Augmented Reality (AR)-based beauty service apps offer a variety of beauty information and services.	.725				
Factor 2	Augmented Reality (AR)-based beauty service apps rapidly update with the latest information.	.704				
Information Availability	Augmented Reality (AR)-based beauty service apps can meet users' personal needs, such as beauty information search and consultation.	.695	2.709		779	
	The beauty information and services offered by augmented reality (AR)-based beauty apps are accurate and beneficial.	.578				
	The augmented reality (AR)-based beauty service app provides an experience with two-way communication in the cosmetics domain.	.749				
Factor 3	You can receive real-time feedback from the cosmetic experience offered by augmented reality (AR)-based beauty service apps.	.747	147			
Brand Name Functionality	I can quickly access the information I want using the cosmetic experience provided by augmented reality (AR)-based beauty service apps.	.733	2.558	6.625 (63.839%)	.759	
	The augmented reality (AR)-based beauty service app allow you to access relevant cosmetics information in real time.	.673	.673			
	In augmented reality (AR)-based beauty service apps, you can choose what you want to see.	.669				

This study used principal component analysis (PCA) to analyze the factors from 10 questions. The Varimax rotation method facilitated the extraction of factors, exploring spatial presence and immersion sub-dimensions.

The factor analysis results of spatial presence and immersion are shown in Table 4.

Figure 4: The Factor Analysis Results of Spatial Presence and Immersion

Factor	Question	Fact or load	Eigenva lue	Description Variable (Accumulated Variable) (%)	Reliability (α)	
Factor 1 Sense of Spatial Presence	When using augmented reality (AR)-based beauty service apps, the world within the app feels more real than reality.	.846				
	After the trip, I felt I was back in reality after using augmented reality(AR) – based beauty service apps.	.834				
	Using augmented reality (AR)-based beauty service apps made me feel like someone was right beside me.	.833	3.337	(53.525%)	.883	
	Using augmented reality (AR)-based beauty service apps felt like being in virtual reality.	.723				
	The virtual experience of augmented reality (AR)-based beauty service apps is similar to experiencing real products.	.510				
Factor 2 Indulge	Using augmented reality (AR)-based cosmetic experiences can lead to spending more time on them than expected.	.772			.818	
	When using an augmented reality (AR)-based cosmetics experience, carefully examine the relevant information to ensure you don't miss any details provided.	.745	3.058			
	Using an augmented reality (AR)-based cosmetic experience, you will be visually immersed and unaware of the passage of time.	.687		10.422 (63.947%)		
	Using augmented reality (AR)-based cosmetic experiences becomes completely immersive.	.677				
	When using an augmented reality (AR) - based cosmetic experience, you will encounter sensations that are not possible in real life.	.623				

natory power is considered, and Cronbach's alpha is calculated to verify the reliability of the measurement items. The results indicate that spatial sense of presence and immersion emerge as two distinct factors. Factor 1, focusing on spatial presence, consists of five questions, has an intrinsic value of 3.337, an explanatory power of 53.525%, and a reliability of 0.883. Factor 2, centered on participation, also includes five questions with an intrinsic value of 3.058, an explanatory power of 10.422%, and a reliability of 0.818, indicating a reliable level.

4.2. The Impact of Augmented Reality (AR)-Based Beauty Service App Characteristics on Immersion

To understand the impact of augmented reality (AR) beauty service apps' characteristics in Korea and China on reality perception, interaction, and information availability, regression analysis was performed. The specific results are shown in Table 5. In South Korea, the features of augmented reality (AR)-based beauty service apps significantly affect the immersion rate, with an explanatory power of 45.9%. The results indicate that the relative influence ranks as follows: reality (0.405, t = 8.551), information availability (0.213, t = 3.726), and interaction (0.189, t = 3.091). Reality has the most significant impact on the immersion of AR beauty service apps.

In China, augmented reality (AR)-based beauty service apps significantly impact immersion, with an explanatory power of 56.2%. The results indicated that their relative influence, in descending order, was reality (0.405, t=8.551), interaction (0.257, t=4.717), and information provision (0.244, t=4.804). Reality had the greatest impact on immersion in AR beauty service apps.

Both Korean and Chinese users found that the sense of reality was the most influential factor when using augmented reality (AR)-based beauty service apps (Korea: = 0.405, China: = 0.346), indicating that the realism of AR-based beauty services plays a crucial role in user engagement. Conversely, interaction was valued differently, with Chinese users placing more importance on it than Korean users (Korea: = 0.189, China: = 0.257). AR face recognition technology to recommend personalized beauty products and styles is expected to enhance user experience. On top of that, users in South Korea and China similarly value the information delivery performance of AR beauty service apps (South Korea: = 0.213, China: = 0.244), underscoring the importance of information transparency and accuracy in both countries. These findings align with Zhao Hee-kyung and Kim Sung-hoon (2017)'s research on the impact of AR applications on user participation and engagement, suggesting users are more likely to participate and engage when interaction and reality factors are adequately addressed.

Figure 5: Regression Analysis on the Impact of Augmented Reality (AR) Beauty Service Apps' Characteristics in Korea and China on Reality Perception, Interaction, and Information Availability

Country	Dependent Variable	Indepen dent Variable	β	t value	Modifi ed R ²	F
	Indulgence	Real Feeling	.405	8.551***		99.781***
Korea		Interactiv ity	.189	3.091*		
Noiea		Informati on availabili ty	.213	3.726***	450	
		Real Feeling	.346	7.054***	439	
China		Interactiv ity	.257	4.717***		
		Informat ion availabili ty	.244	4.804***		

4.3. The Influence of Spatial Presence on Immersion

To understand the impact of spatial presence on immersion, a regression analysis was conducted with spatial presence as the independent variable and immersion as the dependent variable. The findings are as follows: in Korea, the regression's explanatory power is 20.2%, and spatial presence (β = 0.670, t = 16.858) significantly positively (+) affects immersion. In China, the regression's explanatory power increases to 35%, with spatial presence (β = 0.539, t = 14.353) also showing a positive correlation with immersion.

Figure 6:Regression Analysis on the Influence of Spatial Presence on Immersion.

Country	Depend ent Variable	Indepen dent Variable	β	t value	Modified R ²	F	Country
Korea	Indulgen ce	Sense of Spatial Presenc e	.670	16.858** *	.448	284.183 ***	Korea
China	Indulgen ce	Sense of Spatial Presenc e	.539	14.353** *	.350	205.996 ***	China

This means that Korean and Chinese users experience a higher sense of spatial presence, with its impact on immersion greater in South Korea than in China. These analytical results align with findings from studies by Hao Li (2017), Chen Tianchuan, Dai Mingyue, and Park Xianzhen (2019), which indicate a positive correlation between the feeling of spatial presence and immersion. Hence, it can be observed that differences exist in the level of spatial presence during participation, with a higher spatial presence leading to greater enthusiasm for participation.

5. Conclusion

This study analyzed the characteristics of augmented reality (AR)-based beauty service apps in Korea and China, examining their impact on spatial presence and immersion. It also explored the differences in influence of AR- based beauty service apps between the two countries. The findings are summarized as follows: First, the characteristics of AR-based beauty service apps are categorized into three factors: reality, interaction, and information availability. Second, these characteristics significantly influence immersion in both Korea and China, with the order of influence being reality, information provision, and interaction in Korea, as well as reality, interaction, and information provision in China. For consumers in both countries, the sense of reality is the main factor affecting user immersion in AR beauty service apps. Still, Chinese consumers place more emphasis on interactive experience, while the importance of information supply is similar in both countries. Third, the study found that the feeling of spatial presence significantly influences immersion, and Korean consumers perceive greater influence than their Chinese counterparts.

The practical enlightenment is as follows: Firstly, the results indicate that the primary factor influencing the immersion of Korean and Chinese consumers in augmented reality (AR) beauty service apps is the sense of reality. Therefore, to effectively enter the Chinese market and meet local user needs, Korean AR beauty service app companies must employ advanced AR technology to offer a realistic and natural virtual makeup experience. This approach ensures users experience a high level of realism and natural harmony during use. Additionally, the transparency and diversity of information provision are crucial in enhancing consumer immersion. Thus, cosmetics enterprises should provide detailed product information, clear usage instructions, and effectively highlight relevant information, enabling users to understand better and trust the products. Secondly, the results indicate that spatial presence positively affects user immersion. There are notable differences between Chinese and Korean users, with the impact of spatial presence on immersion being stronger in Korea than in China. As a consequence, Chinese AR beauty service apps should provide customized services that cater to users' spatial presence and individual needs. By leveraging intelligent algorithms and analyzing user data, it is essential to

recommend beauty products or skincare solutions that align with users' spatial preferences, thereby enhancing immersion and satisfaction. Based on these findings, Chinese and Korean cosmetics brands should establish interactive virtual experience stores in major business districts, allowing users to experience app functionalities in real time and interact with professional consultants on-site. Providing such experiences and services can attract more consumers, guiding them to experience the brand, increasing exposure, and enhancing popularity. Furthermore, it can collect user feedback and opinions in the experience store, continuously optimizing and improving the app's functions and user experience, thereby increasing user satisfaction and loyalty.

This study has the following limitations, which need to be addressed in future follow-up research.

Firstly, the study focuses on specific augmented reality (AR) beauty service apps. There are many types of beauty apps, and their differences may affect the study's results.

Secondly, this study examines the impact of augmented reality (AR)-based beauty service app characteristics and spatial presence on immersion. Further, it explores the relationship between them and actual purchase intention, which is also meaningful. Specifically, the impact of AR-based beauty service apps on immersion is significant, but it is more important to investigate how this relates to consumers' actual purchase intentions. High investment in AR may not necessarily translate to purchase intention; other variables influencing purchase intention should also be considered.

The future application prospects of augmented reality (AR) technology in the cosmetics industry are expected to expand greatly. As consumer sophistication improves and consumption patterns change, this study aims to serve as valuable foundational research material for various marketing strategies based on AR experience.

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