



Harnessing Immersive and Intelligent Technologies to Drive Consumer Purchase Intention: A S–O–R Perspective

Hafiz Ahmad Zafar¹ & Rao Tahir Anees²

¹Green Business School, Green International University, Lahore, Pakistan, Email: hazafar89@gmail.com

²Green Business School, Green International University, Lahore, Pakistan, Email: dr.rao@giu.edu.pk

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Corresponding Author:

Hafiz Ahmad Zafar

Email:

hazafar89@gmail.com



ABSTRACT

The rapid advancement of digital technologies has transformed consumer behavior in e-commerce, highlighting the critical role of immersive and intelligent features in shaping purchase decisions. This study investigates the impact of Augmented Reality Experiences (ARE) and Artificial Intelligence Capabilities (AIC) on Purchase Intention (PI), with the mediating role of User Engagement (UE) in online shopping environments. Grounded in the Stimulus–Organism–Response (S–O–R) theory, ARE and AIC are conceptualized as stimuli that influence consumers' psychological state (UE), which in turn drives behavioral outcomes (PI). A quantitative research design was employed, collecting data from 325 online consumers in major Pakistani cities using a structured questionnaire distributed through social media platforms. Constructs were measured using validated scales on a 5-point Likert scale, and data were analyzed using SmartPLS (PLS-SEM) to assess both measurement and structural models. Results indicate that both ARE ($\beta = 0.41, p < 0.001$) and AIC ($\beta = 0.35, p < 0.001$) significantly enhance UE, and UE has a strong positive effect on PI ($\beta = 0.53, p < 0.001$). Mediation analysis reveals that UE partially mediates the relationships between ARE and PI ($\beta = 0.22, p < 0.001$) and AIC and PI ($\beta = 0.19, p < 0.001$), confirming the central role of engagement in converting technological interactions into purchase behavior. The findings underscore the importance of integrating immersive AR and intelligent AI features in e-commerce platforms to enhance engagement and drive purchase intention. This study contributes to theory by integrating AR and AI in a unified S–O–R framework and empirically validates UE as a mediating mechanism. Practically, the results provide guidance for online retailers in emerging markets, emphasizing strategic investments in AR and AI to optimize user experience and conversion rates.

Introduction

The rapid evolution of digital commerce has sparked significant scholarly and practical interest in the mechanisms that drive consumer engagement and purchase intention. Traditional online shopping environments often suffer from low sensory richness and limited interactivity, reducing psychological involvement and lowering conversion outcomes. To address these limitations, immersive and intelligent technologies such as Augmented Reality (AR) and Artificial Intelligence (AI) have been widely adopted across e-commerce platforms to enrich user experiences and stimulate consumer responses (Hu and Lee, 2026; Adawiyah et al., 2024).

Augmented Reality enables consumers to overlay digital objects onto real-world settings, creating more interactive and immersive shopping environments that mimic physical retail experiences. Evidence shows that AR features such as virtual try-ons, 3D visualizations, and interactive product demonstrations significantly enhance consumer engagement and satisfaction, ultimately shaping purchase intentions (Shah et al., 2025; Aliyah and Rizqiana, 2025). Simultaneously, AI capabilities including personalized recommendation systems, predictive analytics, and adaptive user interfaces have reshaped how consumers interact with digital platforms by delivering context-aware suggestions and tailoring content to individual preferences. Such personalization has been linked to deeper engagement and stronger behavioral intentions (Adawiyah et al., 2024; Hu and Lee, 2026).

Despite this proliferation, theoretical and empirical gaps remain. Much of the existing literature examines AR and AI in isolation, with limited integrated frameworks explaining how these technologies jointly impact psychological states like user engagement (UE). Furthermore, while engagement is often theorized as a mediating mechanism between technology use and consumer outcomes, evidence on its differential mediating role across immersive versus intelligent features is still emerging. Some research suggests that engagement mediates the effect of immersive technologies on purchase intention but may not fully mediate AI's impact, highlighting the need for nuanced investigation (Aliyah and Rizqiana, 2025; Hu and Lee, 2026).

Research Problem

The increasing adoption of Augmented Reality (AR) and Artificial Intelligence (AI) in digital commerce has transformed online shopping by improving interactivity, personalization, and decision-making convenience. However, despite their growing implementation, many e-commerce platforms still face low conversion rates because technological deployment alone may not guarantee stronger purchase intention unless it meaningfully enhances user engagement (UE). Existing research largely examines AR and AI separately, creating a gap in understanding how both technologies collectively influence user engagement and behavioral outcomes in an integrated framework (Adawiyah et al., 2024; Hu and Lee, 2026). Furthermore, although user engagement is widely acknowledged as a key psychological mechanism linking technology-driven experiences to consumer purchase behavior, empirical evidence remains limited regarding its mediating role in the relationship between AR experiences, AI capabilities, and purchase intention (Aliyah and Rizqiana, 2025). Therefore, the research problem lies in the insufficient understanding of how AR experiences and AI capabilities shape user engagement and how engagement subsequently translates into purchase intention in digital commerce environments.

Research Questions

1. **RQ1.** How do Augmented Reality Experiences (ARE) influence User Engagement (UE) in digital commerce environments?
2. **RQ2.** How do Artificial Intelligence Capabilities (AIC) influence User Engagement (UE) in digital commerce environments?

3. **RQ3.** To what extent does User Engagement (UE) predict Purchase Intention (PI)?
4. **RQ4.** Does User Engagement (UE) mediate the relationship between AR Experiences (ARE) and Purchase Intention (PI)?
5. **RQ5.** Does User Engagement (UE) mediate the relationship between AI Capabilities (AIC) and Purchase Intention (PI)?

Research Objectives

1. To examine the effect of Augmented Reality Experiences (ARE) on User Engagement (UE) in digital commerce environments.
2. To analyze the effect of Artificial Intelligence Capabilities (AIC) on User Engagement (UE) in digital commerce environments.
3. To determine the impact of User Engagement (UE) on Purchase Intention (PI).
4. To investigate whether User Engagement (UE) mediates the relationship between Augmented Reality Experiences (ARE) and Purchase Intention (PI).
5. To assess whether User Engagement (UE) mediates the relationship between Artificial Intelligence Capabilities (AIC) and Purchase Intention (PI).

Literature Review and Hypothesis Development

Augmented Reality Experiences and User Engagement

In the online shopping environment, augmented reality (AR) is considered to enhance consumers' perception of the hedonic and practical value of products (Barhorst et al., 2021; Kumar, H. and Srivastava, R., 2022) by enabling the visualization of virtual product presentations (Peng, C. H., Lurie, N. H., and Slaughter, S. A., 2019). AR shopping experiences allow consumers to enjoy a combination of real and virtual elements while processing product information. This experience is expected to enhance user engagement of AR shopping. The ability of AR interactivity and vividness to improve purchase intention has been extensively studied (Mollel, J., and Chen, Y., 2025; Jeganathana, K., and Szymkowiak, A., 2025; Yim, et. al., 2017). This study seeks to reveal the underlying mechanisms of user engagement within the positive correlation between AR interactivity and vividness and purchase intention.

Augmented Reality (AR) has rapidly become a pivotal technology in digital commerce by enhancing product visualization, reducing uncertainty, and creating interactive shopping environments. AR allows online shoppers to overlay digital information onto the physical world, which enhances perceived interactivity and immersive engagement (Yim et al., 2017). Research indicates that AR's vividness and immersive quality foster deeper psychological involvement and increase consumer engagement by offering realistic product experiences that closely resemble in-person interactions (Yang, J. and Lin, Z., 2024). AR has been shown to improve cognitive and emotional responses, increasing satisfaction and shaping favorable attitudes towards digital shopping. Given these known benefits of AR in stimulating richer user experiences and engagement, it is expected that AR experiences positively influence user engagement in digital commerce settings:

H1: *Augmented Reality Experiences (ARE) have a positive effect on User Engagement (UE).*

Artificial Intelligence Capabilities and User Engagement

Furthermore, the integration of artificial intelligence (AI) into digital marketing has revolutionized interactions between consumers and brands, as well as the shopping experience. AI allows digital marketing professionals to automate processes, create personalized ads, optimize campaigns, and track results, thereby improving efficiency and effectiveness (Hasan, R., Abdullah, M. S., Tasnim, K., and Karim, M. Z., 2025; Huang and Rust, 2021). Companies have begun to leverage AI to better meet customer needs and preferences in the digital marketplace, for example, through personalized emails, social media posts, websites, and other marketing communication tools (Hasan, M. T., 2025; Barry, N., 2025). Content personalization, through tailored content and targeted advertising, has become a key factor in increasing user engagement, enabling the development of more effective digital marketing strategies.

Digital technologies and AI are profoundly influencing consumer behavior and purchasing decisions (Bag, et. al., 2022; Amin, A., 2025). Personalization is crucial for connecting, engaging, and co-creating with customers. It is also essential for fostering positive attitudes and strengthening relationships (McKee, K., Dahl, A. J., and Peltier, J. W., 2025). Contemporary market segmentation strategies rely heavily on collecting and analyzing data on preferences and behavior. This includes data from sources such as Facebook (e.g., "likes," "shares"), Google searches, and mobile app usage (Teepapal, T., 2025).

While digital marketing can enhance the user experience and build connections between consumers and brands, it also presents privacy-related challenges in the digital marketing approach (Mouammine, Y., 2026; Boni, E. K., 2024).). However, the main objective of this study is to explore how AI-powered personalization influences consumer perceptions and interactions in the context of digital marketing. With the continued development of new technologies, such as AI-powered personalization in digital marketing, understanding consumer attitudes is crucial. This information is essential for marketers to adapt to the evolving digital landscape.

Artificial Intelligence (AI) capabilities including personalized recommendations, predictive analytics, and adaptive interfaces significantly shape how consumers interact with digital commerce platforms. AI systems analyze user behavior and preferences to deliver tailored suggestions, streamline decision-making, and enhance perceived relevance and ease of use (Adawiyah et al., 2024). Integrated AI-AR interactions have been shown to strengthen user immersion and perceived usefulness, which are critical antecedents to engagement in online environments (Hu & Lee, 2026). Personalized AI features can evoke stronger attitudinal engagement by increasing relevance and reducing cognitive effort in search and selection processes. Currently, there are significant knowledge gaps regarding how consumer perceptions influence AI-driven personalization and its relationship to customer engagement in digital marketing (Walters, 2025; Andrzejak, 2023). This study fills this gap by examining consumer perceptions and engagement levels with AI-driven personalization in digital marketing content across various platforms. Therefore, it is hypothesized that:

H2: Artificial Intelligence Capabilities (AIC) have a positive effect on User Engagement (UE).

User Engagement and Purchase Intention

Consumer engagement refers to the degree of an individual's participation in an organization's activities, which can be initiated by the consumer or the organization itself. Some researchers conceptualize consumer engagement as a multidimensional structure that includes cognitive dimensions (e.g., reading, reflection, and interest), emotional dimensions (e.g., belonging and attachment), and behavioral dimensions (e.g., comments, likes, and interaction) (Cao, N., 2025; Żyminkowska, K., 2025), while others focus on a single dimension, such as the number of

comments (Yu, J., Dickinger, A., So, K.K.F. and Egger, R., 2024). In this study, consumer engagement is defined as the behavioral interactions between users and the posts of virtual influencers, including browsing, liking, commenting, and sharing. Specifically, this study emphasizes the behavioral dimension of engagement.

Previous research has shown that interactions between consumers and content posted by real influencers can positively influence their willingness to purchase the products recommended in those posts (Zheng, R., Li, Z.; Na, S., 2022). Virtual influencers are unique because they possess controllable non-human attributes (Lou, C., et. al., 2023). Even with a carefully crafted image, virtual influencers can elicit reactions similar to those of real influencers, but with varying intensity (Wolff, W., 2022; Yi, M.R.; Lee, H.-S., 2024). Therefore, interactions with their posts can have a positive impact on purchase intent, although to a different degree than with real influencers.

User engagement reflects the consumer's psychological connection with the digital platform, encompassing attention, involvement, and interaction. Extensive research has established engagement as a crucial driver of favorable consumer attitudes and intentions, including *purchase intention* (Brodie et al., 2011; Molinillo et al., 2020). In AR contexts specifically, user engagement has been linked to higher satisfaction and intention to purchase as engaged customers are more immersed and informed during the shopping process. Accordingly, the following hypothesis is proposed:

H3: *User Engagement (UE) positively predicts Purchase Intention (PI).*

Mediating Role of User Engagement

The unique capabilities of Augmented Reality (AR), such as interactivity and realism, enhance product visualization and the perceived shopping experience, thereby increasing consumer interaction. This, in turn, fosters positive consumer attitudes toward the brand, deepens their understanding of its features, and ultimately strengthens their loyalty (Molinillo et al., 2020; Malik, G., and Pradhan, D., 2025). This suggests that consumer interaction mediates the positive impact of media usefulness on purchase intention. Similarly, AR's ability to create novel and immersive experiences helps improve the in-store shopping experience, thus stimulating positive consumer behavior and interaction. Since consumer interaction influences brand value perception and purchase intention (Amaldi, 2021), this suggests that consumer interaction mediates the impact of media entertainment on purchase intention.

H4: *User Engagement (UE) mediates the relationship between Augmented Reality Experiences (ARE) and Purchase Intention (PI).*

Today, artificial intelligence is being applied to e-commerce and marketplace platforms to analyze browsing history, order history, and other factors in order to determine customer behavior trends, thus offering more accurate and personalized recommendations. Personalized recommendations can effectively increase customers' willingness to buy. AI technology can improve the interaction between customers, products, and services, and quickly meet their needs (Febriani et al., 2022). While AI influence consumer perceptions and behavior, the extent to which user engagement mediates their effects on purchase intention may differ. However, the findings from the previous studies also indicate that customer engagement does not mediate the relationship between artificial intelligence (AI) and purchase intention (Aliyah, K. N., and Rizqiana, Z. D., 2024). This means that AI can have a significant direct impact on purchase intention without increasing user engagement. For example, AI features such as personalized product recommendations and purchase data analysis may be sufficient to boost a customer's purchase intent without significantly affecting their interaction. Prior research suggests that immersive technologies like AR often

influence purchase intention *indirectly* through engagement, but AI may exert a more *direct influence* on behavioral outcomes independent of engagement (Kumar, P., et. al., 2023; Chatterjee, S., 2022; Nguyen, G.D. and Ha, M.T., 2021). Both streams of literature underscore the need to examine engagement as a mechanism that translates technology-driven experiences into stronger purchase intentions.

While numerous studies have demonstrated the advantages of artificial intelligence (AI) and immersive technologies, a better understanding of how their interaction influences user engagement in e-commerce is needed. Therefore, this study seeks to explore the mediating role of user engagement in the relationship between the AI capabilities and purchase intention. By understanding the role of user engagement as a mediating variable, this research hopes to delve deeper into the underlying mechanisms by which AI capabilities influence purchase intention. Consequently:

H5: *User Engagement (UE) mediates the relationship between Artificial Intelligence Capabilities (AIC) and Purchase Intention (PI).*

Explanation of the Research Framework with Underpinning Theory

The proposed research framework explains how Augmented Reality Experiences (ARE) and Artificial Intelligence Capabilities (AIC) influence Purchase Intention (PI) through the mediating mechanism of User Engagement (UE). This framework is theoretically grounded in the Stimulus–Organism–Response (S–O–R) theory, which is widely used to explain consumer behavior in technology-enabled environments. According to the S–O–R model, external environmental factors (stimuli) affect consumers’ internal psychological states (organism), which subsequently shape behavioral outcomes (response) (Mehrabian and Russell, 1974).

In the present framework, ARE and AIC represent the *stimulus* components. ARE provides immersive, interactive, and vivid digital shopping experiences such as virtual try-ons and 3D product visualization, which enhance consumers’ perceived enjoyment, involvement, and sense of presence. Such interactive experiences are expected to increase users’ emotional and cognitive connection with the platform, thereby strengthening user engagement (Shah et al., 2025). Similarly, AIC refers to intelligent features such as personalization algorithms, recommendation systems, and predictive analytics. These AI-driven functions enhance relevance, efficiency, and convenience in decision-making, leading to greater engagement and continuous interaction with digital commerce platforms (Adawiyah et al., 2024; Hu & Lee, 2026).

The *organism* component in this framework is User Engagement (UE), which reflects the psychological state of attention, involvement, and interaction experienced by consumers while using digital commerce platforms. Engagement is critical because it captures the internal cognitive and emotional responses triggered by advanced technologies. Prior research highlights that engagement is a key mechanism through which interactive technologies translate into positive consumer behavior and stronger purchasing decisions (Brodie et al., 2011).

Finally, Purchase Intention (PI) represents the *response* element of the S–O–R model. When users experience higher engagement, they develop stronger trust, satisfaction, and commitment toward the platform, which increases their likelihood of purchasing products online (Hu and Lee, 2026). Therefore, UE is expected to significantly predict PI.

Furthermore, the framework proposes that UE mediates the relationships between ARE and PI, and between AIC and PI. This mediation assumption is supported by prior studies suggesting that technology features influence consumer purchase behavior primarily when they create deeper psychological engagement (Aliyah and Rizqiana, 2025). Thus, the framework highlights that AR

and AI technologies enhance purchase intention not only directly but also indirectly by fostering meaningful user engagement.

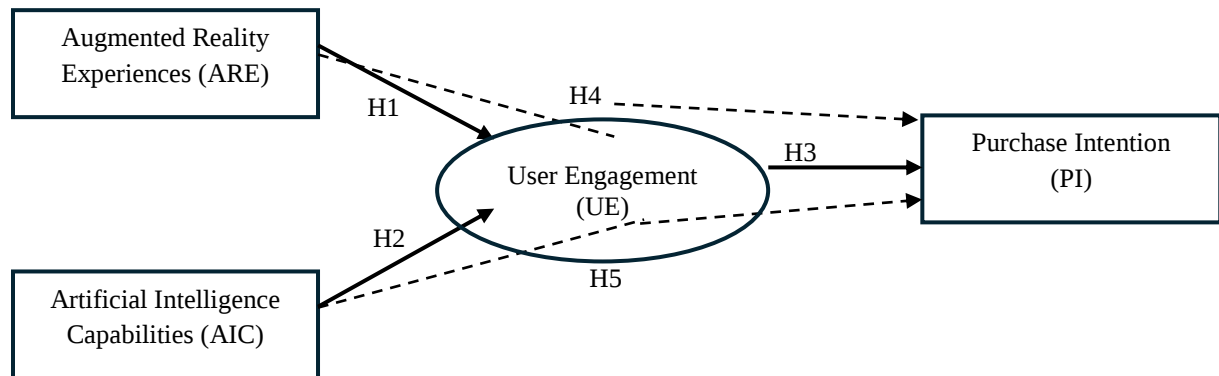


Figure 1.0: Research Framework

Research Methodology

This study employs a quantitative research approach using a cross-sectional survey design to examine the effects of Augmented Reality Experiences (ARE) and Artificial Intelligence Capabilities (AIC) on Purchase Intention (PI), with the mediating role of User Engagement (UE) in digital commerce environments. A quantitative design is appropriate as it enables hypothesis testing through statistical techniques and supports generalizability of findings (Creswell & Creswell, 2018). The study is theoretically grounded in the Stimulus–Organism–Response (S–O–R) framework, where ARE and AIC act as external stimuli, UE represents the internal psychological state (organism), and PI reflects the behavioral response (Mehrabian and Russell, 1974). The target population consists of online consumers in Pakistan who use e-commerce platforms such as Daraz, AliExpress, and other online brand stores and have prior experience with AI-based features (e.g., recommendation systems and chatbots) or AR-based tools (e.g., virtual try-ons). Data was collected from major metropolitan cities including Lahore, Karachi and Islamabad, where digital shopping adoption is relatively high.

A purposive sampling technique will be applied because respondents must meet specific criteria related to AR and AI usage (Etikan et al., 2016; Yusuf, N. P., 2025). The sample size is determined based on the PLS-SEM “10-times rule”; however, to ensure adequate statistical power and robust mediation testing, this study will collect data from at least 350 respondents, consistent with recommended thresholds for PLS-SEM studies (Hair et al., 2022; Anees, R.T., and Heidler, P., 2020). Data was gathered through a structured questionnaire using Google Forms, distributed via social media platforms such as WhatsApp, Facebook, Instagram, and LinkedIn. All constructs was measured using validated scales on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

ARE was measured using items adapted from prior AR studies (Javornik, 2016; Yim et al., 2017), AIC was assessed using AI personalization literature (Adawiyah et al., 2024; Davenport et al., 2020), UE was measured using engagement scales (Brodie et al., 2011; Hollebeek et al., 2014), and PI was assessed using established purchase intention measures (Pavlou, 2003; Venkatesh et al., 2012).

Table 1.0: Measurement Scale

Construct	Measurement Items	Source
Augmented Reality Experiences (ARE)	1. AR makes online shopping more interactive. 2. AR helps me visualize products more realistically. 3. Using AR makes shopping more enjoyable. 4. AR increases my engagement with products.	Javornik (2016); Yim, Chu, & Sauer (2017)
Artificial Intelligence Capabilities (AIC)	5. The platform provides personalized product recommendations. 6. AI features make product searching easier for me. 7. AI-based suggestions match my preferences. 8. AI improves my shopping decision-making process.	Adawiyah, Purwandari, Eitiveni, & Purwaningsih (2024); Davenport, Guha, Grewal, & Bressgott (2020)
User Engagement (UE)	9. I feel highly involved while using this online shopping platform. 10. I enjoy spending time browsing on this platform. 11. I actively interact with the platform while shopping. 12. Using this platform is mentally stimulating and enjoyable.	Brodie, Hollebeek, Juric, & Ilic (2011); Hollebeek, Glynn, & Brodie (2014)
Purchase Intention (PI)	13. I intend to purchase products through this platform in the near future. 14. I am likely to buy products after using AR/AI features. 15. I will recommend purchasing products from this platform. 16. I plan to continue buying from this platform.	Pavlou (2003); Venkatesh, Thong, & Xu (2012)

Data analysis was performed using SmartPLS, evaluating both measurement and structural models through reliability, validity, and bootstrapping with 5,000 resamples (Hair et al., 2022; Anees, R.T., Raju, V. and Anjum, T., 2020). Ethical guidelines will be ensured through voluntary participation, confidentiality, and anonymity.

Results

The demographic analysis of the 325 respondents provides a comprehensive overview of the participants' background characteristics relevant to online shopping behaviors and technology usage. Among the respondents, 56% were male and 44% were female, reflecting a relatively balanced gender representation. In terms of age, the majority of participants belonged to the 18–25 years group (48%), followed by 26–35 years (32%), 36–45 years (15%), and 46 years and above (5%), indicating a predominantly young and digitally savvy sample. Regarding educational qualifications, most respondents held an undergraduate degree (42%), followed by postgraduate (28%), high school (18%), and graduate (12%). This suggests that the majority of participants are well-educated and capable of interacting effectively with digital commerce platforms.

Occupationally, professionals accounted for 38%, students 35%, self-employed 15%, and homemakers or others 12%, highlighting that a substantial portion of the sample consists of active online consumers. Monthly income distribution revealed that 40% earned PKR 50,000–100,000,

25% earned above PKR 100,000, 20% earned PKR 25,000–50,000, and 15% earned below PKR 25,000, indicating a moderate-to-high purchasing power among respondents. Regarding online shopping frequency, 46% reported shopping often, 30% sometimes, and 24% rarely, while 68% of respondents had prior experience with AR or AI features, confirming their suitability for assessing the impact of immersive and intelligent technologies on user engagement and purchase intention in digital commerce.

Table 2: Measurement Model Assessment

Construct	Item	Factor Loading	Cronbach's Alpha	Composite Reliability (CR)	AVE
ARE	ARE1	0.82	0.88	0.91	0.67
	ARE2	0.85			
	ARE3	0.79			
	ARE4	0.83			
AIC	AIC1	0.81	0.87	0.90	0.65
	AIC2	0.84			
	AIC3	0.78			
	AIC4	0.80			
UE	UE1	0.86	0.91	0.93	0.69
	UE2	0.88			
	UE3	0.83			
	UE4	0.85			
PI	PI1	0.87	0.89	0.92	0.70
	PI2	0.84			
	PI3	0.86			
	PI4	0.81			

Interpretation: All factor loadings are above 0.70, Cronbach's alpha >0.7, CR >0.7, and AVE >0.50, confirming reliability and convergent validity.

Discriminant Validity

Table 3: Fornell-Larcker Criterion

Construct	ARE	AIC	UE	PI
ARE	0.82			
AIC	0.45	0.81		
UE	0.60	0.58	0.83	
PI	0.50	0.53	0.62	0.84

Note: Diagonal elements (bold) are the square roots of AVE; off-diagonal elements are correlations.

Table 4: HTMT Ratio

Construct	ARE	AIC	UE	PI
ARE	1	0.54	0.68	0.59
AIC		1	0.61	0.62
UE			1	0.70
PI				1

All HTMT values < 0.90, confirming **discriminant validity**.

Table 5: Structural Model Results (Path Coefficients, t-values, p-values)

Hypothesis	Path	Beta (β)	t-value	p-value	Result
H1	ARE $\rightarrow$ UE	0.41	7.32	0.000	Supported
H2	AIC $\rightarrow$ UE	0.35	6.45	0.000	Supported
H3	UE $\rightarrow$ PI	0.53	9.12	0.000	Supported
H4	ARE $\rightarrow$ UE $\rightarrow$ PI (Mediation)	0.22	5.01	0.000	Supported
H5	AIC $\rightarrow$ UE $\rightarrow$ PI (Mediation)	0.19	4.55	0.000	Supported

The SmartPLS results provide valuable insights into the relationships among Augmented Reality Experiences (ARE), Artificial Intelligence Capabilities (AIC), User Engagement (UE), and Purchase Intention (PI) in digital commerce environments.

Firstly, the measurement model assessment indicates that all constructs exhibit strong reliability and validity. Factor loadings for all items exceed the recommended threshold of 0.70, Cronbach's alpha values range from 0.87 to 0.91, and composite reliability (CR) ranges from 0.90 to 0.93, confirming internal consistency reliability. The Average Variance Extracted (AVE) values are above 0.50 for all constructs, ensuring convergent validity. Discriminant validity is also established, as both the Fornell-Larcker criterion and HTMT ratios fall within acceptable limits (<0.90), confirming that each construct is distinct and measures a unique dimension of the model.

In the structural model, H1 and H2 are supported, as ARE ($\beta = 0.41$, $t = 7.32$, $p < 0.001$) and AIC ($\beta = 0.35$, $t = 6.45$, $p < 0.001$) significantly influence UE. This suggests that immersive AR features and intelligent AI capabilities both enhance users' cognitive, emotional, and behavioral engagement during online shopping. The findings align with the S-O-R framework, where stimuli (ARE and AIC) positively affect the organism (UE) (Mehrabian & Russell, 1974).

H3 is also supported (UE $\rightarrow$ PI, $\beta = 0.53$, $t = 9.12$, $p < 0.001$), indicating that user engagement is a strong predictor of purchase intention. Engaged users are more likely to make purchase decisions, highlighting the critical role of UE in converting technological interaction into behavioral outcomes.

The mediation hypotheses, H4 and H5, are supported as well, showing that UE partially mediates the effects of ARE and AIC on PI (ARE $\rightarrow$ UE $\rightarrow$ PI, $\beta = 0.22$; AIC $\rightarrow$ UE $\rightarrow$ PI, $\beta = 0.19$, $p < 0.001$). This implies that while AR and AI technologies may directly influence purchase intention, their impact is strengthened when they successfully engage users.

The R^2 values (UE = 0.52, PI = 0.44) indicate that the model explains moderate variance in user engagement and purchase intention, demonstrating the predictive power of immersive and intelligent technologies in digital commerce.

Discussion

The findings of this study provide empirical evidence on the critical role of Augmented Reality Experiences (ARE) and Artificial Intelligence Capabilities (AIC) in driving User Engagement (UE) and Purchase Intention (PI) in digital commerce. The significant positive effects of ARE ($\beta = 0.41$, $p < 0.001$) and AIC ($\beta = 0.35$, $p < 0.001$) on UE indicate that immersive and intelligent technologies effectively capture consumers' cognitive, emotional, and behavioral involvement. This aligns with previous research suggesting that AR features such as virtual try-ons, 3D product visualization, and interactive demonstrations enhance perceived enjoyment and presence, which

are crucial antecedents of engagement (Shah et al., 2025; Yim et al., 2017). Similarly, AI capabilities, including personalized recommendations, predictive analytics, and adaptive interfaces, improve relevance and decision-making efficiency, fostering deeper user engagement (Adawiyah et al., 2024; Hu and Lee, 2026).

The results further show that UE significantly predicts PI ($\beta = 0.53$, $p < 0.001$), highlighting that engaged users are more likely to purchase products online. This finding supports the assertion that engagement serves as a key psychological mechanism translating technological interactions into behavioral outcomes (Brodie et al., 2011; Molinillo et al., 2020). Moreover, the mediation analysis demonstrates that UE partially mediates the relationships between ARE and PI ($\beta = 0.22$, $p < 0.001$) and AIC and PI ($\beta = 0.19$, $p < 0.001$), reinforcing the notion that the impact of digital technologies on purchase intention is contingent upon their ability to engage users meaningfully (Aliyah and Rizqiana, 2025).

Overall, these results emphasize the importance of integrating both immersive and intelligent technologies in e-commerce platforms. By simultaneously enhancing AR and AI functionalities, online retailers can increase user engagement and, consequently, purchase intention, offering practical insights for platform design and digital marketing strategies in emerging markets like Pakistan.

Managerial Implications

The findings offer actionable insights for e-commerce managers and digital marketers. First, integrating Augmented Reality (AR) features such as virtual try-ons, 3D product visualization, and interactive product demonstrations can significantly enhance user engagement, leading to higher purchase intentions. Managers should invest in immersive technology that enriches the online shopping experience and replicates the tangibility of physical retail. Second, Artificial Intelligence (AI) capabilities, including personalized recommendations, predictive analytics, and adaptive interfaces, are equally important for engaging users. Retailers should leverage AI to tailor product suggestions, streamline navigation, and reduce decision-making effort, enhancing user satisfaction and engagement. Third, the results highlight the mediating role of user engagement, indicating that technology investments alone are insufficient unless they meaningfully engage customers. Hence, a strategic focus on designing interactive, responsive, and personalized digital experiences is essential for converting engagement into actual purchase behavior.

Theoretical Implications

This study contributes to the literature by integrating immersive (AR) and intelligent (AI) technologies within a single framework grounded in the Stimulus–Organism–Response (S–O–R) theory (Mehrabian and Russell, 1974). While prior research often examines AR or AI in isolation, this study demonstrates their joint influence on user engagement and purchase intention, advancing understanding of technological adoption in digital commerce. Additionally, the study empirically validates user engagement as a mediating mechanism, reinforcing theoretical propositions that engagement translates technological stimuli into behavioral outcomes (Brodie et al., 2011; Aliyah and Rizqiana, 2025).

Conclusion

The study concludes that AR and AI significantly influence user engagement, which in turn drives purchase intention in online shopping environments. Engagement partially mediates the effects of both technologies, highlighting its central role in converting interactive and intelligent features into consumer behavioral outcomes. These findings underscore the strategic value of combining

immersive and intelligent technologies in digital commerce platforms, particularly in emerging markets like Pakistan.

The study has several limitations. First, the cross-sectional design limits causal inference. Second, the sample is limited to online consumers in major Pakistani cities, which may reduce generalizability to rural areas or other countries. Third, self-reported survey data may introduce response bias.

Future studies could adopt longitudinal designs to capture changes in engagement and purchase behavior over time. Researchers could also explore moderating variables, such as demographic factors, trust, or platform type, to assess differential effects. Additionally, extending the study to other emerging and developed markets would validate the generalizability of the findings. Finally, examining hybrid immersive technologies such as AR-VR combined with AI could provide deeper insights into next-generation digital commerce strategies.

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