University of Pannonia

Doctoral School of Business and Management

Technology Acceptance and Use of Consumers

Habilitation Thesis Summary

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1. Introduction

My habilitation thesis has been started with the introduction of my carrier overview, especially how my scientific activities, interest and publication has been related in since I have got obtained my Ph.D. degree. In summary I have obtained my Ph.D in 2014, and the dissertation manuscript has been finished in Beijing, when I have spent 3 semester at Peking University in the People's Republic of China. While my dissertation has mainly focused on consumer loyalty, my new focus in the recent years has been shifted within consumer behavior (marketing) and I mainly focus on technology acceptance and use of consumers.

I have mainly focused on issues like publicity and privacy and artificial intelligence (AI) as influencing factors in technology acceptance and use, however East-Asia also remains as an important factor in my academic career, so some article has been investigated how East-Asian innovation may influence Hungarian consumers, or the sample has been selected from countries from that region. My most important publications are the following, in which the first 5 has been briefly introduced in my habilitation thesis, while the last 2 are accepted papers with early access to show the ongoing work.

[1] Simay, Attila Endre – Gáti, Mirkó (2018): Jó példa-e Kína? Feltáró kutatás a mobil közösségi kereskedelemről. (Is China a good example? Exploratory study about social mobile commerce.) Vezetéstudomány, Vol. 49, No. 12, pp. 11-23. (MTA B)

[2] Simay, Attila Endre – Gáti, Mirkó (2019): Publicity in mobile and social media. Society and Economy. Vol 41, No 2, pp. 193-210. (Scopus Q3)

[3] Gáti, Mirkó – Simay, Attila Endre (2019): GDPR - A személyes adatok védelme és ennek percepciója egy magyar kutatás tükrében. (GDPR – Protection of personal data and its perception in a Hungarian research). Glossa Iuridica, Vol. 6, No. 1-2, pp. 305-322. (MTA A)

[4] Wei, Yuling – Simay, Attila Endre – Agárdi, Irma – Syahrivar, Jhanghiz – Hofmeister-Tóth, Ágnes (2023): Using Artificial Intelligence to Promote Branded Color Cosmetics: Evidence from Indonesia. Journal of Promotion Management, Vol 29, No. 5, pp. 644-675. (Scopus Q2)

[5] Simay, Attila Endre – Wei, Yuling – Gyulavári, Tamás – Syahrivar, Jhanghiz – Gaczek, Piotr – Hofmeister-Tóth, Ágnes (2023): The e-WOM intention of artificial intelligence (AI) color cosmetics among Chinese social media influencers. Asia Pacific Journal of Marketing and Logistics, Vol 35, No. 7, pp. 1569-1598 (Scopus Q1)

[6] Wei, Yuling – Syahrivar, Jhanghiz – Simay, Attila Endre (2024), "Unveiling the influence of anthropomorphic chatbots on consumer behavioral intentions: evidence from China and Indonesia", Journal of Research in Interactive Marketing, Paper: Early Access, 26 p. (Scopus Q1)

[7] Wei, Yuling – Gáti, Mirkó – Simay, Attila Endre (2024): How consumers' privacy perceptions influenced mobile payment acceptance during the COVID-19 pandemic. International Journal of Bank Marketing. Paper: Early Access, 24 p. (Scopus Q1)

In my habilitation thesis summary, I will briefly summarize the main results from that 5 article, but because of the limitations only the main concepts, results and implications will be present in this manuscript. I put more emphasis on the 4th and 5th Scopus Q2 and Q1 articles in this summary. I more detailed introduction of these articles has been elaborated in the habilitation thesis and the whole papers has been attached to the habilitation application. 3 out of 5 articles has been published in English in ranked Scopus journals.

2. Is China a good example? Social mobile commerce

In a paper published in the journal Management Science in 2018, my colleague Mirkó Gáti and I investigated the phenomenon of mobile social commerce. By this time, China had already made significant progress in the development of mobile and internet technologies. From a country adapting western technologies, it had become an incubator of internet innovation, and by the mid-2010s, mobile commerce and its combination with social media applications had created a new internet ecosystem. China has become the most advanced mobile commerce market in the world, so we thought it would be interesting to examine the extent to which Hungarian consumers would be receptive to adopting and using such a technological environment.

The data collection was conducted in the form of an online questionnaire, as the topic investigates online consumer behaviour among Hungarian users, so the method seemed appropriate and we tried to minimise any discrepancies between the survey and the subject of the survey (Gyulavári et al., 2015). In addition, the online survey allowed for a quick and large sample. The questionnaire survey was conducted between 24 April 2017 and 15 May 2017, as it is assumed that this 3-week period could have resulted in a large number of responses, however, potential biases in the data were minimised due to the potentially overly long data collection process. The analysis of the models presented below after the data cleaning phase was based on the final sample size of 844 respondents after the data cleaning phase. As the respondents participated voluntarily and were mostly undergraduate students from Corvinus University of Budapest and to a lesser extent from Károli Gáspár University of the Reformed Church in Hungary, the results cannot be considered representative. Nevertheless, the results were likely to point to exciting and general trends related to the topic. The sample was 72% female and 28% male. The higher proportion of women is due to the characteristics of the student sample (gender composition of students in the university courses surveyed). The average age of the respondents in the primary survey was 23 years (standard deviation: 3.9 years), with the most common age value (mode) being 22 years. The sample composition suggests that the sample consisted of university students, who are assumed to have smartphones and are likely to have a high proportion of presence on various social media platforms. Respondents in the sample tend to use social media intensively on their mobile phones (mean score of 5.85 on a 7-point scale, where a score of 7 represents the most intensive use), but less shopping activity on their mobile phones (mean score of 2.79 on a 7-point scale, where a score of 7 represents the most intensive shopping behaviour on their mobile phones).

We used international models and scales that have already been tested in the research, and we examined the international models with the aim of drawing relevant conclusions about mobile social media commerce applications in Hungary at the end of the research. The analysis of propensity to use was based on the model of Liebana-Cabanillas et al. (2017), while the model of Wang and Yu (2017) was used to examine propensity to buy, and then the two models were combined to perform a comparative analysis. Our research problem was to test the functioning of the models under investigation in a Hungarian context, showing the presumably different relationships and correlations between the constructs and their associations with willingness to use and willingness to buy under investigation. The significant relationship suggests that perceived usefulness, personalisation and user involvement may contribute to willingness to use, which may subsequently contribute to willingness to purchase such an application, which may ultimately contribute to purchase and, later, to post-purchase activities. While combining the models, trust was found to be incorporated as a direct indicator of purchase propensity as a significant variable. However, in this case the role of word of mouth was lost and the role of peer influence was thus excluded from the factors explaining propensity to buy.

In our opinion, the results obtained could or could have been useful in practice. For example, for organisations that would use e-commerce solutions with social media elements via mobile phones to target consumers. Consumers in Hungary were in the early stages of adopting m-commerce, so education and training were a priority for them before any sophisticated technology was introduced. This would presumably also be expected at present when introducing a new technology. What was then a reality in China was, or could be, a possible future in Hungary, so it would be worthwhile to test many of the principles of the solution with due awareness, adapting them if necessary, as this would allow a system that has already been tried and tested in some form elsewhere to be applied to companies in Hungary as a 'pre-test'.
The results thus suggest that educating potential users before deployment would be essential, as the application and in particular the purchase of goods via social mobile commerce apps would otherwise face serious challenges. First of all, it would be necessary to break down the barriers in the minds of consumers due to a lack of knowledge and hence a limitation of imagination, so that they can be persuaded to install and use the apps in exchange for personal benefits. In this context, companies entering the Hungarian market should, above all, build on personal benefits to convince potential consumers and try to involve them in the use of the applications, thereby emphasising the personalisation potential. Personal benefits are most likely to persuade respondents to use the apps.
As a future direction, it was considered interesting to see to what extent the integrated platforms studied, which are currently mostly used in China, will become established in our country in a few years, since then it will be possible to carry out a real comparative analysis in an international context, even if the analysis is carried out on platforms that have become common by then. However, recent years seem to have deepened the technological and platform divergence, and internet ecosystems have not merged, but are still developing along separate paths.

3. Publicity and Privacy in Mobile and Social Media

Recent technological developments, including mobile devices, have reformulated the separation between the public and the private spheres. The radical change in individual communications practice has also transformed the “publicity structure” of society and is reinterpreting the boundaries of public and private communication. By making phone calls (local, national, and international), the space and time constraints of personal communication can be overcome (Gálik – Urbán 2014). The rapid expansion of new info communications technology is changing the publicity perception of people involved in various communications situations. New social situations are being established, in addition to the contexts created by physical spaces, while the roles, expectations, and rules assigned to social situations are also changing. The line between public and private is becoming blurred; publicity is starting to encroach on the private sphere (Ferencz 2009).
According to research data, privacy-related issues do not affect users’ readiness to personalise their phones with applications, even if doing so raises questions of security. The level of privacy protection decreases with the use of mobile applications, since users use them to share more and more personal information (Han et al. 2015). Moreover, they are less and less circumspect, not only in terms of the quantity but also in terms of the quality of the information they share (Gronli et al. 2013).
Research from Taiwan found that the use of mobile applications potentially offers perceived benefits for users, benefits that are bigger than the potential degree of risks they perceive (Wang et al. 2016). This is not a unique result. Other data also show that in the case of young Facebook users, there are no private-sphere related considerations; they do not perceive any risk, say,

when checking in, i.e., sharing information regarding a given location on their smartphone (Kim 2016). Based on the results from Taiwan, personalised services, in which users have self-representation with portraits and personal information, are seen as social ties, which promote users' confidence in mobile applications. These services therefore encourage smartphone users to share information. The intention of symbolic self-expression also encourages people to share personal information via mobile applications. By sharing these personal data, they develop, maintain, and improve their personal relationships via mobile applications (Wang et al. 2016).
In 2015, 92% of both households and private individuals over the age of 14 had mobile phones, and the proportion of smartphones was showing a dynamic growth rate: 48% of people over the age of 14 had smartphones, compared to 11% in 2011 (NMHH 2016a). Further examination of public internet usage also shows the significance of Facebook in the online space used by Hungarian people. Based on an NMHH report (NMHH 2016b), Facebook was the most widely used internet-based social website in 2015 in Hungary with 86% of internet users. The NMHH report also shows that 66% of smartphone owners have installed the Facebook application and 52% have installed Facebook Messenger, the two most popular applications in Hungary in 2015. Facebook is therefore the dominant social media platform, and a widespread smartphone application (NMHH 2016b). Thanks to the spread of smartphones, the use of internet communities has appeared on mobile phones, too. In the following sections, and related to the main topic of this article, the term smartphone is used when mobile phones are mentioned in connection with internet use and social media.
As a starting point, this research focused on Hungarian and Taiwanese internet and social media usage, because it can be assumed that internet usage entails the rapid growth of the use of social networks. In Taiwan, internet penetration is 83.8% (Taipei Times 2014), while in Hungary it is 68% (NMHH 2016a). Facebook penetration in Taiwan is 76.7%, while in the case of Hungarian internet users this value is 86%, but the Taiwanese value is higher in proportion to its population (Internet World Stats 2016). On the whole, Taiwan is the most Facebook-using country based on total population (Taipei Times 2014).
In line with the context of new media, the research was carried out within the framework of an online survey, which allowed research in the shortest possible time, on the largest possible sample, thus minimizing costs incurred. Participants were students of Corvinus University of Budapest (CUB), and, to a lesser extent (20%) of the Károli Gáspár University of the Reformed Church in Hungary (KGU). Data collection was performed between 19 April 2016 and 11 May 2016, within a three-week interval to eliminate potential distortions which could have been derived from a wider interval. After the data cleansing, the final sample size was 1,088.
The proportion of women and men in the sample was 61.8% and 38.2%, respectively. The higher proportion of women derives from the characteristics of the sample of students and in that regard, the students' composition in the university courses involved in the research. The average age of the sample was 21.71 years (standard deviation: 3.39 years). Students in the sample belonged to the age group (mostly of 19–25 years) that possesses the most smartphones according to the NMHH report (2016b); 90% of the respondents were 25 years old or younger. In conclusion, 94.2% of the students in the sample live in cities and nearly 90% had average or above-average salaries.
Based on the primary analysis, the following conclusion can be made, taking into consideration the differences between the Taiwanese (Wang et al. 2016) and the Hungarian research: in relation to privacy, those surveyed consider the loss of their photos a less serious problem than was observed in the international sample. This is an interesting result, since the role of photos is hence shown to be on a different level of importance and it is possible that it has to be treated in a different way than the intention to disclose certain content (e.g. text).
As a result of the primary research, the contribution of self-presentation to the perceived benefits is not significant, i.e., in this case, the sample subjects are motivated by an external

opportunity and not an internal driving force to perceive information sharing to be beneficial. From this point of view, a characteristic of the Hungarian sample is that they are willing to share various types of information as a result of a kind of opportunistic, external-confirming force.
While in the Taiwanese research (Wang et al. 2016), the perceived risks primarily arose from the severity of the data loss the respondents suffered, in the case of the Hungarian sample the reason for the perceived risks was different. In the Taiwanese research (Wang et al. 2016), content and the importance of the lost data are more important. In the present research, the perceived risks include unauthorized access to data and the possibility of their loss. That is to say, for people in the Hungarian sample, losing their bank information is not as crucial an issue as somebody accessing their information.
In the attitude analysis of the Hungarian sample, it can be observed that along with the various data publication features, in the case of the opportunistic attitude – i.e., to obtain benefits from data transmission – the desire to avoid possible problems is more evident. Based on this, it can be concluded that for respondents in the Hungarian sample, the fear of a data breach is stronger than the positive expectations of benefits potentially deriving from the provision of the data.
Based on the primary analysis, the following conclusions can be made, taking into account the differences between the American (Kim 2016) and the Hungarian research: It is interesting that in the Hungarian sample respondents typically shared information with others in order to improve their own fame – self-development and reputation – while the other influencing factors do not have any significant effect on the extent of the transmission.
It matches with the original research (Kim 2016), that Facebook-related convictions in connection with privacy protection are significantly affected by general convictions, i.e., general assumptions affect specific attitudes related to a given social media platform and privacy in a logical way. Hence, the narrowed sub-questions of this research may follow directly from the general attitudes. On the contrary, none of the privacy-related convictions influences how much users are willing to share information (or maybe recommendations) via their smartphones, while according to Kim (2016), convictions related to Facebook affect disclosure of information and word-of-mouth. Based on this – according to the results of the Hungarian sample – actual information sharing is not dependent on underlying convictions. This result is not nuanced by the fact that mobile phone involvement does not have any significant influence on information sharing either.
New correlations have been revealed compared to the original models. Several factors contribute to the intention to disclose which jointly derive from functions created by social media opportunities. Perceived consumer authorization and communication related to contents created by other people (e.g. like, comment, sharing) contribute to the intention to disclose. The role of word-of-mouth is therefore significant in the sense that it determines to what extent respondents share information in social media. Another interesting correlation is that the general, privacy-protection-related attitudes have moderate correlation with control and only weak correlation with concerns about the severity of data loss. Based on the data, it can be concluded that general privacy-protection-related concerns do not affect the perceived risks directly; however, they influence all the factors affecting the perceived risks (severity of data loss, control, online privacy concerns).
It is interesting that mobile phone involvement is not connected to the intention to disclose via mobile application, or the perceived benefits implied, or even personalised services. After mobile phone involvement and the privacy protection-related attitudes were eliminated from the group of variables explaining word-of-mouth, self-development and commitment towards check-in became significantly correlated with word-of-mouth. Thus, information sharing of a given location via Facebook on smartphones can be explained by the commitment towards check-in and the given user's motivations related to self-development and reputation but cannot be explained by the enjoyment-like nature of checking in.

Overall, information sharing via mobile applications depends on three factors. It is positively affected by promotional agency. Consequently, if users are willing to share information for marketing communications purposes (role of word-of-mouth), then it is more typical that they share general information via mobile applications. The perceived benefits of information sharing also positively affect the intention to disclose, especially by means of the opportunities of personalised services. Thirdly, perceived risks have a typically negative contribution to the intention to disclose. Furthermore, the strongest correlation in the three-factor model is with the perceived risks. Therefore, in the case of the Hungarian respondents, it is their fears which play the greatest role when they decide to share their data. This is followed by promotional agency motivations – i.e., how much users tend to use word-of-mouth – and finally, the explanatory variable which plays the smallest role in the group of expected benefits of personal information sharing.

Besides the described theoretical correlations, this research can also be useful from a practical point of view for companies using mobile and social media. Based on the results the "more relaxed" user attitude towards various visual contents – regarding privacy protection-related issues – may be key data for marketing research and marketing communications companies, too. It is worth intensifying users' intention to disclose (which is more significant if they get external benefits) by means of external confirmations (incentives, gifts, etc.) to make it a rich source of social media content later. Another suggestion is that as the Hungarian sample had significant fears deriving from data loss, companies should highlight the security of user data to motivate people to use their services. The emphasis on self-development and reputation – and the users' motivation to show themselves on certain platforms – may encourage companies to provide an opportunity for the completion of the user self (e.g. consumer authorisation opportunities). The role of word-of-mouth in information sharing envisages that the word-of-mouth activity initiated by users could be supported on mobile and social media. The treatment of users' fears and the reduction of possible reasons of privacy protection-related concerns (e.g. transparent data protection principles, procedures) may also lead to a bigger quantity of information mentioned by users.

4. GDPR – Protection of Personal Data and its Consumer Perception

We have already reflected on the changes to the data management rules in our third article, based on a survey conducted on the anniversary of the entry into force of the GDPR and published in the MTA A-rated legal journal Glossa Iuridica. The GDPR (General Data Protection Regulation), the European Union's new General Data Protection Regulation, has as its main objective to harmonise privacy and personal data law in Europe. On the anniversary of the entry into force of the new regulation, my co-author Mirkó Gáti and I have been exploring consumer attitudes.

Given that this publication was published in a law journal, we also reflected on data protection law and how the GDPR fits into the existing regulatory environment in the literature review. In the technology press, we have observed a rise in the prominence of the term "Big Data", which at the same time has also appeared in the privacy literature. This may be one of the reasons for the shift in the focus of regulation at European level from the rights of data subjects to the obligations of data controllers, even as the regulation was being drafted. In other words, the legal approach emphasising the obligations, responsibilities and accountability of data controllers has been increasingly emphasised alongside/rather than the concept of information

self-determination, which presupposes individual enforcement and data subject awareness (Szőke, 2013).
The online survey was conducted between 26 April and 8 May 2019, as it is assumed that this period of almost one and a half weeks will result in many responses, while at the same time it is a short enough time interval to minimize possible bias. The sampling technique was voluntary sampling, as the respondents are university students from Corvinus University of Budapest, and therefore the results cannot be considered representative. Nonetheless, the results are likely to indicate trends of an exciting nature related to the topic. At this point, it should be noted that the sample chosen differs from the average population along some characteristics. For example, they have much higher scores in digital literacy, and their average literacy, reading comprehension and abstraction skills are also much more advanced than the average for society. It should therefore be stressed that the generalisability of the results is limited by the characteristics of the sample for the reasons indicated. In the course of the research, international models and scales have already been tested, and in this paper we would like to present the results relevant to the GDPR aspect. This mainly refers to the privacy scales of Fox and Royne (2018) and their adaptation to the GDPR context.
The sample size after data cleaning was 606 respondents. 40.1% of the sample was male and 59.9% female, which is presumably due to the gender bias of the economics education. Given the characteristics of the sample, the majority of the respondents were born in 1998-1999 (453 out of 606). Most of the sample is from Budapest (56.6%), but there is also a significant presence of the Budapest agglomeration (10.4%), while 12% live in the county seat and 15% in other cities. In terms of their perceived financial situation, the majority feel that their financial situation is average (46.2%), but there is a deviation from this towards above average. Far more reported a perceived income situation that was slightly above average (38.6%) or significantly above average (7.4%) than slightly (6.6%) or significantly (1.2%) below average.
The results show that the majority of the young people in the sample understand the GDPR privacy policy and its terms and consider that they understand the regulatory environment well enough to use the available websites with confidence. There is a broadly mixed picture on whether respondents understand or have information about how the GDPR regulates exactly how their personal data is handled and used, and a mixed view on the correct interpretation of the privacy policy. However, the majority would not be confident if they had to explain these rules to others, which suggests that a thorough knowledge and understanding of the legal environment is not well established among respondents, despite the perceptions of the other answers.
There was a marked demand from the sample respondents for companies to make clear in their privacy policies and in their communications and information to users how personal data is collected and used. And, according to stakeholders, organisations should also raise awareness of how data is used. A basic expectation is that the privacy policy should be published in a clear and conspicuous place. The same expectation was expressed not only in relation to privacy policies in general, but also in relation to privacy policies developed in accordance with GDPR rules. No charts were used here to visualise the data, as the proportion of negative or even indifferent responses to all the questions concerned was too low to be adequately visualised.
However, the one year since the GDPR came into force has also shown that further outreach efforts would be needed to ensure that the rules are made known and understood in detail by data subjects, so that citizens are increasingly aware of the rules on data protection issues.

5. Using Artificial Intelligence to Promote Branded Color Cosmetics: Evidence from Indonesia.

Besides privacy the other important factor of technology acceptance and use are artificial intelligence, which has been investigated in multiple articles. In these articles the industry context is usually the AI color cosmetics application, and different East-Asian sample has been studied. Artificial intelligence (AI) color cosmetics applications are becoming a powerful social enhancement and promotion tool, especially among young people. Artificial intelligence (AI) is a branch of computer science that enables computers to think, do, interact, and act in various fields, including the beauty industry, the catering industry, and the advertising industry (Dirican, 2015; Del Campo *et al*., 2019). The recent advancements in smartphone technology and social media platforms have increased the popularity of Artificial Intelligence (AI) color cosmetics. For instance, cosmetics try on commonly taken place in the physical cosmetic stores can be replaced by AI color cosmetics in the virtual environment (Zhang *et al*., 2019). Moreover, facial enhancement technology, such as AI color cosmetics applications, may appeal to those who simply wish to look attractive online.

In the beauty industry, AI is mainly about machine algorithms adopted in various platforms, such as Face App, Faceu, YouCam Makeup, and B621. AI color cosmetics are primarily used in the form of Augmented Reality (AR) applications and Magic Mirrors (Faust *et al*., 2012). AR is a technology that superimposes virtual data onto the user's field of view, enhancing the physical environment with virtual data (Ghazali, Mutum, & Woon, 2019). Users can use AR applications to try on different color cosmetics, read color cosmetics reviews, learn about their loyalty points, make payments, and contact customer service (Smink *et al*., 2019). The other applications of AR technology are a magic mirror that reflects the image of the user’s body in a three-dimensional (3D) environment (Kurul *et al*., 2020).

Besides this article body esteem and price sensitivity also has been involved in the research to get better understanding about technology acceptance of AI color cosmetics. Body esteem is defined as an individual's evaluation of his or her own body and appearance (Mendelson, Mendelson, & White, 2001). In this research, price consciousness is defined as the extent to which users of AI color cosmetics prefer actual branded color cosmetics with discounts. During an economic downturn, consumers are more price-conscious and more likely to shop around for the best deal (Grewal *et al*., 2012). Individuals with low body esteem are tempted by direct self-improvement cues, such as wearing branded color cosmetics than those with high esteem (Robertson, Fieldman, & Hussey, 2008). Meanwhile, AI color cosmetics applications enable consumers to virtually try various branded color cosmetics and then compare prices, thus providing a "try before you buy" experience (Smink *et al*., 2019).

In this quantitative research, we employed purposive sampling. We selected female users who used AI color cosmetics with varying degrees of usage frequency. They were approached via various social media platforms, such as Facebook and Instagram, where they posted their self-edited photos. A selfie with AI color cosmetics applications watermarks (e.g., B612, FaceApp) was a good indication that they were the right respondents for this research. After establishing prior communication with our potential respondents, we sent them a link to the online questionnaire. The data collection activity was carried out from March to June 2021, when the COVID-19 and social restrictions were still prevalent in Indonesia. The rise in computer-mediated social interaction during the COVID-19 pandemic has changed the way people interacted in their personal and professional lives (Lal, Dwivedi, & Haag, 2021; Tibbetts *et al*., 2021). Furthermore, we contend that the decline in branded cosmetics due to hygiene concerns and financial constraints during the pandemic (Mościcka *et al*., 2020) has all contributed to the growing popularity of Artificial intelligence (AI) color cosmetics applications, particularly for those who want to appear attractive during online social interactions.

Our online questionnaire had two preliminary questions to determine respondents' gender and knowledge of AI color cosmetics. We initially obtained 315 respondents in total out of 400 invitations sent (about 70 percent survey response rate). However, in the end, this research used and analyzed data from 262 respondents. The respondent profile is shown in **Table 1**.

Table 1. Respondent profile in the Indonesian sample

		N	%
Education	With university degrees	138	52.67
	Without university degrees	124	47.32
Occupation	Full-time students	125	47.71
	Employees	68	25.95
	Entrepreneurs	20	7.63
	Professionals (e.g., doctors, lawyers, university professors, etc.)	17	6.50
	Housewives	32	12.21
Age	18 – 30	166	63.36
	31 – 40	73	27.86
	41 – 50	17	6.49
	> 50	6	2.29
Usage frequency	Always	55	21
	Often	120	45.80
	Occasionally	43	16.41
	Rarely	44	16.79

Note(s): N = Number of Respondents, % = Percentage.

Source: own research

The purpose of the research is to investigate the relationships between body esteem, price consciousness, and AI color cosmetics applications adoption. Body esteem is the predictor, price consciousness is the mediator and moderator, and AI color cosmetics applications adoption is the outcome. Through Exploratory Factor Analysis (EFA), we found that body esteem diverged into two distinct factors that we named the “positive-view of body esteem” and the “negative-view of body esteem”. Positive-view of body esteem refers to items with positive wording that may indicate respondents' self-acceptance regardless of their physical appearance, whereas negative-view of body esteem refers to items with negative wording that may indicate body dissatisfaction. It is the latter that is closely related to the notion of low body esteem.

This research provides evidence on the positive relationship between body esteem and price consciousness (H1). To be precise, both the positive-view and negative-view of body esteem are proven to increase price consciousness levels. However, when the magnitudes of the effects of the two factors of body esteem are compared, it is revealed that respondents with a good perspective of body esteem are more price-conscious, as we predicted. We argue that women with a positive view of body esteem (PBES) engage in shopping activities to maintain their perceived body esteem (e.g., to stay beautiful and fit). Engaging in shopping activities of, let’s say, branded color cosmetics improve their awareness and knowledge of various cosmetic brands in the market and the differences in prices. Being knowledgeable about the prices (price mavens) and knowing how to get a good deal may also improve self-esteem (Tatzel, 2002; Muratore, 2016). Our findings also show that respondents with a negative view of body esteem

(NBES) are price conscious. A study by Hampson, Gong, and Xie (2021) suggests that financial vulnerability could be one of the causes of low self-esteem. We argue that the inability to keep up with beauty-enhancement products and services due to financial constraints may lower one's perceived body esteem. People with a negative view of body esteem might also be financially vulnerable, which explains their price search behavior.

This research provides partial evidence on the negative relationship between body esteem and AI color cosmetics adoption (H2). The results suggest that both the positive-view and negative-view of body esteem improve the intention to adopt AI color cosmetics applications. When the magnitudes of the effects of the two factors of body esteem are compared, respondents with a poor opinion of body esteem are revealed to be more prone to embrace AI color cosmetics applications, as predicted. This research provides evidence on the positive relationship between price consciousness and AI color cosmetics adoption (H3a). Initially, AI color cosmetics are used in the cosmetics industry as a virtual trial (Smink *et al*., 2019). The applications allow them to try a variety of branded color cosmetics hence minimizing the risks associated with the wrong purchase. We argue that AI color cosmetics may serve as a cheaper alternative to branded cosmetics, and hence are desirable to price-conscious customers, especially those who just wish to appear attractive in their social media (e.g., Instagram, Facebook).

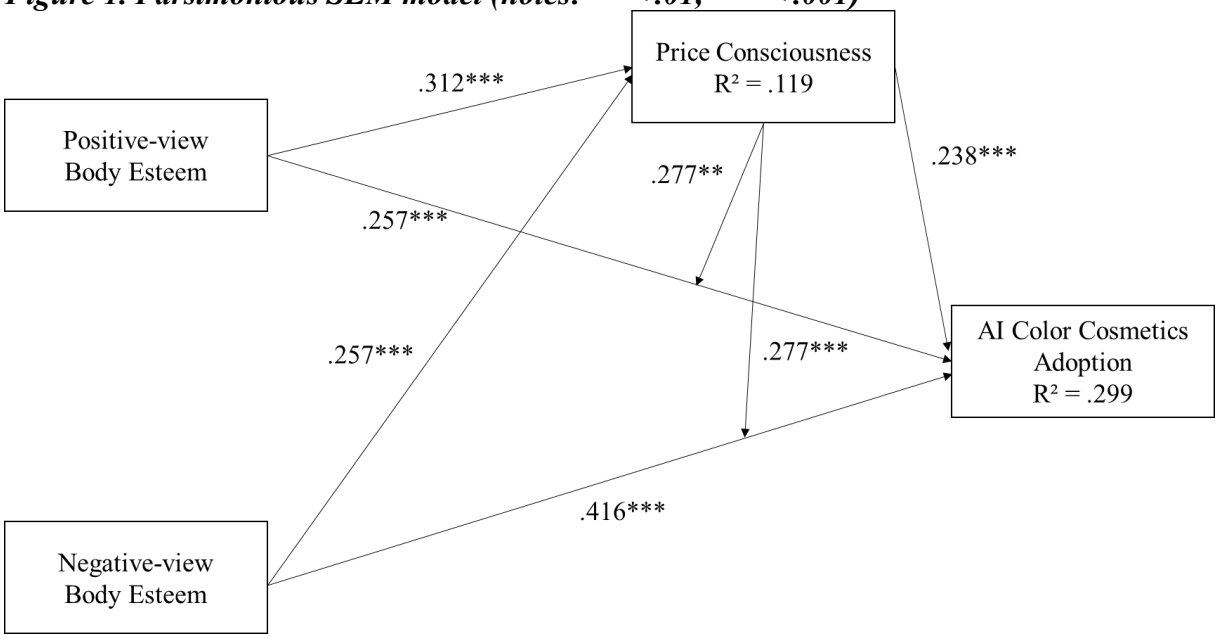
Previous research has demonstrated that a variable can act as both a mediator and a moderator, indicating that their role changes over time (see Karazsia & Berlin, 2018). AI color cosmetics applications as a beautifying mechanism may be perceived as more practical, safer, and less expensive, especially during the COVID-19 pandemic, when most social interactions occur online. The relationship between body esteem and AI color cosmetics applications adoption can be explained by the desire to find a cheaper alternative to actual branded color cosmetics. We believe this is especially true for those who are only interested in looking more attractive in virtual settings. However, because AI color cosmetics applications also function as e-commerce platforms, recommending various virtual branded color cosmetics along with their prices on a regular basis, the strength of the relationship between body esteem and AI color cosmetics is governed by the users' price consciousness level over time.

This research proved the mediating role of price consciousness in the relationship between body esteem and AI color cosmetics adoption (H3b). The nature of the mediating role is partial. According to Chang *et al*. (2019), people with high body esteem (PBES) are generally satisfied and confident with their overall appearance, whether or not they wear color cosmetics. As they become less dependent on wearing branded color cosmetics in real life or virtually on social media, they become more price-conscious when purchasing. AI color cosmetics applications were developed as a trial function to assist consumers with high PBES in lowering the risk of purchasing the incorrect one (Smink *et al*., 2019). As for consumers with NBES, their motivations to adopt AI color cosmetics applications can be explained by the desire to find a less expensive alternative (or virtual version) to branded color cosmetics. The results also proved the moderating role of price consciousness in the relationship between body esteem and AI color cosmetics adoption (H4). The results suggest that price consciousness strengthens the positive relationships of both PBES and NBES and the AI color cosmetics adoption. The results add a weight of evidence on the previous studies in different contexts, such as Cham *et al*. (2018), that have demonstrated the moderating effect of price consciousness on the purchase intention.

The control variables (education, age, occupation and usage frequency) show significant effects on AI color cosmetics applications adoption. Interestingly, the inclusion of control variables weakens the effects of the variables of interest to the point where PBES becomes irrelevant or insignificant ($p > .05$). In this sense, the control variables provide an alternative explanation for why our respondents embrace and promote AI color cosmetics applications. In the context of Indonesian users, the adoption of AI color cosmetics applications may be age and education

dependent, with the younger and more educated groups being the most eager. Furthermore, as usage frequency increases, so does the propensity to accept and promote the applications. York (2018) recommended that a parsimonious model be favored because more complex models do not always provide more valid results. Based on theoretical considerations, we adopted a parsimonious model while still reporting the effects of control variables.

Figure 1. Parsimonious SEM model (notes: ** < .01, *** < .001)



Source: own research

This research has several theoretical contributions: First, our research adds to the body of knowledge in social comparison theory by elucidating the roles of body esteem and price consciousness in the context of AI color cosmetics, a relatively new innovation in facial enhancement technology. Second, our research provides empirical evidence on the relationship between body esteem and price consciousness that were hinted by the previous studies (e.g., Tatzel, 2002; Kukar-Kinney *et al*., 2012; Muratore, 2016) but was never actually tested. Consumers' dissatisfaction with their appearance prompted them to purchase color cosmetics to boost their body esteem and self-esteem. Using AI color cosmetics applications as a trial platform before purchasing greatly reduced the risk of purchasing the wrong products. AI color cosmetics applications allow users to fully immerse themselves in a virtual environment and try on various virtual color cosmetics, creating a novel shopping experience (Javornik, 2016; Javornik *et al*., 2021). Third, our research provides empirical evidence on the relationships between body esteem and AI color cosmetics adoption. Previous studies have discussed the applications of facial enhancement technology (e.g., AI color cosmetics applications) in the beauty industry (Scholz & Duffy, 2018; Smink *et al*., 2019; Hsu *et al*., 2021; Javornik *et al*., 2021). Previous studies have also discussed the role of facial enhancement technology in consumers' selfie-editing behavior, such as to garner likes from followers in social media platforms and, possibly, to attract the opposite gender (Wang, 2019; Barker, 2020; Fastoso *et al*., 2021). To the best of our knowledge, this is the first research to elaborate the precise relationship between body esteem and AI color cosmetics adoption. Fourth, this research provides the first empirical evidence on the association between price consciousness and AI-related technology adoption, which is less explored. Previous studies suggest that augmented reality (AI-related technologies) retail experiences can positively affect consumers' purchase intention (Watson, Alexander, & Salavati, 2018; Erdmann, Mas, & Arilla, 2021; Whang *et al*.,

2021). We considered that value association and price-related concerns about the adoption of certain AI-related technology may have an impact on the retail experience. Fifth, this research provides novel findings about the mediating and the moderating roles of price consciousness in the relationship between body esteem and AI color cosmetics. Lastly, this research closes the population gap by investigating Indonesian users who are still underrepresented in facial enhancement technology literature.

This research has several managerial implications: First, our findings reveal that our respondents were also concerned with their bodyweights (an indicator of body esteem). Developers of AI color cosmetics applications may incorporate virtual branded color cosmetics that enable users to appear slim online. Second, our findings suggest that price-conscious respondents had more intention to adopt AI color cosmetics applications. Users may consider AI color cosmetics as a less expensive option to branded color cosmetics. Developers of AI color cosmetics applications may include price search and comparison features among different brands of color cosmetics. Special promotions and best deals may also be featured in the applications to attract price-conscious users. Promotion managers can embed some promotion campaigns in AI color cosmetics applications such as limiting purchase time and creating a "panic buying" environment for price-conscious consumers, particularly during special festivals and days like Single's Day and Black Friday. Promotion managers should begin to recognize and embrace AI color cosmetics applications as a trial function for branded color cosmetics and thus as a component of promotion activities. Furthermore, we recommend that promotion strategies should apply not only to actual branded color cosmetics available through AI color cosmetics applications, but also to their virtual forms (i.e., AI color cosmetics) for online use. Third, promotion managers may use interactive technologies (e.g., AI color cosmetics applications) to organize dynamic promotion campaigns with price tools to assist firms in increasing sales and brand image. According to our findings, both the positive view and negative view of body esteem are proven to increase price consciousness levels. Users may be offered a promotion campaign with more entertainment and personalized activities (more appropriate for positive-view body esteem consumers while shopping) or, conversely, some promotion activities with a greater emphasis on price, such as discounts, coupons, and sales promotion (more appropriate for negative-view body esteem consumers). Lastly, our findings suggest that our respondents may associate physical attractiveness and dating opportunities. The AI color cosmetics applications can be effective in attracting opposite genders in the early stages of seeking compatible companions by projecting enhanced self-images. Therefore, we suggest that AI color cosmetics applications be integrated with dating applications to improve user engagement.

6. The e-WOM intention of AI color cosmetics among Chinese social media influencers

In this research, we focus on individual user characteristics that influence the adoption of AI color cosmetics applications. It is important to understand how a user's individual characteristics, rather than their experience with the application, influence their intent to use it. This allows one to forecast which user segments will be interested in such products. Furthermore, application designers can provide a tailored end-user product based on individual characteristics and online activity.

User characteristics have been overlooked in previous research on AR beauty applications although Venkatesh (2022; p.13) suggested that they "*are critical in most technology adoption and use contexts".* We draw on Uses and Gratifications theory (U&G; Ibáñez-Sánchez *et al.,*

2021) to understand the influence of Chinese user characteristics on application usage, product purchase and electronic word of mouth (e-WOM). The main research question is therefore: to what extent do users' individual characteristics determine the use of AI color cosmetics application? The purpose of the research directly corresponds to the research question: to identify the influence of individual characteristics of Chinese social media influencers in the adoption of AI color cosmetics applications and their e-WOM intention.

According to Fastoso *et al*. (2021), low self-esteem is the primary reason for users' selfie-editing behavior. As a selfie-taking and selfie-editing platform, AI color cosmetics applications can provide virtual makeup services, manually edit users' facial features, and beautify users' selfies without using physical makeup. According to U&G theory, the desire to create one's desired image can be a motivation factor for using AI color cosmetics (Javornik *et al*., 2022). AI color cosmetics applications can help customers determine whether products meet their needs and preferences, reducing uncertainty, boosting their purchase decision confidence (Romano *et al*., 2022). U&G and social media usage research are especially interested in how to improve one's appearance to receive positive feedback from other users. The adoption of AI color cosmetics functions (e.g., filters and virtual makeup) has been linked to TikTok, Instagram, and Facebook usage (Barker, 2020). Because social media influencers expect to be admired (Casale and Fioravanti, 2018), the need to improve their appearance is critical. In our research actual purchase mediates the effect of AI color cosmetics applications usage on e-WOM intention.

We used several measurement scales in this research adopted from previous studies. Once we ascertained the reliability of our measurement scales, we spread an online questionnaire via social media platforms, such as WeChat and TikTok. The data was collected between July and August 2021, during the COVID-19 pandemic, which is still ongoing in China. The questionnaire was primarily spread in Shanghai, China. "Shanghai" is one of China's largest cities, and it is home to nearly all types of social media influencers. As a result, we argue that Shanghai is representative of the behavior of Chinese influencers. To gather relevant respondents, this research employed a combination of purposive and snowball sampling. We chose nano influencers with 1000 to 10000 followers as our respondents for the type of social media influencers. To be eligible, all of our respondents had to meet several criteria: first, they had to state that they were users of AI color cosmetics applications; second, they also had to state that they were social media influencers. To find the right respondents, we started by looking for people in our networks who were social media influencers and fit our criteria, and then we used snowball sampling to gather the remaining respondents. As indicated in **Table 2**, the majority of respondents (67.4 percent) were female influencers between the ages of 17 and 30 who had earned a bachelor's degree.

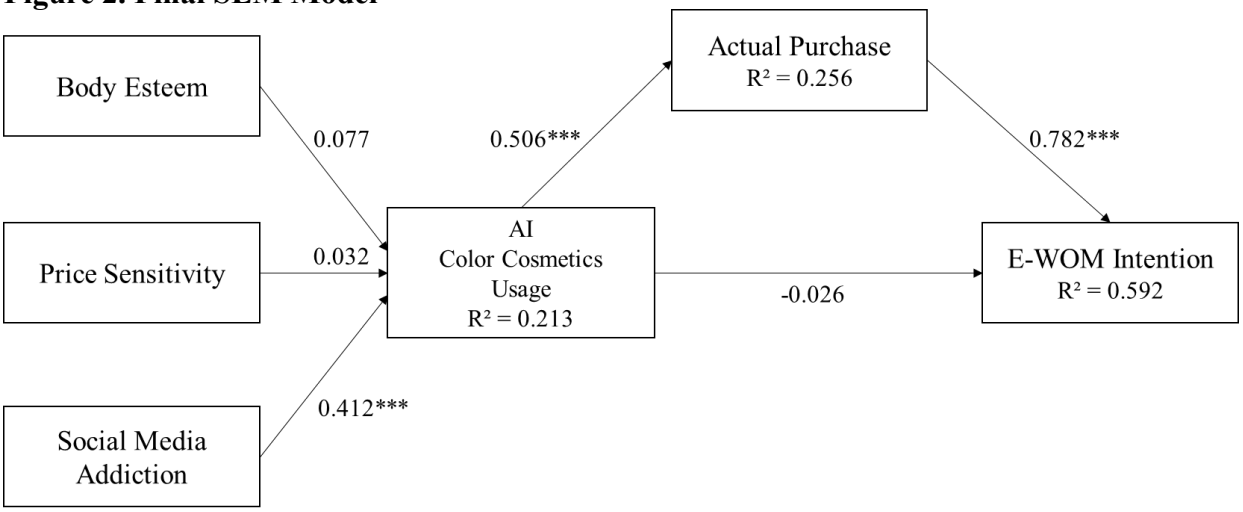
Table 2. Respondent profile in the Chinese sample

		N (221)	Percent (%)
Gender	Male	72	32.6
	Female	149	67.4
Age	< 17	9	4.02
	17 - 30	195	88.3
	31 - 45	13	5.88
	> 45	4	1.8
Education Level	No college Degree	33	14.9
	Bachelor’s Degree	129	58.4
	Master’s Degree	49	22.2
	PhD Degree	10	4.5
Total		221	100

Source: own results

To achieve the goal of the research, we created the Structural Equation Modelling (SEM) model, which was preceded by a two-step approach: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). We conducted a Confirmatory Factor Analysis (CFA) via SPSS and AMOS software. Based on Figure 2, the three exogenous variables are Body Esteem (BES), Price Sensitivity (PRS) and Social Media Addiction (SMA); the two endogenous variables are AI Color Cosmetics Usage (ACU) and Electronic Word-of-Mouth Intention (EWMI); finally, one mediating variable that is Actual Purchase (ACP). The Squared Multiple Correlations (R^2) value of the model suggests that 21.3 percent of the variance of ACU can be explained by SMA. As many as 25.6 percent of the variance of ACP can be explained by ACU. Moreover, as many as 59.2 percent of the variance of EWMI can be explained by ACP.

Figure 2. Final SEM Model



Source: own results

Our research focuses on the effects of AI color cosmetics usage on actual purchases. To explore the effects, our research examines six hypotheses: the relationship between body esteem and AI color cosmetics usage (H1), the relationship between price sensitivity and AI color cosmetics usage (H2), the relationship between social media addiction and AI color cosmetics usage (H3), the relationship between AI color cosmetics usage and actual purchase (H4), the relationship between AI color cosmetics usage and e-WOM intention (H5), the relationship between actual purchase and e-WOM intention (H6a), and the mediation effect of actual purchase in the relationship between AI color cosmetics usage and e-WOM intention (H6b).

Our research is unable to prove that body esteem is a significant predictor of AI color cosmetics usage (H1; $p > 0.05$). A previous study by Tran *et al*. (2020) among YouTube influencers suggests that there are inconsistent findings between body esteem and color cosmetics usage. Various factors, such as internal (e.g., sense of creativity) and external (e.g., peer-pressure) motivations, may shape influencers' self-esteem. We argue that in the context of influencers, (low) body esteem is not a strong enough inducer of AI color cosmetics usage due to its 'trial' nature (Bonetti *et al*., 2018; Smink *et al*., 2019). Moreover, compared to actual color cosmetics, faking their beauty through AI color cosmetics may harm influencers' overall image in the eyes of their followers.

But our results are unable to prove that price sensitivity has a positive relationship with AI color cosmetics usage (H2; $p > 0.05$). Since our respondents were social media influencers who got paid for promoting products online, this segment may be less price-sensitive hence the insignificant result. The alternative explanation is that being highly immersed in the AI color cosmetics virtual environment might lower users' price sensitivity levels (Meißner *et al*., 2020).

Meanwhile the data suggested that social media addiction has a positive relationship with AI color cosmetics usage (H3; $p < 0.001$). People who are addicted to social media, especially in the case of influencers, need to look attractive online. The use of AI color cosmetics may improve their profiles and likability online.

Our research can prove that AI color cosmetics usage has a positive relationship with actual purchases (H4; $p < 0.001$). Using Augmented Reality (AR) and magic mirrors, consumers may digitally "try-out" cosmetics on their faces, which could help create a "try before you buy" experience when shopping online (Scholz and Duffy, 2018; Smink *et al*., 2019). Our finding gives weight evidence to a previous study by Smink *et al*. (2019) demonstrating that the use of AR in the context of cosmetics improved purchase intention. Meanwhile this research is unable to prove that AI color cosmetics usage has a positive and direct relationship with e-WOM intention (H5; $p > 0.05$). This means that the use of AI color cosmetics alone is not sufficient to generate e-WOM intention. We argue that Chinese social media influencers may need to protect their credibility and reputation by testing (and showing) the actual cosmetics before offering their opinions online to their followers. In a way, influencers are paid to promote tangible products, whereas their “virtual” alternatives serve as a trial.

Results prove that actual purchase has a positive relationship with e-WOM intention (H6a; $p < 0.05$). Our finding gives a weight of evidence to the previous studies suggesting that WOM occurs as a result of user experiences, such as shopping and product usage (Yoon, 2012; Yoo *et al*., 2013; San-Martín *et al*, 2015; Yoon and Park, 2018; Zhang *et al*., 2021). In other words, the more experience consumers have with a product, the more likely they will express or share their opinions about the product via online platforms. Our research is also able to prove that actual purchase mediates the relationship between AI color cosmetic usage and e-WOM intention (H6b; $p < 0.001$). This means that there is a full mediation of cosmetics actual purchase and that the relationship between AI color cosmetic usage and e-WOM intention is indirect. Future research may retest the relationship by investigating a different segment, such as housewives and office women.

This research employs the uses and gratification (U&G) theory to examine how specific user characteristics affect Chinese social media influencers' adoption of AI color cosmetics, as well as how this may influence their decision to buy branded color cosmetics and their e-WOM. The popularity of the aforementioned technology, especially among influencers, has partly increased as a result of recent developments in smartphone and social media platforms. However, companies may only profit from AI color cosmetics applications, which are inherently a form of trial, when they can turn users into actual buyers. Our findings suggest that social media addiction plays a role in AI color cosmetics applications usage. In turn, frequent usage of AI color cosmetics applications leads to the actual purchase of branded color cosmetics. Finally, a combination of AI color cosmetics applications usage and actual purchase leads to positive e-WOM intention.

There are several theoretical contributions of this research: First, in influencer marketing, the e-WOM intention is necessary to develop and investigate the individual characteristics among social media influencers on online shopping platforms (Dwidienawati *et al*., 2020). According to Haenlein *et al*. (2020), social media influencer marketing is also a significant business strategy for influencing consumers' online purchasing behavior. Many previous studies on influencer marketing have focused on how to generate e-WOM intention based on influencers' marketing reviews on an e-commerce platform (Dwidienawati *et al*., 2020; Wandoko and Panggati, 2022). However, little attention has been paid to how new technologies (e.g., AR and AI) are generating e-WOM intention among social media influencers, as well as what factors influence the willingness to use AI color cosmetics. Second, our research draws on the uses and gratification (U&G) theory to examine and explain how social media addiction affects the adoption of AI color cosmetics. Previous research has shown that people utilize social media to

satisfy needs associated with self-presentation (Huang and Liu, 2020) and that social media addiction corresponds with increased willingness to idealize self-image (Chen, 2019). Our research confirms that social media addiction has a positive effect on the intention to use AI color cosmetics application. In other words, our research extends the existing literature by demonstrating that social media addiction is a key construct in determining the use of facial enhancement technology, which is commonly found in mobile phones. Third, our research provides empirical evidence on the relationship between AI color cosmetics usage and actual purchase. By that, we contribute to the literature regarding experiences from a product trials and its consequence on purchase intentions (De Groot *et al*., 2009; Lu and Chen, 2021). Unlike previous research on AI cosmetics usage showing that user experience influences purchase decisions (Wang *et al*., 2021), our research demonstrates that application usage itself can influence branded color cosmetics purchase decision. Fourth, while previous research has highlighted the importance of positive e-WOM on purchase intentions (e.g., Kudeshia and Kumar, 2017), only a few studies in this context have examined the effect of actual purchase on e-WOM intention. In most cases (Wu *et al*., 2017; Guping *et al*., 2021), the e-WOM intention and the intention to purchase were treated as two unconnected outcomes of consumer attitudes. Meanwhile, our research took a different approach and demonstrated that the e-WOM intention could be driven by the actual purchase of branded color cosmetics. Fifth, our research is also significant in that it is the first to provide empirical evidence on the role of actual purchase as a full mediator in the relationship between AI color cosmetics usage and e-WOM intention; As a result, we have a better understanding of the mechanism by which the use of specific brand-related technology can result in brand e-WOM. Finally, our research contributes to a deeper knowledge of Chinese social media influencers and their interactions with AI color cosmetics applications, a relatively new type of facial enhancement technology. We believe that Chinese beauty influencers are still underrepresented in comparison to their Asian counterparts (e.g., Chen and Dermawan, 2020; Wang and Lee, 2021).

The managerial implications of this research are intended for branded color cosmetics manufacturers and retailers, as well as AI color cosmetics developers. First, our research has shown that social media addiction predicts the use of AI color cosmetics applications. AI color cosmetics developers must devise marketing strategies to capture this market segment (e.g., social media users and addicts), such as connecting their applications to popular social media platforms. Social media users can be rewarded for connecting their social media accounts to AI color cosmetics applications and sharing their AI-enhanced photos with other social media users. Second, our research has shown that using AI color cosmetics applications is a positive predictor of purchasing branded color cosmetics. Branded color cosmetics manufacturers and retailers can work with AI color cosmetics developers to capture previously untapped segments. Branded color cosmetics manufacturers can ensure that their products' virtual versions are correctly represented in the applications. The more cosmetics featured in the applications, the higher their value should be. Developers can then connect their applications to the official online stores of branded color cosmetics that support them. In this regard, both parties' marketing promotional materials should demonstrate an apparent strategic alliance, allowing the AI color cosmetics applications to serve as both a trial and an e-commerce platform. Third, our research has shown that purchasing branded color cosmetics positively predicts e-WOM among social media influencers. Thus, there is a clear link between owning a branded color cosmetic and sharing information about it on social media platforms. The message to branded color cosmetics manufacturers and retailers is clear: they must allow product trials and giveaways to induce online word of mouth. Whereas AI color cosmetics developers must instill a sense of ownership in their users. This makes it possible to combine real branded color cosmetics and their virtual counterparts at a discounted price (product bundling). Meanwhile, users who just want to look appealing in a virtual environment can use AI color cosmetics, a

less expensive alternative to branded color cosmetics. Finally, a strategic alliance and coordinated marketing efforts between the cosmetic industry and AI color cosmetics developers are expected to improve business performance and market share as the branded color cosmetics market shifts online at a rapid pace, in part due to the COVID-19 pandemic, which is still present in some countries, such as China.

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