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How User-Platform Interactions Influence Continuance Intention in Augmented Reality Mobile Platforms

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ABSTRACT

When we interact with mobile platforms in an augmented reality environment, it changes our cognitive and emotional engagements through different stimuli cues that respond to our behavioral intentions. The effects of those engagements through augmented reality, considering user-platform interactions, are unexplored. This study investigated a nuanced understanding of how stimuli cues in augmented reality affect sense of immersion and sense of presence, followed by an interaction-engagement-intention (I-E-I) model. A quantitative method was used to validate the proposed model. Based on our online survey with 886 responses, we assessed the influences of product fit, network quality, and artificial intelligence-driven recommendation in perceiving cognitive engagements. This study examined the importance of engaging satisfaction and trust as emotional engagements, influencing users' continuance intention. Our findings confirm that sources of information, especially AIR has a significant influence in perceiving sense of immersion and product fit has a positive effect in perceiving sense of presence. Moreover, trust has a more significant influence on the continuance intention to use AR mobile platforms. Also, the results explored that generation Z has more impact on continuance intention than generation X and millennials. This could enhance the capabilities of information system designers, researchers, marketing professionals, and solution providers to attain sustainable user retention.

Keywords: User-platform interaction, Continuance intention, Augmented reality, Mobile platform, Interaction-engagement-intention model

INTRODUCTION

Augmented reality (AR) revolutionizes the mobile platform industry through interactive engagements. AR enhances user experience (UX) through correlated actions among cognitive, physical, and virtual encounters to collaborate, cooperate, and communicate in the physical world (Ameen, 2021). This requirement has increased due to rapid changes in user expectations for heterogeneous human-computer interaction (HCI). The effect of those interactions involves users' engagements with AR applications that demand to assess users' decision-making through continuance intention (Wang et al., 2021). Previous literature has shown that exploring the effects

of interactive engagements in perceiving UX for augmented reality in the user-platform interaction paradigm is unrealized (Chandler et al., 2022).

This study addressed a fundamental research interest to explain the consequences of user-platform interaction through product fit (Soliman et al., 2024), network quality (Huang et al., 2023) and artificial intelligence-driven recommendation (Goti et al., 2023). We investigated that AR intrinsically motivates users' cognitive engagement (Jessen et al., 2020), and explained a process of assessing users' emotions through satisfaction and trust as subsequent effects of engagements. Finally, we explained how user engagement motivates user experience through intrinsic values and understanding to facilitate the decision-making process on continuance intention (Acharya et al., 2023).

This study aims to deliver a research framework to explain how stimuli cues affect sense of immersion and sense of presence that influences continuance intention. We conducted an online survey (N = 886) with an AR mobile platform (IKEA app) to validate the interaction-engagement-intention (I-E-I) model. We analyzed the data using a smart-partial least square (PLS) - structural equation model (SEM) guided by the following research questions: RQ1: What are the key factors determining users' continuance intention in the user-platform interaction paradigm? RQ2: What are the intervening effects of cognitive and emotional engagement toward continuance intention? User-platform interactions influence users' continuance intention, encourage the user retention process, and support the mobile platform industry in understanding how to assess user experience for user-platform interactions with an AR environment. It contributes to identifying the cognitive and emotional impact in perceiving user experience that influences continuance intention to use AR mobile platforms.

RELATED RESEARCH

In the e-commerce revolution, user-platform interactions engage interaction-based stimuli cues. Emerging technologies like artificial intelligence (AI), the Internet of Things (IoT), and big data analytics are revolutionizing the analytical process to provide more interactions in AR mobile platforms (Nazir et al., 2023). Users can create a virtual identity to communicate, interact, and perform activities with mobile platforms and create a user-platform interaction-enabled environment (Yuntao et al., 2022). Furthermore, previous studies examined user experience (UX) as a user's perceptions gained through cognitive (Qin et al., 2021) and emotional engagements (Goel et al., 2023).

Previous studies explained that users interact with virtual products through spatial registration and gesture-based interaction by changing the orientation of physical spaces (Grubert, 2023). In the online platform industry, AR provides product fit through personalization, scale measurement, positioning, and virtual try-on features. In AR mobile platforms, network qualities are crucial to maintaining uninterrupted immersive services using mobile devices (Huang et al., 2021). On the other hand, network quality is vital in maintaining the platform's ability to provide uninterrupted services.

Artificial intelligence (AI) provides more interactions between users and platforms that persuade cognitive engagements (Soliman et al., 2024), generating recommendations (Yin and Qiu, 2021) to provide user comfort.

Previous studies have examined how users' expectations are fulfilled through AR interactions that create a sense of immersion through users' psychological responses (Dargan et al., 2023). In another context, the situated cognition theory explains that sense of presence occurs when a user interacts with virtual products and perceives situated feeling as a unique psychological state of "being there" in the virtual world (Alimamy and Gnoth, 2022). Furthermore, researchers have explained satisfaction (David et al., 2022; Park et al., 2020) and trust (Kumar et al., 2023) as emotional feelings. Satisfaction develops a pleasant mode and trust as a mental state where a user confirms willingness to perform actions after fulfilling expectations.

The term "continuance intention" was adapted from the expectation-confirmation theory (ECT) in the field of consumer behavior literature (Bhattacherjee, 2001). Recently, researchers have studied the effects of AR on continuance intention to use mobile platforms. Hung describes the continuance intention through cognitive states for AR mobile platforms (Huang et al., 2021). In an e-commerce mobile platform, the physical distance to touch a product creates user uncertainty. Thus, augmented reality features can alleviate the problems by perceiving immersive experiences to end-users. Sun examines the critical implications of AR characteristics on user experience to gain continuance intention (Sun et al., 2022).

HYPOTHESES DEVELOPMENT AND RESEARCH MODEL

Previous studies have followed the stimulus-organism-response (S-O-R) paradigm to investigate immersive experience, repurchase, and continuance intentions (Goel et al., 2023; Huang et al., 2021). This model is rooted in environmental psychology, which considers stimuli cues to explain cognitive reactions. Multiple stimuli cues in an environment influence the user's cognitive state, which consequently affects the user's behavioral responses (Mehrabian and Russell, 1974).

AR involves product movement through tracking and engages sense of immersion in an immersive environment (David et al., 2022). In the context of AR applications, Kowalczuk explained the effects of network qualities in engaging a sense of immersion and feeling absorbed in the AR environment (Kowalczuk et al., 2021). AR involves users with a high level of influence when placing virtual products in physical spaces. Moreover, online mobile platforms use feeling Artificial Intelligence (AI) through adaptive and personalized recommendation systems to extend predictive data analytics (Yin and Qiu, 2021; Huang et al., 2021). Therefore, the following hypotheses are proposed:

H1. Product fit positively influences the sense of immersion in AR mobile platforms.

H2. Network quality positively influences the sense of immersion in AR mobile platforms.

H3. AI-driven recommendation positively influences the sense of immersion in AR mobile platforms.

In AR, Hilken defines situated experience as a sense of presence in an augmented reality environment (Hilken et al., 2017). Furthermore, AR features provide users comfort in viewing virtual products in their physical spaces, which alleviates product uncertainties and reduces the need for touch (Wang et al., 2021). On the other hand, AI transforms wireless networks through network optimization with network parameters, enhancing the UX by adopting seamless convergence of virtual and physical realms that engage the sense of presence (Schubert, 2009). Therefore, we propose the following hypothesis:

H4. Product fit positively influences the sense of presence in AR mobile platforms.

H5. Network quality positively influences the sense of presence in AR mobile platforms.

Previous studies established that sense of immersion engages users to sense virtual products through psychological ownership that persuades satisfaction (Sun et al., 2022). Furthermore, prior studies explained that the AR environment enhances the sense of presence through the embodiment of a product and enhances the user's impression through satisfaction (Chylinski et al., 2020; Heller et al., 2019). Therefore, we are proposing the following hypothesis:

H6: Sense of immersion positively influences satisfaction in the user-platform interaction paradigm.

H7: Sense of presence positively influences satisfaction in the user-platform interaction paradigm.

Immersion engages closely with subjective sensation with product virtualization, and trust acts as a mediating construct that includes the effects of perceived immersive experiences (Koh et al., 2023). AR can alleviate those issues by incorporating immersive features and building trust to interact with mobile platforms (Payal et al., 2024). Growe defined that the virtual body associated with the physical space develops a sense of presence that creates user trust (Grubert, 2023). Furthermore, sense of presence creates a realization of "being there" in the physical space, enhancing trust in products (Wang et al., 2021). Therefore, we are proposing the following hypothesis:

H8: Sense of immersion positively influences trust in the user-platform interaction paradigm.

H9: Sense of presence positively influences trust in the user-platform interaction paradigm.

Bhattacharjee emphasized that satisfaction with IS use is a prime concern for users to maintain usage intention (Bhattacharjee, 2001). Previous studies suggested that trust influences users' willingness to continue using mobile apps (Nguyen, 2021). Moreover, Balakrishnan describes the relationship between user trust and continuance intention to use technological systems (Kumar et al., 2023). Therefore, we propose the following hypotheses:

H10. Satisfaction positively influences continuance intention in the user-platform interaction paradigm.

H11. Trust positively influences continuance intention in the user-platform interaction paradigm.

A conceptual interaction-engagement-intention model (as shown in Figure 1) is developed to determine how interactions-based stimuli cues (product fit, network quality, and AI-driven recommendation) affect user experience (sense of immersion and sense of presence) in the user-platform interaction paradigm. Subsequently, the study investigates the effect of cognitive states on users' satisfaction and trust as emotional states and their influences on continuance intention.

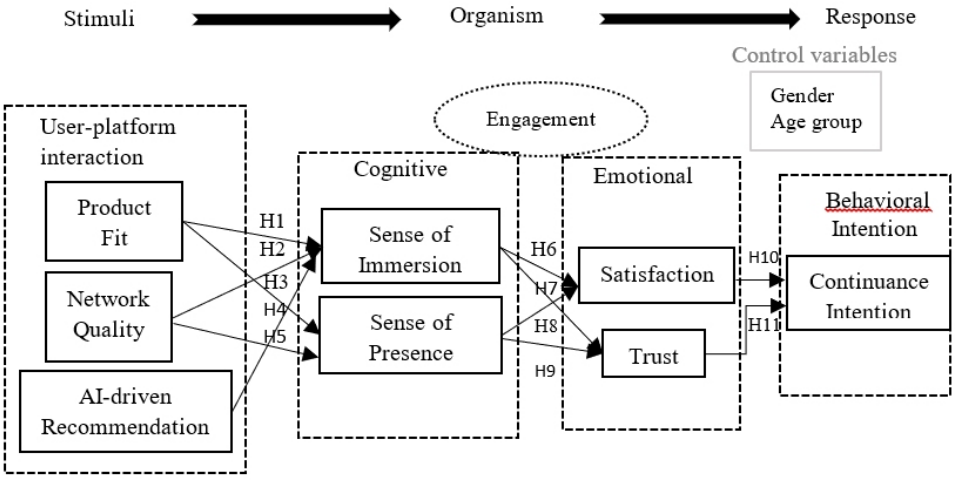

Figure 1: Interaction-engagement-intention model.

METHODOLOGY

This study conducted an online survey in Australia following the convenience snowball sampling technique. In the study, we chose IKEA as an AR platform because of its versatility and AR capabilities. We have considered constructs and measurement items from the validated instruments. Considering previous studies, we followed the measures of product fit from Sun (2022), network quality from Nadir (2021), and AI-driven recommendation from Yin and Qiu (2021). We followed this with a sense of immersion from Dargan (2023) and a sense of presence from Alimamy and Gnoth (2022). We also followed the measures of satisfaction from Park (2020) and David (2021), as well as trust from Kumar (2023). The study relates to continuance intention as a behavioral response and measures continuance intention from Yin and Qiu (2021) and Park (2020). We have maintained all the UTS guidelines, and an ethical application has been approved as per UTS HREC REF NO. ETH22-7706 on 9 August 2023. We have critically checked and computed data using SPSS to clean it through the proper validation process. Finally, the sample size of 886 (N = 886) was confirmed, with a response rate of 84%.

The proposed research model was validated using partial least squares structural equation modeling (PLS-SEM), which emphasizes extending the

explained variance of the constructs (Kowalczuk et al., 2021). SmartPLS 4.0 was used to examine the measurement and develop a structure model to contrast the results. The measurement model acted as an outer model assessment with confirmatory factor analysis (CFA) to determine the reliability of survey instruments and the validity of constructs (Kowalczuk et al., 2021). Then, we executed the structural model as an inner model assessment to test the hypotheses (Nazir et al., 2023).

RESULTS

We analyzed socio-demographic characteristics and prepared user profiles from responses. It includes 60.2% male, 38.9% female, and 0.9% did not prefer to say. Regarding the age group, 22.8% of respondents are Generation Z (18–26 years), 53.2% are Millennials (27–42 years), 18.8% are Generation X (43–58 years), and 5.2% are Boomers II (59 years and above). As reported, most respondents (51.2%) have achieved a bachelor's degree, 14.6% have a professional degree, and 7.9% have a vocational degree in Australia.

This study used confirmatory factor analysis to check the reliability and validity of the measurement items and constructs in the measurement model (Covez et al., 2023). The measurement model is analyzed through factor loadings, Cronbach's alpha, composite reliability, and average variance extracted (AVE) to assess the reliability of the survey instrument. Table 1. describes the psychometric properties of all the constructs deployed in the study. As retrieved from the data, all the outer loadings are above 0.70, and the average variance extracted (AVE) values are above 0.50. Cronbach's alpha value of all constructs is assessed from 0.750 to 0.924, which is higher than the recommended value of 0.7 (Payal et al., 2024). CR values of all constructs were assessed as higher than the recommended value of 0.70. (i.e., from 0.752 to 0.927). Further, the AVE values were found to be higher than MSV (Maximum Shared Variance) and ASV (Average Shared Variance), which shows the strength of AVE and confirms the threshold for discriminant validity (Goel et al., 2023).

In the structural model assessment, we initially assessed the value of R^2 for all dependent variables and then observed the collinearity statistics value for all the relationships. The result showed that the value of R^2 for all the variables is within the range of 0.11–0.25 (except sense of presence), which is recommended as a higher value. R^2 values for sense of immersion (0.208), sense of presence (0.194), satisfaction (0.334), trust (0.272), and continuance intention (0.389) showed reasonable variance explained. Also, the collinearity statistics (VIF) value for all the relationships is less than 4.0 (as shown in Table 2).

The significance of the hypotheses was tested through path co-efficient (β), t-value, and p-value in the structural model assessment. All the hypotheses were supported with the $p < 0.001$ level. The results for the AR environment show that all hypotheses are supported and sources of information positively influence users' behavioral responses. The structural model results (hypothesis testing) are provided in Table 5.

Table 1. Measurement model assessment.

Constructs	Items	Factor Loading	Cronbach's Alpha	Composite Reliability (rho_a)	Average Variance Extracted (AVE)
Product fit	PF1	0.958	0.911	0.855	0.919
	PF2	0.959			
Network quality	NQ1	0.946	0.879	0.879	0.892
	NQ2	0.943			
AI-driven recommendation	AIR1	0.924	0.924	0.927	0.929
	AIR2	0.966			
Sense of immersion	SI1	0.952	0.902	0.903	0.911
	SI2	0.956			
Sense of presence	SP1	0.943	0.880	0.880	0.834
	SP2	0.946			
Satisfaction	SF1	0.958	0.912	0.912	0.919
	SF2	0.960			
Trust	TR1	0.943	0.881	0.882	0.894
	TR2	0.948			
Continuance intention	CI1	0.819	0.750	0.752	0.724
	CI2	0.833			
	CI3	0.798			

Table 2. R-square statistics and collinearity statistics (VIF).

R^2 Statistics			Collinearity Statistics (VIF)	
Construct	R-Square	R-Square adjusted	Relationship	VIF
SI	0.208	0.204	PF -> SP	1.000
SP	0.194	0.191	IE -> SN	1.235
SF	0.334	0.331	OR -> SN	1.235
TR	0.272	0.271	SP -> SF	1.250
CI	0.389	0.387	SP -> TR	1.480
	SN -> SF	1.348		
	SN -> TR	1.354		
	SF -> CI	1.178		
	TR -> CI	1.278		

Table 3. Hypotheses testing.

Hypothesized Relationship	Mean (M)	Std. Deviation	T Statistics	P Values	Hypothesis Result
H1: PF ->SI	0.150	0.035	1.439	0.001***	Yes
H2: NQ -> SI	0.156	0.058	2.688	0.007**	Yes
H3: AIR -> SI	0.136	0.036	3.792	0.001***	Yes
H4: PF -> SP	0.197	0.035	2.787	0.003**	Yes
H5: NQ -> SP	0.104	0.052	2.104	0.044*	Yes
H6: SI -> SF	0.227	0.036	6.325	0.000***	Yes
H7: SP -> SF	0.343	0.035	9.740	0.000***	Yes
H8: SI -> TR	0.226	0.037	6.089	0.000***	Yes
H9: SP -> TR	0.321	0.036	8.964	0.000***	Yes
H10: SF -> CI	0.112	0.042	2.619	0.009**	Yes
H11: TR -> CI	0.125	0.042	2.986	0.003**	Yes

The relationship of sense of presence toward satisfaction (9.740) is higher than with trust (8.964). Similarly, the relationship of sense of immersion toward satisfaction (6.325) is higher than its relationship with trust (6.089).

Also, the relationship of trust with continuance intention (2.986) is higher than that of satisfaction with continuance intention (2.619).

We have tested the effects of control variables (age group and gender) on continuance intention. Among the control variables, gender does not have an impact. However, the age group significantly affects continuance intention. Especially, Generation Z ($\beta = 0.595$, t = 2.863) and Millennials ($\beta = 0.521$, t = 2.504) have more significant effects rather than Generation X ($\beta = 0.505$, t = 2.285) on continuance intention (as shown in Table 4).

Table 4. Control variables test analysis result.

Effect of Control Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Significance
Generation Z -> CI	0.595	0.601	0.208	2.863	0.002***	Significant
Millennial -> CI	0.521	0.525	0.208	2.504	0.006***	Significant
Generation X -> CI	0.505	0.512	0.221	2.285	0.011**	Significant

DISCUSSION

In this study, continuing the previous studies, our findings support the impact of perceived cognitive (Nazir et al., 2023; Kumar et al., 2023) and emotional factors (Payal et al., 2024) on continuance intention Online shopping benefits through AR are exposed in this study as an integral part of information system research. In the context of processing sensory information through multi-modal user-platform interactions with AR, this study confirms that the correlations among sense of immersion, sense of presence, satisfaction, and trust as consistent with the previous research findings (Wang et al., 2021; Payal et al., 2024). Satisfaction and trust were found to mediate the relationships among sense of immersion, sense of presence, and continuance intention.

This study contributes to the theoretical understanding of perceived user experience considering augmented reality by identifying and validating the cognitive and emotional factors and investigating their impacts on users' continuance intention. The findings confirm the significance of the relationships between cognitive and emotional engagements, extending the value of co-creation in perceiving user experience. Practically, this study guides developers and designers in optimizing AR to enhance user experiences. Marketers can leverage the study's findings to develop targeted marketing strategies that appeal to different demographic segments, particularly Generation Z and Millennials. Emphasizing trust-building initiatives and leveraging satisfaction can shape users' perceptions and foster continued usage.

CONCLUSION

The user experience is a key consideration for IS researchers to retain users toward the sustainable growth of AR mobile platforms in the e-commerce

industry. User-platform interactions give users more value in AR and support them in changing their cognitive and emotional engagements. Consequently, these perceived values make users more satisfied and trusted in influencing continuance intention. This study empirically investigated the effects of different interactions-based stimuli cues on user experience that influence continuance intention. Also, we have identified the mediation effects of trust and satisfaction on the relationship between the perceived sense of immersion sense of presence, and continuance intention. As a sustainable growth in the retail industry, interactions in augmented reality engage in immersive and interactive experiences, and this study confirms the significance of examining the consequences of user-platform interactions in AR and its effects on continuance intention.

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