



Research on Consumers' Intention to Use and Promote Augmented Reality

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Abstract. To explore the factors influencing consumers' intention to use and promote augmented reality (AR), this study constructed an online furniture purchasing scenario. The study incorporated AR features as an external variable and Word of Mouth as a promotion evaluation dimension with Technology Acceptance Model. The results show that (1) Interactivity positively affects Perceived Usefulness and Perceived Ease of Use, and Vividness and Novelty positively affect Perceived Ease of Use. (2) The Perceived Usefulness and Perceived Ease of Use of AR positively affect consumers' Intention to Use, and the Perceived Ease of Use of AR positively affects Perceived Usefulness. (3) The Intention to Use of AR positively influences consumer's Word of Mouth.

Keywords: Augmented Reality · Technology Acceptance Model · Partial Least Squares · IKEA Place

1 Introduction

The development of e-commerce and the popularity of smartphone applications have led to consumers relying on online purchases [1]. However, due to the limitations of online purchases in product display, information richness, and multi-dimensional experience, offline purchases are still preferred by consumers when buying certain types of products [2]. Therefore, in order to enhance the user experience of online shopping and simulate real shopping process, some emerging technologies represented by Augmented Reality (AR) are gradually being applied to product development. The combination of AR and online shopping can provide users with a shopping experience that transcends channel boundaries and organically connects various distribution channels [3]. Currently, many manufacturers have launched related AR applications. For example, IKEA and Dulux allow users to remotely experience products intuitively using mobile applications [4].

However, it is unclear whether consumers are willing to adopt and promote AR shopping experiences [5]. For retailers, the high economic and time costs of developing AR applications, the dynamic relationship between customer loyalty and AR services remain unknown, many companies are cautious about whether to launch AR services [6]. Therefore, it is necessary to explore the factors that influence consumers' intention to use and promote AR. In this study, we use the AR-based application "IKEA Place" as the object and combine AR features and word-of-mouth (WOM) as external variables with the Technology Acceptance Model (TAM) to explore these issues.

2 Research Model and Hypotheses

Regarding AR, Mclean and Wilson summarized three key features of the technology: Interactivity, Vividness, and Novelty [7]. Specifically, for interactivity, Yim et al. elaborated on the technological outcome and user perception [8]. From the perspective of technological outcome, interactivity refers to the degree to which consumers can directly interact with the product. From the perspective of user perception, interactivity is the subjective perception of individuals on the interaction effect. For vividness, Steuer et al. defined it as ‘the ability of a technology to create a rich sensory-mediated environment’ [9]. Vivid product displays can prompt consumers to make a more comprehensive evaluation of the product information [10]. For novelty, Massetti believes that novelty is the perception that something is ‘new, unique, and different’ [11]. Novel stimuli can promote cognitive processing, thus arousing consumers’ attention and curiosity about the product itself [12].

The Technology Acceptance Model (TAM) is widely used to predict and explain individuals’ adoption behavior of new technologies. In the TAM model, the intention to use (IU) a new technology depends on the perceived usefulness (PU) and perceived ease of use (PEU) of the technology, additionally, PEU has a positive impact on PU [13]. However, the TAM also has limitations in that it ignores the impact of social, personal, and cultural factors on technology acceptance [14].

Word of mouth (WOM) was originally defined as a noncommercial verbal communication between two or more individuals about a brand, product, or service [15]. With the development of social media, WOM of a new technology can also influence the actual usage behavior of consumers. This is filling the gap in TAM for social, personal and cultural factors. Therefore, this study analyzes WOM as an indicator in the TAM model.

As mentioned before, interactivity, vividness, and novelty are three significant characteristics of AR. Algharabat et al. considers that interactivity is reflected in the ability of users to control what they see by zooming, rotating, and otherwise manipulating methods using their smartphones [16]. A shopping model with strong interactivity will provide an efficient shopping experience, thus increasing the acceptance of the technology [8]. Therefore, the study proposes following hypothesis:

H1a Interactivity positively affects PU.

H1b Interactivity positively affects PEU.

The vividness of AR lies in its ability to combine the real and virtual world, and provide consumers with clear, vivid, and detailed product displays. Barhorst et al. believes that user acceptance of technology can be improved when users better capture the details of the product [17]. Therefore, the study proposes following hypothesis:

H2a Vividness positively affects PU.

H2b Vividness positively affects PEU.

Finally, for novelty, AR applications enable users to place virtual objects in physical places. The unique presentation of content allows the products to be presented in the real world, thereby providing highly personalized and novel content [18]. Novel shopping experiences can stimulate new cognitive processing and increase efficiency [19]. When users feel increased efficiency in the shopping process, they will have higher PU and PEU [12]. Therefore, the study proposes following hypothesis:

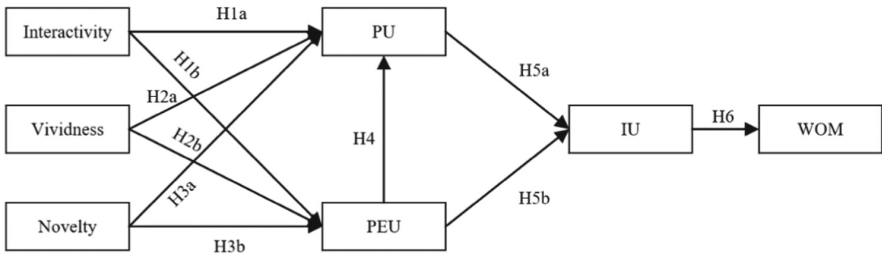


Fig. 1. Research model

H3a Novelty positively influences PU.

H3b Novelty positively affects PEU.

PU and PEU are the primary motivators for individuals to accept and use new technology, which not only affects individuals' attitudes towards using new technology, but also is a way to measure their satisfaction with using new technology. AR can significantly improve consumers' perception of the real world, enhance their PU and PEU, and thus influence their attitudes towards using the technology. Therefore, the study proposes following hypothesis:

H4 PEU positively influences PU

H5a PU positively influences IU

H5b PEU positively influences IU.

Word of mouth (WOM) is one of the factors that influence consumers to promote a technology. In a study of AR advertising, Sung found that consumers who were satisfied with the AR advertisement content not only formed a purchase intention, but also voluntarily shared the experience with their social group [20]. After perceiving the usefulness and ease of use of a technology, consumers develop behavioral intentions towards it, and this experiential process makes it easier to imagine and express their feelings, and more inclined to share the experience with others. Therefore, the hypothesis is proposed:

H6 IU positively influence WOM

Figure 1 presents the study's research model.

3 Method

3.1 Experience Tasks

IKEA PLACE was chosen as the experiential product for the AR, see as Fig. 2. Participants were required to complete two tasks: (1) browse the tags and select a bench from the featured product with the EKEDALEN tag, and then place the bench; (2) select a chair and place it next to the bench by dragging and rotating it.

3.2 Experimental Procedure and Questionnaire Design

Before the experiment started, a brief introduction of AR technology and its applications were given to all participants. After watching and experiencing both modes of the application and completing the experimental tasks in sequence, all participants filled



Fig. 2. Experiential product (IKEA PLACE)

out a questionnaire on AR and web modes. The questionnaire asked the participants to imagine that they needed to buy new furniture (a bench and a chair) and use the two applications launched by IKEA for selection. The questionnaire used a Likert seven-point scoring method. The design of corresponding variables and the explanation of the questionnaire items are shown in Table 1.

3.3 Data Analysis

This study used IBM SPSS Statistics 25 for descriptive statistics. For model evaluation, partial least squares (PLS) were used to test the research model. This method does not require strict adherence to distribution assumptions, is suitable for processing small sample models, is suitable for exploratory model research, and can support multi-group analysis. This article used the PLS algorithm of SmartPLS 3.0 analysis software to evaluate the reliability and validity of the model, and used the bootstrap algorithm for 5000 repeated samples to estimate the path coefficients and conduct significance testing of the model.

4 Result

A total of 127 participants completed the experiment. 121 valid questionnaires were collected (62 males, mean age = 19.882 ± 0.905). The descriptive statistics of the questionnaire are shown in Table 2.

4.1 Measurement Model

Reliability was tested using Composite Reliability (CR) and Cronbach's α . The CR was measured by Average Variance Extracted (AVE) of the indexes, and then validity was differentiated by comparing the inter-factor correlation coefficient with the square root test of AVE. The results are shown in Table 3. The results showed that both the CR and

Table 1. Items design of questionnaire

Construct	Items
Interactivity	The interactive features of this mode can help you make decisions when purchasing furniture (benches and chairs). When buying with this mode, you can interactively select customized furniture (benches and chairs) that meet your needs. The interaction of this purchase mode works very well.
Vividness	This way the features of the furniture (benches and chairs) can be clearly presented. Details of furniture (benches and chairs) can be presented in detail using this approach. This way of presenting furniture (benches and chairs) is vivid.
Novelty	Shopping in this way gives you a new experience. Shopping this way gives you a unique experience. There is a difference between shopping this way and shopping the other way.
PU	This approach helps save time in the shopping process by comparing relevant information and selecting products. Using this method of shopping will increase your shopping efficiency. This is a great aid when selecting furniture. It makes it easier for you to select the products that meet your needs. Overall, this is a very useful way for you to shop.
PEU	Mastering the applications that have this technology is easy for you. Shopping in this way does not require a lot of mental activity. You can easily use this technology to achieve your needs. Overall, this application is easy for you to use.
IU	If you were to purchase furniture in the future, you would consider using this application. If other merchants offer products with this buying experience, you would give priority to items in this buying mode. You would also consider using this model for future product purchases if needed.
WOM	You will talk to others about this shopping mode. You will recommend manufacturers who offer this shopping model to others.

Cronbach's α were greater than 0.8, indicating that the scale had good reliability. The AVE of each factor was greater than 0.5, indicating that the variance extraction rate was high and the scale had good combined validity, and the square root of AVE was greater than the inter-factor correlation coefficient of the corresponding column, indicating that the scale had good discriminant validity.

4.2 Structural Model

The structural model was evaluated using the coefficient of determination (R^2), cross-validation redundancy (Q^2), and goodness of fit (GOF). $R^2_{PEU} = 0.33$, $R^2_{PU} = 0.572$,

Table 2. The descriptive statistics of the questionnaire

	Mean	Median	Lower Quartile	Upper Quartile	SD
Interactivity	5.741	6	5.333	6.333	0.908
Vividness	5.703	6	5.167	6.333	0.994
Novelty	5.992	6.333	5.5	6.667	0.904
PU	5.605	5.6	5	6.4	0.874
PEU	5.661	5.75	5	6.5	0.947
IU	5.804	6	5.333	6.5	0.94
WOM	5.843	6	5.5	6.5	1.033

Table 3. Results of measurement model

	Cronbach's α	CR	AVE	Interactivity	Vividness	Novelty	PU	PEU	IU	WOM
Interactivity	0.843	0.905	0.76	0.872						
Vividness	0.812	0.884	0.718	0.487	0.847					
Novelty	0.825	0.896	0.742	0.649	0.531	0.861				
PU	0.816	0.87	0.574	0.651	0.477	0.558	0.757			
PEU	0.8	0.868	0.624	0.498	0.45	0.5	0.648	0.79		
IU	0.837	0.902	0.753	0.558	0.416	0.626	0.698	0.596	0.868	
WOM	0.761	0.893	0.807	0.438	0.422	0.598	0.649	0.548	0.731	0.898

Note: The diagonal is the arithmetic square root of AVE

$R^2IU = 0.519$, and $R^2WOM = 0.541$. $Q^2PEU = 0.182$, $Q^2PU = 0.308$, $Q^2IU = 0.375$, and $Q^2WOM = 0.421$. $ROF = 0.591$. The path coefficients, t-values and significance levels were calculated for the AR. The results are shown in Table 4.

Interactivity positively affects PEU and PU, as verified for H4a and H4b. Vividness positively affects PEU and insignificantly affects PU ($\beta = 0.08$, $p = 0.48$), as verified by H5b. Novelty positively influenced PEU and insignificantly influenced PU ($\beta = 0.086$, $p = 0.392$), as verified by H6b. In addition, PEU positively affects PU, as verified by H7. PEU and PU positively affect IU and WOM, and H8a, H8b, and H9 were verified. The results of testing the structural model are shown in Fig. 3.

The impact of vividness and novelty on PU is not significant. This indicates when using AR as an aid to purchase products, customers are more concerned about the efficiency of the technology than the novelty of the product presentation or experience.

Table 4. Results of hypotheses testing

Hypothesis	Path	Path Coefficient	t	p
H1a	Interactivity → PU	0.364	3.345	0.001
H1b	Interactivity → PEU	0.247	2.749	0.006
H2a	Vividness → PU	0.08	0.706	0.48
H2b	Vividness → PEU	0.208	2.603	0.009
H3a	Novelty → PU	0.083	0.799	0.424
H3b	Novelty → PEU	0.228	2.44	0.015
H4	PEU → PU	0.389	6.143	<0.001
H5a	PU → IU	0.536	6.652	<0.001
H5b	PEU → IU	0.246	2.699	0.007
H6	IU → WOM	0.736	13.469	<0.001

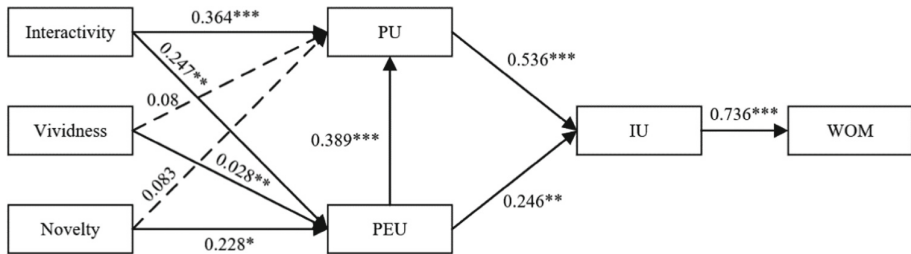


Fig. 3. Results of the structural model

5 Conclusions

First, the study shows that interactivity has a positive impact on PU and PEU, while vividness and novelty have a positive impact on PEU. When using AR, consumers are more interested in whether it brings efficiency to their pursuits than in the vividness and novelty of the product display. Second, PU and PEU of AR have a positive impact on consumers' IU, and PEU of AR also affects PU. For AR, consumers will use IU only when they find the technology easy to use and can bring efficiency to their purchase. Therefore, developers should not raise the threshold of using AR through complicated operations. Third, IU has a positive impact on WOM. Therefore, for companies, WOM is one of the factors that influence AR promotion. Promoting AR applications to consumers through public opinion will make more consumers aware of the technology and actively use it to help their consumption.

6 Limitations and Future Research

The limitations of this study are mainly in the following three aspects. First, this study focuses on the AR experience in the process of purchasing furniture. Future research needs to be extended to other application scenarios of AR. Second, this study used a questionnaire as a measurement method. Future research could incorporate physiological measurements to observe differences in consumers' physiological responses. Third, this study constructed a shopping scenario for consumers. Future studies could be extended to use AR apps to shop in retail or other real-world environments to determine if similar results can be obtained.

References

1. Shukla, M., Jain, V., & Misra, R. (2021). Factors influencing smartphone based online shopping: an empirical study of young Women shoppers. *Asia Pacific Journal of Marketing and Logistics*, 34(5), 1060-1077. <https://doi.org/10.1108/APJML-01-2021-0042>
2. Cheema, A., & Papatla, P. (2010). Relative importance of online versus offline information for Internet purchases: Product category and Internet experience effects. *Journal of Business Research*, 63(9-10), 979-985. <https://doi.org/10.1016/j.jbusres.2009.01.021>
3. Rhee, H. L., & Lee, K. H. (2021). Enhancing the sneakers shopping experience through virtual fitting using augmented reality. *Sustainability*, 13(11), 6336.
4. Caboni, F., & Hagberg, J. (2019). Augmented reality in retailing: a review of features, applications and value. *International Journal of Retail & Distribution Management*, 47(11), 1125-1140. <https://doi.org/10.3390/su13116336>
5. Meuter, M. L., Ostrom, A. L., Bitner, M. J., & Roundtree, R. (2003). The influence of technology anxiety on consumer use and experiences with self-service technologies. *Journal of Business Research*, 56(11), 899-906. [https://doi.org/10.1016/S0148-2963\(01\)00276-4](https://doi.org/10.1016/S0148-2963(01)00276-4)
6. Chylinski, M., Heller, J., Hilken, T., Keeling, D. I., Mahr, D., & de Ruyter, K. (2020). Augmented reality marketing: A technology-enabled approach to situated customer experience. *Australasian Marketing Journal*, 28(4), 374-384. <https://doi.org/10.1016/j.ausmj.2020.04>
7. McLean, G., & Wilson, A. (2019). Shopping in the digital world: Examining customer engagement through augmented reality mobile applications. *Computers in Human Behavior*, 101, 210-224. <https://doi.org/10.1016/j.chb.2019.07.002>
8. Yim, M. Y. C., Chu, S. C., & Sauer, P. L. (2017). Is augmented reality technology an effective tool for e-commerce? An interactivity and vividness perspective. *Journal of interactive marketing*, 39(1), 89-103. <https://doi.org/10.1016/j.intmar.2017.04.001>
9. Steuer, J., Biocca, F., & Levy, M. R. (1995). Defining virtual reality: Dimensions determining telepresence. *Communication in the age of virtual reality*, 33, 37-39. <https://doi.org/10.1111/j.1460-2466.1992.tb00812.x>
10. Yim, M. Y. C., & Park, S. Y. (2019). "I am not satisfied with my body, so I like augmented reality (AR)": Consumer responses to AR-based product presentations. *Journal of Business Research*, 100, 581-589. <https://doi.org/10.1016/j.jbusres.2018.10.041>
11. Massetti, B. (1996). An empirical examination of the value of creativity support systems on idea generation. *MIS Quarterly*, 83-97. <https://doi.org/10.2307/249543>
12. Zhong, Y., Oh, S., & Moon, H. C. (2021). Service transformation under industry 4.0: Investigating acceptance of facial recognition payment through an extended technology acceptance model. *Technology in Society*, 64, 101515. <https://doi.org/10.1016/j.techsoc.2020.101515>
13. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340. <https://doi.org/10.2307/249008>

14. Tarhini, A., Arachchilage, N. A. G., & Abbasi, M. S. (2015). A critical review of theories and models of technology adoption and acceptance in information system research. *International Journal of Technology Diffusion*, 6(4), 58–77. <https://doi.org/10.4018/IJTD.2015100104>
15. Anastasiei, B., & Dospinescu, N. (2019). Electronic word-of-mouth for online retailers: Predictors of volume and valence. *Sustainability*, 11(3), 814. <https://doi.org/10.3390/su11030814>
16. Algharabat, R., Alalwan, A. A., Rana, N. P., & Dwivedi, Y. K. (2017). Three-dimensional product presentation quality antecedents and their consequences for online retailers: The moderating role of virtual product experience. *Journal of Retailing and Consumer Services*, 36, 203-217. <https://doi.org/10.1016/j.jretconser.2017.02.007>
17. Barhorst, J. B., McLean, G., Shah, E., & Mack, R. (2021). Blending the real world and the virtual world: Exploring the role of flow in augmented reality experiences. *Journal of Business Research*, 122, 423-436. <https://doi.org/10.1016/j.jbusres.2020.08.041>
18. Javornik, A. (2016). Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behaviour. *Journal of Retailing and Consumer Services*, 30, 252-261. <https://doi.org/10.1016/j.jretconser.2016.02.004>
19. Arghashi, V. (2022). Shopping with augmented reality: How wow-effect changes the equations!. *Electronic Commerce Research and Applications*, 54, 101166. <https://doi.org/10.1016/j.elerap.2022.101166>
20. Sung, E. C. (2021). The effects of augmented reality mobile app advertising: Viral marketing via shared social experience. *Journal of Business Research*, 122, 75-87. <https://doi.org/10.1016/j.jbusres.2020.08.034>

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