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From screens to spontaneity: How augmented reality sparks impulse buying intention in e-commerce

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ABSTRACT

The growing prevalence of e-commerce has transformed consumer behavior, particularly in sensory-driven industries like cosmetics. However, the absence of physical interaction with products poses challenges in building consumer confidence and driving purchase decisions. Augmented Reality (AR) has emerged as a potential solution by creating vivid and interactive virtual shopping experiences. This study examined the influence of AR on impulse buying intention, with product presence as a mediating variable, focusing on Shopee's BeautyCam feature. A quantitative approach utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to analyze responses from 135 women aged 18–35 in East Java, Indonesia. The findings revealed that AR significantly impacted both product presence and impulse buying intention, confirming its ability to enhance consumer engagement. However, the mediating role of product presence was not statistically significant, suggesting its limited effect on impulse buying. These results highlight the direct effectiveness of AR in stimulating spontaneous purchase behavior and underline the importance of refining AR features to maximize consumer impact. This study offers insights into leveraging AR technology to address sensory gaps in e-commerce and recommends further exploration into additional factors influencing impulse buying. Future research could investigate AR applications across diverse product categories and technological advancements, broadening the understanding of AR's role in shaping digital consumer experiences.

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1. INTRODUCTION

The advent of digital shopping has significantly altered consumer behavior, especially in the cosmetics sector, where online platforms now offer an array of products traditionally selected based on in-store experiences. While e-commerce provides unparalleled convenience, it often lacks the sensory elements—such as visual and tactile engagement—that play a critical role in consumer satisfaction and decision-making. This absence is particularly challenging in the cosmetics industry, where choices depend on subtle factors like color and texture, and mismatches between online expectations and real products can lead to dissatisfaction (Mou & Cohen, 2013). In response, e-commerce platforms increasingly incorporate immersive technologies like Augmented Reality (AR) to simulate the physical shopping experience digitally, allowing consumers to virtually try on products and make more confident purchasing decisions. Augmented reality (AR) in marketing is a new technology that enhances consumer experience and changes marketing strategies (Du et al., 2022). Research indicates that augmented reality (AR) technologies enhance online shopping experiences through increased interactivity and vividness. These factors contribute to a product presence and leading to positive consumer outcomes (Kim et al., 2023). Further contemporary studies have corroborated the effectiveness of AR in marketing. For instance, (Dwivedi et al., 2021) emphasize that AR has become a popular tool in digital marketing strategies due to its capability to blend virtual and physical elements seamlessly, thereby improving customer engagement and brand perception. Recent days, AR-integrated marketing and service strategies are considered essential for creating customer engagement (Buhalis & Sinarta, 2019), as technology becomes an integral part of our daily lives, augmented reality (AR) experiences offered through mobile applications are increasingly used to further enhance the consumer experience (Chen et al., 2022).

In the Southeast Asian market, Indonesia stands out as a leading user of e-commerce, with Shopee emerging as one of the most popular platforms. These platforms provide a convenient, safe, and efficient online shopping experience for millions of consumers (Khaw, 2023). Shopee offers an interesting shopping experience for consumers through Shopee BeautyCam which is supported by an advanced AR feature, namely Virtual Try-On on certain cosmetic products such as Make Over, Maybelline, Azarine, and others (Wearesocial, 2023). BeautyCam reflects a broader trend in e-commerce, where companies utilize AR as a tool to bridge the gap between online and in-store experiences, thus enhancing consumer engagement and satisfaction (Fransiska & Candraningrum, 2020; Putri & Marlien, 2022). Research highlights that AR's interactivity, and vividness —key dimensions that distinguish AR experiences—are essential in cultivating what is known as "product presence," a state in which users feel as if the virtual product is physically present in their environment (Hsu et al., 2024; Vonkeman et al., 2017). This increased presence not only improves engagement but can also lead to impulse buying, a form of spontaneous purchasing behavior driven by external stimuli (Hsu et al., 2024; Rook, 1987). AR has significantly influenced various marketing domains, including consumer acceptance, customer interactivity, retail, and destination marketing (Javeed et al., 2024). As a marketing tool, AR aims to capture consumer attention, stimulate desire, and motivate purchases by allowing customers to visualize products through mobile applications (Ruiz et al., 2019).

Impulse buying, particularly in digital contexts, is an area of increasing interest due to its significant impact on consumer spending and platform revenue. Impulse buying is triggered by both internal factors like mood and self-identity, as well as external factors like platform design and product characteristics (Iyer et al., 2020). Technological features that heighten sensory engagement, such as AR, can intensify these impulses by providing a more interactive and vivid experience that lowers the cognitive barriers to buying (Trivedi et al., 2022). For instance, studies show that high interactivity and vividness within AR experiences can heighten product presence, making consumers feel more connected to the virtual product and thereby increasing the likelihood of impulse purchases (Javeed et al., 2024; Poushneh, 2018). Augmented reality increases the attractiveness of online stores by creating a perceived spatial presence, which has a positive impact on purchase intention (Zhang et al., 2023). Additionally, research by (Hsu et al., 2024) in Taiwan's footwear market demonstrated that AR's immersive qualities could significantly amplify the urge to buy impulsively, particularly when users perceived a high degree of authenticity and vividness in the virtual representation. Despite these findings, there remains a research gap in understanding how product presence specifically affects the relationship between AR and impulse buying intention in the beauty sector. Previous studies, such as those by Chen et al., 2022; Trivedi et al., 2022, have explored how AR affects impulse buying within fashion and accessories, underscoring the unique challenges cosmetics pose due to their need for close sensory accuracy in digital representation. Moreover, Javaheri et al., 2020; Vonkeman et al., 2017 identified that while AR could enhance product interest, it does not always lead directly to impulsive buying unless product presence creates a strong enough sensory experience to overcome the perceived risk. This highlights the need for further exploration of how AR attributes like interactivity, and vividness uniquely affect impulse buying intention within beauty products, where the ability to simulate physical characteristics is particularly important for consumer confidence.

Indonesia was selected as the study's focus because of its quickly expanding e-commerce sector, which is now a major force behind the nation's digital economy. With a population of more than 281 million and rising internet usage, Indonesia is home to a thriving and varied customer base that is adopting digital platforms at a rate never seen before. Known for its cutting-edge features like Shopee BeautyCam, Shopee in particular has made a name for itself as Indonesia's top e-commerce site. In addition to satisfying the increasing need from customers for immersive shopping experiences, this AR-powered tool is a prime example of how technology can transform sensory-driven industries like cosmetics. This study offers insights into the interaction between local consumer behaviour, cutting-edge technology, and the dynamics of a developing e-commerce ecosystem by concentrating on Shopee and its Indonesian customers.

This study aims to fill this gap by focusing on female consumers in East Java, Indonesia, aged 18-35—a demographic that represents one of the most active segments in online shopping on Shopee. By examining how AR features in Shopee's BeautyCam enhance product presence and, in turn, drive impulse buying intention, this research offers insights into the strategic use of AR in e-commerce, particularly for platforms looking to optimize consumer engagement in sensory-driven markets like beauty. The findings will contribute to a deeper understanding of AR's role in digital consumer behavior, providing actionable insights for enhancing platform strategies in the competitive landscape of online beauty retail.

2. RESEARCH METHOD

This study utilizes a quantitative approach with a descriptive survey design to examine the influence of augmented reality (AR) on impulse buying intention, with product presence as a mediating factor. The framework is based on the Stimulus-Organism-Response (S-O-R) model, where AR features serve as stimuli, product presence as the organism, and impulse buying intention as the response, building on prior consumer behavior research (Mehrabian & Russell, 1974). Studies have employed this model to investigate the factors influencing impulsive purchases, including external stimuli, cognitive and affective motivations, and situational characteristics (Shaon Sen, 2024). The Stimulus-Organism-Response (S-O-R) model was selected for its suitability in analyzing how augmented reality (AR) features influence consumer behavior in e-commerce. This model, proposed by Mehrabian and Russell (1974), effectively links external stimuli (AR vividness and interactivity) to internal states (product presence) and subsequent behavioral responses (impulse buying intention). Unlike models such as the Theory of Planned Behavior or the Technology Acceptance Model, the S-O-R framework accommodates the emotional and sensory dimensions integral to AR experiences. Its proven efficacy in prior AR studies further underscores its relevance in capturing the mediating role of product presence in shaping impulsive purchase behaviors in digital retail contexts (Vonkeman et al., 2017; Hsu et al., 2024). The research targets women aged 18-35 residing in East Java, Indonesia, who have used Shopee's BeautyCam feature. A proportional sample of 135 responden)ts was calculated to represent this population, distributed across nine cities based on regional demographic data (Badan Pusat Statistik Jawa Timur, 2020).

Data collection was conducted through an online questionnaire via Google Forms, with questions assessing AR features, product presence, and impulse buying intention. Only necessary information was gathered via the questionnaire—no personally identifiable information was collected—and answers were anonymised to protect privacy and security. The encryption feature of Google Forms protected data while it was being transmitted, and only the research team had access. Ethical approval was obtained, adhering to data protection standards to maintain confidentiality and integrity. Items were rated on a 5-point Likert scale, capturing levels of agreement or experience, and providing quantitative data for statistical analysis (Sugiyono, 2019). The AR construct was measured by vividness, representing the sensory richness of the experience (Javornik, 2016), and interactivity, which reflects the degree of user control within the AR environment (Vonkeman et al., 2017). Product presence, defined as the feeling of a virtual product's physical presence in the user's environment, was assessed to gauge its impact on impulse buying intention (Vonkeman et al., 2017). Finally, impulse buying intention was measured to understand spontaneous purchase desires influenced by AR (Hsu et al., 2024).

Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS. SmartPLS was selected for its ability to analyze complex models and its suitability for smaller sample sizes, as recommended by Hair et al. (2022). Its variance-based approach is ideal for predictive analysis and exploring relationships between constructs, making it appropriate for examining AR's influence on consumer behavior in e-commerce. The model was tested for validity and reliability through the measurement model, assessing convergent and discriminant validity. Path coefficients in the structural model were evaluated to verify the direct and indirect relationships between AR, product presence, and impulse buying intention. Additionally, product presence was tested as a mediator, with significant indirect paths confirming its role. This methodology provides a structured, scientifically grounded approach for examining AR's impact on consumer behavior in e-commerce, particularly within sensory-driven markets like cosmetics.

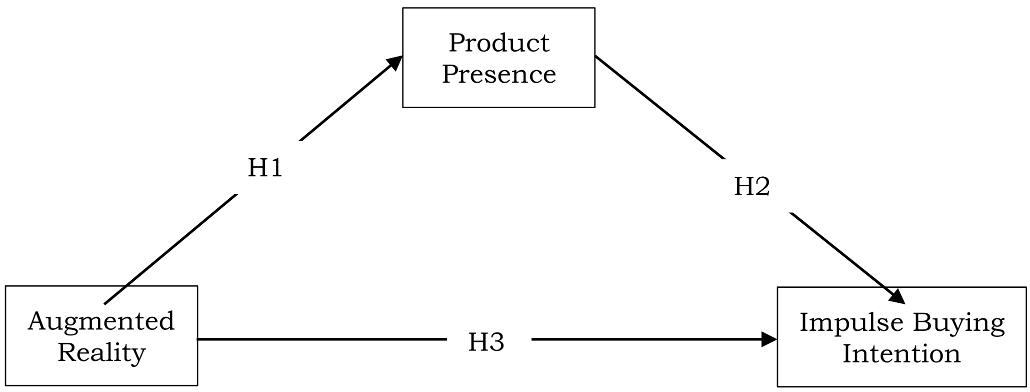

Figure 1. Conceptual Framework

3. RESULTS AND DISCUSSIONS

The distribution of respondents' ages provides insight into the segmentation of the target population, which comprises women aged 18–35 years in East Java who utilize Shopee's BeautyCam feature. This demographic was chosen because it represents a significant portion of Indonesia's active e-commerce users, as identified by the Badan Pusat Statistik Jawa Timur, (2020).

Table 1. Respondent Characteristics by Age

Age	Percentage	Frequency
18-23 y.o	51.1%	69
24-30 y.o	37%	50
30-35 y.o	11.9%	16

As shown in Table 1, the majority of respondents fall within the 18–23 age group (51.1%), followed by the 24–30 age group (37%), and the 30–35 age group (11.9%). These results indicate that the primary users of AR in e-commerce are younger individuals, specifically Gen Z and Millennials, who are more inclined to adopt new technologies. This aligns with findings by Hsu et al., 2024, which suggest that younger demographics exhibit higher levels of technology adoption compared to older groups.

Table 2. Respondent Charactheristiics by Domicile

Domicile	Percentage	Frequency
Kota Surabaya	34.07%	46
Kota Blitar	13.33%	18
Kota Kediri	3.70%	5
Kota Madiun	1.48%	2
Kota Malang	10.37%	14
Kota Mojokerto	12.59%	17
Kota Pasuruan	18.52%	25
Kota Batu	2.96%	4
Kota Probolinggo	2.96%	4

Demographic data by domicile identifies the geographic distribution of respondents and assesses the relevance of the research findings to the target population in East Java. Table 2 reveals that most respondents reside in Surabaya (34.07%), followed by Pasuruan (18.52%) and Blitar (13.33%). Surabaya, as a metropolitan city, accounts for the largest proportion of respondents, reflecting that AR adoption in e-commerce is more prevalent in urban areas. This distribution also highlights that respondents from regions with better internet access are more likely to utilize AR features, consistent with reports on Indonesia's e-commerce landscape (Putri & Marlien, 2022).

Convergent validity measures how well indicators of a single construct positively correlate. According to Hair et al., 2022 outer loading values > 0.7, AVE > 0.5, and CR > 0.7 are indicative of strong convergent validity.

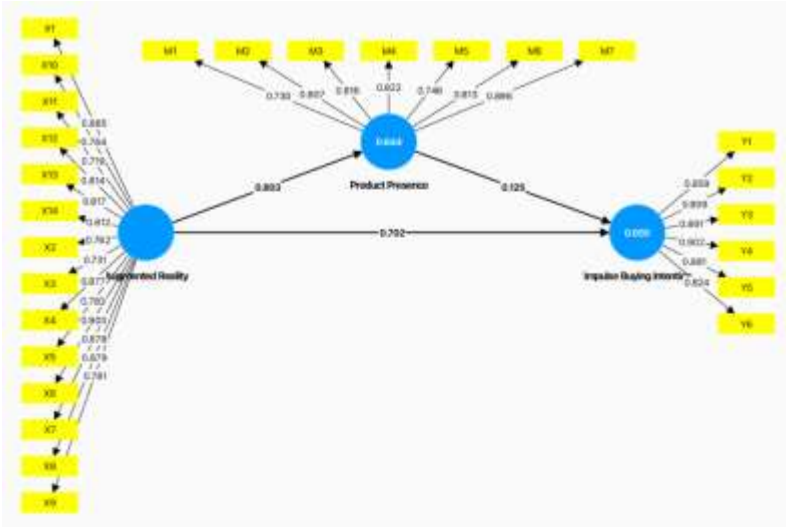

Figure 2. Conceptual Model
Source: SmartPLS Output, 2024

The results in Table 3 demonstrate that all indicators meet the criteria for convergent validity. The outer loading values for AR exceed 0.7, with AVE at 0.667 and CR at 0.965, indicating strong internal consistency within the AR construct. Similarly, the Product Presence (PP) and Impulse Buying Intention (IBI) constructs also meet the thresholds for convergent validity, confirming the robustness of the measurement instruments used in this study.

Table 3. Convergent Validity Test Results after Model Evaluation

Code	Outer Loading	AVE	CR
AR 1	0.885		
AR 2	0.762		
AR 3	0.731		
AR 4	0.877		
AR 5	0.783	0.667	0.965
AR 6	0.903		
AR 7	0.878		
AR 8	0.879		
IBI 1	0.859		
IBI 2	0.909		
IBI 3	0.891	0.771	0.953
IBI 4	0.902		
IBI 5	0.881		
IBI 6	0.824		
PP 1	0.730		
PP 2	0.807		
PP 3	0.816		
PP 4	0.822	0.649	0.928
PP 5	0.746		
PP 6	0.813		
PP 7	0.896		

Source: SmartPLS Output, 2024

Discriminant validity ensures that each construct in the model is empirically distinct. According to the Fornell-Larcker Criterion, the AVE values of constructs should exceed the correlations between constructs (Hair et al., 2022).

Table 4. Discriminant Validity Test Results

	AR	IBI	PP
AR			
IBI	0.833		
PP	0.846	0.737	

Source: SmartPLS Output, 2024

The findings in Table 4 establish that all constructs are distinct from one another. The AVE values for AR, PP, and IBI surpass their inter-construct correlations, confirming discriminant validity and ensuring that each construct measures a unique dimension of the model. This suggests that each construct is unique and measures a distinct theoretical concept.

R-Square values are used to evaluate the proportion of variance in the dependent variable explained by the independent variables. According to Hair et al., 2022, R-Square values of 0.25, 0.5, and 0.75 indicate weak, moderate, and substantial predictive power, respectively.

Table 5. Value of R-Square and Adjusted R-Square Structural Model

Influence	R Square	R Square adjusted
IBI	0.650	0.642
PP	0.644	0.642

Source: SmartPLS Output, 2024

The structural model demonstrates moderate to substantial predictive power, as evidenced by the R-Square values in Table 5. For Impulse Buying Intention (IBI), 65% of the variance is explained by AR and PP, while Product Presence (PP) is similarly influenced, with an R-Square value of 0.644. These results highlight the model's strength in capturing the relationships among the constructs.

Hypothesis testing was conducted to examine the relationships between AR, PP, and IBI within the structural model. Significant relationships are identified by T-Statistics > 1.96 and P-Values < 0.05 (Hair et al., 2022).

Table 6. Hypothesis Testing Results

	Hypothesis	β	T -Stat	P Value	Information
H1	Augmented Reality -> Product Presence	0.803	24.783	0.000	Supported
H2	Product Presence -> Impulse Buying Intention	0.125	1.277	0.201	Not Supported
H3	Augmented Reality -> Impulse Buying Intention	0.702	7.390	0.000	Supported

Source: SmartPLS Output, 2024

Hypothesis testing yielded mixed results, as displayed in Table 6. The relationship between AR and PP (β = 0.803, P < 0.001) and between AR and IBI (β = 0.702, P < 0.001) is significant, supporting H1 and H3. However, the influence of PP on IBI (β = 0.125, P = 0.201) is not statistically significant, meaning H2 is not supported. These findings suggest that AR has a strong direct impact on IBI, while the mediating role of PP is less evident in this context.

4. CONCLUSION

The objectives outlined in the introduction have been addressed through the results and discussions, establishing compatibility between the study's initial expectations and the findings. The research confirms that Augmented Reality (AR) technology significantly enhances consumer engagement and impulse buying intention by creating an interactive and vivid virtual shopping experience. However, while product presence plays an important role in shaping consumer perceptions of virtual realism, its mediating influence on impulse buying was not strongly evident. These findings underline AR's potential as a direct driver of consumer behavior in sensory-driven markets such as cosmetics.

The implications of this study highlight the value of AR in bridging the sensory gaps of e-commerce platforms, aligning with the demands of a tech-savvy and experience-driven consumer demographic. This aligns with the notion proposed in prior research that AR fosters a unique product experience by reducing cognitive barriers to purchasing (Hsu et al., 2024; Poushneh, 2018). However, the limited role of product presence as a mediator calls for further exploration of other psychological or emotional factors, such as trust or perceived enjoyment, which could enhance AR's impact.

This study has several limitations that should be acknowledged. First, the sample size, while adequate for the chosen analysis method, was relatively small and focused on a specific demographic—women aged 18-35 in East Java—limiting the generalizability of the findings to broader populations. Second, the reliance on self-reported data through an online questionnaire introduces the potential for respondent bias, as participants may have provided socially desirable answers rather than reflecting their true experiences. These limitations suggest that future research should consider larger and more diverse samples, as well as incorporating mixed-method approaches to provide a more comprehensive understanding of AR's impact.

Future studies should explore AR's application across diverse product categories, consumer demographics, and cultural contexts to extend the findings of this research. Additionally, advancements in AR technology, such as haptic feedback or real-time AI-driven customization, could be investigated for their influence on consumer decision-making and engagement. These directions will provide deeper insights into AR's transformative potential, shaping e-commerce strategies and enhancing the digital consumer experience.

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