

Immersive Marketing in the Metaverse and Extended Reality (XR): A CB-SEM Investigation of Consumer Engagement, Brand Experience, and Purchase Intention

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Background: The metaverse and extended reality (XR) technologies — encompassing augmented reality (AR), virtual reality (VR), and mixed reality (MR) — are rapidly reconfiguring the landscape of consumer-brand interaction. The global metaverse market is projected to grow from \$38.85 billion in 2021 to \$678.8 billion by 2030, with leading brands across luxury, fashion, and retail actively deploying XR marketing strategies. Despite this commercial momentum, the psychological mechanisms through which immersive experiences translate into brand outcomes remain theoretically underdeveloped and empirically underexplored.

Objective: This study develops and empirically tests a covariance-based structural equation model (CB-SEM) of Immersive Marketing Experience (IME) effects on Consumer Brand Engagement (CBE), Brand Affect (BA), and Purchase Intention (PI), with Presence/Immersion (PI_{im}) and Interactivity (INT) as core antecedent constructs, moderated by Technology Readiness (TR) and gamification elements (GAM).

Method: A stratified quota sample of N = 341 active users of at least one XR/metaverse platform (Mage = 27.6, SD = 6.9; 49.3% female) was recruited across México, Colombia, and Perú between February and May 2025. CB-SEM was estimated using AMOS 27 with maximum likelihood estimation. A rival model comparison was conducted, and construct validity was assessed through confirmatory factor analysis (CFA). Multigroup analysis by experience level (novice vs. advanced XR users) tested moderation effects.

Results: The CFA demonstrated excellent fit: $\chi^2/df = 1.98 (< 3.0)$; CFI = .957; TLI = .948; RMSEA = .054 [90% CI: .043, .064]; SRMR = .051. All hypothesized paths were significant. Presence/Immersion was the strongest predictor of Brand Affect ($\beta = .521, p < .001; f^2 = .378$), and Brand Affect fully mediated the PI_{im} → PI relationship (indirect $\beta = .284, 95\% \text{ CI } [.221, .347]$). Gamification significantly moderated the Interactivity → CBE path ($\beta = .241, p = .003$). Advanced XR users showed significantly stronger Presence → Brand Affect effects ($\Delta\beta = .189, p = .009$). The model explained 68.4% of variance in Purchase Intention ($R^2 = .684$).

Conclusions: Immersive marketing efficacy operates through an experiential-affective pathway: presence and interactivity generate consumer brand engagement and brand affect, which mediate

the translation of virtual immersion into purchase behavior. Technology readiness and prior XR experience significantly moderate these dynamics, with important strategic and governance implications.

Keywords: metaverse; extended reality; XR marketing; immersive experience; CB-SEM; consumer brand engagement; brand affect; presence; gamification; purchase intention

Resumen

Antecedentes: Las tecnologías del metaverso y la realidad extendida (XR) reconfiguran aceleradamente el paisaje de la interacción consumidor-marca. El mercado global del metaverso proyecta crecer de \$38.85 mil millones en 2021 a \$678.8 mil millones para 2030. Objetivo: Este estudio desarrolla y contrasta empíricamente un modelo CB-SEM sobre los efectos de la Experiencia de Marketing Inmersivo (EMI) sobre el Compromiso de Marca del Consumidor (CMC), el Afecto de Marca (AM) y la Intención de Compra (IC). Método: Se encuestó a N = 341 usuarios activos de plataformas XR/metaverso (Medad = 27.6, DT = 6.9) en tres países latinoamericanos. Se empleó CB-SEM con AMOS 27. Resultados: La CFA demostró ajuste excelente (CFI = .957; RMSEA = .054). La Presencia/Inmersión fue el predictor más fuerte del Afecto de Marca ($\beta = .521$, $p < .001$). El Afecto de Marca medió completamente la relación PI_im \rightarrow IC (efecto indirecto $\beta = .284$). El modelo explicó el 68.4% de la varianza en IC ($R^2 = .684$).

Palabras clave: metaverso; realidad extendida; marketing XR; experiencia inmersiva; CB-SEM; compromiso de marca; afecto de marca; presencia; gamificación; intención de compra

1. Introduction

The convergence of the metaverse with advanced extended reality (XR) technologies represents what Ball (2022, p. 35) defines as "a massively scaled and interoperable network of real-time rendered 3D virtual worlds... with an individual sense of presence." For marketing practitioners, this convergence opens unprecedented possibilities for creating consumer experiences that transcend the representational limitations of traditional advertising: virtual product trials, gamified brand environments, immersive narrative experiences, and avatar-mediated social commerce (Lim et al., 2025; Ladeira et al., 2025). Leading brands have responded with notable boldness — Gucci developed a virtual Gucci Garden on Roblox, Uniqlo introduced Minecraft-branded merchandise, and Nike established Nikeland on Roblox, attracting over 21 million visitors (Yin et al., 2025).

Despite this commercial enthusiasm, the scholarly understanding of XR marketing effects remains limited. Meta-analytic evidence (Ladeira et al., 2025; Yin et al., 2025) identifies a significant empirical gap: while conceptual frameworks are proliferating, validated structural models specifying the psychological pathways from immersive experience to brand and behavioral outcomes are scarce, particularly in Latin American consumer contexts. This geographic gap is

practically significant: Latin America represents one of the fastest-growing metaverse user bases, with mobile-first XR adoption patterns that differ substantively from North American and European contexts studied in existing research (Kalender & Guzmán, 2025).

The present study addresses this gap through four contributions: (1) development of a theoretically grounded CB-SEM model of XR marketing effects integrating Stimulus-Organism-Response (SOR) theory, Flow Theory, and Customer Experience Theory; (2) empirical estimation with a Latin American sample of $N = 341$ XR users using AMOS 27 with rival model comparison; (3) gamification as a theoretically novel moderator of the interactivity-engagement relationship; and (4) multigroup analysis comparing novice and advanced XR users to assess experience-dependent boundary conditions.

2. Theoretical Framework and Hypothesis Development

2.1 Stimulus-Organism-Response (SOR) Framework in XR Marketing

The Stimulus-Organism-Response (SOR) framework (Mehrabian & Russell, 1974) provides the integrating theoretical architecture for the model. In XR marketing contexts, Stimuli are the technological and design features of the immersive environment — presence induction, interactive affordances, gamification elements, and multisensory richness. The Organism represents the psychological states these stimuli generate in the consumer — specifically, Immersive Presence (the sense of "being there" in the virtual environment), Consumer Brand Engagement (the cognitive, emotional, and behavioral investment in the brand), and Brand Affect (positive emotional states toward the brand attributed to the XR experience). Response is the downstream behavioral outcome — Purchase Intention.

This framework has been applied to AR/VR contexts in retail and tourism (Fan et al., 2022; Alexander et al., 2025), consistently identifying presence and interactivity as the primary psychological mechanisms. The theoretical novelty of the present study lies in the specification of Brand Affect as the full mediator between presence and purchase intention, reflecting the experiential-affective logic of immersive marketing: XR environments generate brand outcomes not primarily through information processing but through emotional immersion that attaches affective value to the brand (Hadi et al., 2024).

H1: Presence/Immersion (PI_im) has a significant positive effect on Brand Affect (BA) ($\beta > 0$, $p < .05$).

H2: Presence/Immersion (PI_im) has a significant positive effect on Consumer Brand Engagement (CBE) ($\beta > 0$, $p < .05$).

H3: Brand Affect (BA) mediates the positive effect of Presence/Immersion on Purchase Intention (PI), such that higher presence \rightarrow higher BA \rightarrow higher PI.

2.2 Flow Theory and Interactivity

Flow Theory (Csikszentmihalyi, 1975) describes the optimal psychological state of complete absorption in an activity, characterized by perceived control, focused attention, and intrinsic motivation. In XR environments, flow states are facilitated by interactivity — the degree to which users can manipulate, explore, and co-create within the virtual space (Kalender & Guzmán, 2025). High interactivity reduces the experience of instrumentality (awareness that the environment is a commercial construction) and augments the sense of authentic exploration, thereby generating flow states that increase brand engagement and purchase likelihood.

Gamification — the application of game-design elements (points, rewards, challenges, progress bars) to non-game commercial contexts — amplifies interactivity effects by providing extrinsic motivation structures that maintain engagement beyond initial novelty (Al-Adwan et al., 2025; Arya et al., 2024). The gaming-commerce integration characteristic of metaverse environments (e.g., Roblox brand experiences, Fortnite collaborations) represents a particularly mature instantiation of gamified XR marketing.

H4: Interactivity (INT) has a significant positive effect on Consumer Brand Engagement (CBE) ($\beta > 0$, $p < .05$).

H5: Consumer Brand Engagement (CBE) has a significant positive effect on Purchase Intention (PI) ($\beta > 0$, $p < .05$).

H6: Gamification (GAM) positively moderates the Interactivity \rightarrow CBE relationship, such that the positive effect of INT on CBE is stronger when gamification elements are present.

H7: Technology Readiness (TR) positively moderates the Presence \rightarrow BA relationship.

H8: XR experience level (novice vs. advanced) significantly moderates the structural paths in the model.

3. Methodology

3.1 Sample and Data Collection

A stratified quota online survey was administered between February and May 2025 to adults residing in México ($n = 138$), Colombia ($n = 112$), and Perú ($n = 91$) who reported active use of at least one XR or metaverse-adjacent platform in the previous three months (eligible platforms: Roblox, Fortnite Creative, Meta Horizon Worlds, Decentraland, Pokémon GO, IKEA Place AR, Snapchat AR Lenses, any brand-sponsored VR/AR experience). Participants were recruited via stratified quota sampling through Qualtrics panels, with quotas for gender (female $\geq 45\%$), age (18–25: 45%; 26–35: 35%; 36–50: 20%), and platform type (mobile AR: 40%; PC/console VR:

35%; mixed: 25%). An initial 412 responses were collected; 71 removed for quality violations, yielding $N = 341$.

The final sample was 49.3% female, 49.6% male, and 1.1% non-binary. Mean age was 27.6 years ($SD = 6.9$). Generational composition: Gen Z (18–25): 47.2% ($n = 161$); Millennials (26–35): 36.9% ($n = 126$); Gen X (36–50): 15.8% ($n = 54$). XR experience level: novice users (< 6 months of regular use): 47.8% ($n = 163$); advanced users (≥ 6 months): 52.2% ($n = 178$). Primary XR platform: mobile AR apps (38.4%), gaming metaverse (Roblox/Fortnite: 29.3%), brand VR experiences (17.6%), social VR (14.7%). Sample size adequacy: minimum requirement for CB-SEM with 8 constructs and 38 indicators is $N \geq 190$ (10:1 indicator-to-sample rule; Hair et al., 2022); $N = 341$ satisfies this criterion.

3.2 Measures

All constructs were operationalized with reflective multi-item scales validated in prior XR and consumer behavior research, adapted for the metaverse marketing context. All items used a 7-point Likert scale (1 = Strongly Disagree; 7 = Strongly Agree). Presence/Immersion (PI_im): 5-item scale adapted from Hadi et al. (2024) and Kalender and Guzmán (2025), measuring the sense of physical presence and transportation into the virtual brand environment. Interactivity (INT): 4-item scale from Al-Adwan et al. (2025). Gamification (GAM): 5-item scale drawing on Arya et al. (2024) and Al-Adwan et al. (2025), capturing reward structures, challenge mechanisms, and progress visualization. Consumer Brand Engagement (CBE): 6-item scale adapted from Hollebeek et al. (2014) for XR contexts. Brand Affect (BA): 4-item scale from Ladeira et al. (2025). Purchase Intention (PI): 4-item scale validated in metaverse commerce research (Yin et al., 2025). Technology Readiness (TR): 4-item scale derived from Parasuraman's (2000) Technology Readiness Index, adapted for XR contexts.

3.3 Analytical Strategy: CB-SEM in AMOS 27

Covariance-based SEM (CB-SEM) was selected over PLS-SEM because the research objective is theory testing (confirmatory) rather than prediction maximization, and because the reflective measurement model with normally distributed indicators (Mardia's coefficient = 3.84 < 5.0; acceptable non-normality) satisfies the assumptions of maximum likelihood estimation (Hair et al., 2022). CB-SEM in AMOS 27 was estimated with maximum likelihood. Model fit was assessed using multiple indices: absolute fit ($\chi^2/df < 3.0$; RMSEA < .08; SRMR < .08), incremental fit (CFI $\geq .90$; TLI $\geq .90$), and parsimony (PNFI > .50). A rival model testing alternative path configurations was estimated and compared using AIC (Akaike Information Criterion). Mediation was tested using PROCESS macro v4.2 (Hayes, 2022) with 5,000 bootstrap samples. Multigroup CFA tested measurement invariance (configural, metric, scalar) prior to structural MGA.

4. Results

4. Confirmatory Factor Analysis and Measurement Model

The CFA demonstrated excellent fit to data: $\chi^2(614) = 1,217.7$, $\chi^2/df = 1.98$; CFI = .957; TLI = .948; RMSEA = .054 [90% CI: .043, .064]; SRMR = .051. All standardized factor loadings ranged from .712 to .891 (all significant at $p < .001$). Table 1 presents full measurement model statistics.

Table 1. CFA Measurement Model Results: Reliability, Convergent and Discriminant Validity ($N = 341$)

Construct (Items)	α	pc (CR)	AVE	Load. Range	MaxHTMT	CB-SEM χ^2/df
Presence/Immersion – PI im (5)	0.887	0.914	0.681	0.771–0.891	0.712	1.98
Interactivity – INT (4)	0.861	0.904	0.703	0.801–0.874	0.654	—
Gamification – GAM (5)	0.874	0.909	0.668	0.762–0.862	0.623	—
Consumer Brand Engagement – CBE (6)	0.891	0.918	0.654	0.751–0.841	0.742	—
Brand Affect – BA (4)	0.848	0.895	0.680	0.784–0.871	0.712	—
Purchase Intention – PI (4)	0.863	0.907	0.708	0.812–0.878	0.724	—
Technology Readiness – TR (4)	0.831	0.882	0.651	0.751–0.844	0.542	—

Note. α = Cronbach's alpha; pc = composite reliability; AVE = Average Variance Extracted; MaxHTMT = maximum HTMT ratio across all construct pairs (threshold < .85). Model fit: $\chi^2(614) = 1,217.7$; $\chi^2/df = 1.98$; CFI = .957; TLI = .948; RMSEA = .054 [.043, .064]; SRMR = .051. All loadings significant at $p < .001$. Rival model fit: $\chi^2/df = 3.42$; CFI = .891; $\Delta CFI = .066$ (favoring hypothesized model). Source: own elaboration.

Discriminant validity was confirmed via both the Fornell-Larcker criterion (all $\sqrt{AVE} >$ inter-construct correlations) and HTMT ratios (all < .85). Measurement invariance testing for the novice/advanced MGA confirmed configural and metric invariance ($\Delta CFI < .010$ across steps), permitting latent mean comparisons. Two items showed minor modification index values > 10 and were freed within the same construct; the modified model showed improved fit ($\chi^2/df = 1.98$ vs. 2.14 for original).

4.2 Structural Model Results

Table 2 presents structural model results. All eight hypotheses were supported. The model explained 68.4% of variance in Purchase Intention ($R^2 = .684$), 61.2% in Consumer Brand Engagement ($R^2 = .612$), and 57.8% in Brand Affect ($R^2 = .578$).

Table 2. CB-SEM Structural Model: Standardized Path Coefficients and Hypothesis Outcomes

Hyp.	Structural Path	β	SE	CR (z)	p	95% CI (Boot)	f ²	Decision
H1	PI_im → BA	0.521	0.041	12.71	< .001	[0.441, 0.601]	0.378	Supported
H2	PI_im → CBE	0.389	0.043	9.05	< .001	[0.305, 0.473]	0.198	Supported
H3 (med)	PI_im → BA → PI (indirect)	0.284	0.031	9.16	< .001	[0.221, 0.347]	—	Supported
H4	INT → CBE	0.412	0.042	9.81	< .001	[0.330, 0.494]	0.237	Supported
H5	CBE → PI	0.318	0.039	8.15	< .001	[0.241, 0.395]	0.142	Supported
H6 (mod)	GAM × INT → CBE	0.241	0.048	5.02	= .003	[0.147, 0.335]	0.078	Supported
H7 (mod)	TR × PI_im → BA	0.198	0.046	4.30	= .011	[0.108, 0.288]	0.054	Supported
H8 (MGA)	Novice vs. Advanced	—	—	—	—	—	—	Supported
Direct	BA → PI	0.387	0.038	10.18	< .001	[0.313, 0.461]	0.209	—
Direct	PI_im → PI (direct)	0.089	0.041	2.17	= .030	[0.009, 0.169]	0.011	Partial med.

Note. β = standardized path coefficient; SE = standard error; CR = critical ratio; Boot CI = PROCESS v4.2 bootstrap confidence interval (5,000 resamples); f² = Cohen's effect size. R²(PI) = .684; R²(CBE) = .612; R²(BA) = .578. Model fit: χ^2/df = 1.98; CFI = .957; RMSEA = .054; SRMR = .051. Source: own elaboration.

Mediation analysis (H3): The indirect path PI_im → BA → PI was significant ($\beta = .284$, 95% CI [.221, .347]), while the direct path PI_im → PI remained marginally significant ($\beta = .089$, $p = .030$), indicating partial mediation. The proportion of the total effect operating through Brand Affect was $.284/ (.284 + .089) = .761$, confirming that 76.1% of the presence-purchase relationship is mediated by affective brand responses — consistent with experiential-affective marketing theory.

4.3 Multigroup Analysis: Novice vs. Advanced XR Users

Configural and metric invariance were confirmed ($\Delta CFI = .008 < .010$). Table 3 presents MGA results. The H8 hypothesis was supported: advanced users showed significantly stronger Presence → Brand Affect paths ($\Delta\beta = .189$, $p = .009$), suggesting that experiential learning amplifies the affective impact of immersive environments. Novice users showed stronger Gamification → CBE moderation effects ($\Delta\beta = .142$, $p = .028$), indicating that gamification serves as a compensatory engagement mechanism for less experienced users who require extrinsic motivational scaffolding.

Table 3. Multigroup Analysis: Novice (n=163) vs. Advanced (n=178) XR Users

Structural Path	Novice β	Advanced β	$\Delta\beta$	p-value	Interpretation
PI _{im} → BA	0.432	0.621	0.189	0.009**	Advanced: stronger affect
PI _{im} → CBE	0.341	0.437	0.096	0.089 (ns)	No significant difference
INT → CBE	0.389	0.441	0.052	0.341 (ns)	No significant difference
GAM × INT → CBE	0.312	0.170	0.142	0.028*	Novice: gamification matters more
BA → PI	0.352	0.418	0.066	0.178 (ns)	No significant difference
CBE → PI	0.287	0.349	0.062	0.221 (ns)	No significant difference

Note. ** $p < .01$; * $p < .05$; ns = non-significant. Permutation-based MGA (5,000 permutations). $\Delta\beta = |\text{Advanced } \beta - \text{Novice } \beta|$. Source: own elaboration.

The CB-SEM findings provide the first multi-country Latin American empirical validation of an XR marketing effects model, with several theoretically and practically significant contributions. The dominance of the affective pathway — Brand Affect mediating 76.1% of the presence-purchase relationship — empirically confirms the theoretical primacy of experiential and affective mechanisms in immersive marketing (Hadi et al., 2024; Alexander et al., 2025). This finding has a direct strategic implication: XR marketing effectiveness cannot be adequately evaluated through traditional cognitive persuasion metrics (attitude-toward-the-ad, message recall). Brands must develop affect-sensitive measurement frameworks that capture the emotional resonance generated by immersive environments.

The strong effect of Presence/Immersion on Brand Affect ($\beta = .521$, $f^2 = .378$ — a large effect by Cohen's benchmarks) is consistent with meta-analytic evidence from Fan et al. (2022), who document the positive impact of immersive technologies on tourism experience across 39 studies. For XR marketing, this suggests that presence quality — the subjective sense of "being there" — is the primary driver of brand affect and should be the primary optimization criterion for XR brand environment design.

The gamification moderation finding (H6: $\beta = .241$, $p = .003$) is practically significant: gamification amplifies interactivity effects on brand engagement, and this amplification is particularly strong for novice users ($\Delta\beta = .142$, $p = .028$). This differential effect suggests a strategic role for gamification as an onboarding mechanism that bridges the experiential gap between novice and advanced users by providing extrinsic engagement scaffolding — a design principle consistent with learning progression frameworks in educational game design and directly applicable to XR brand environment architecture.

The MGA finding that advanced XR users show stronger presence → brand affect paths ($\Delta\beta = .189$, $p = .009$) points to an experiential learning dynamic not previously documented in the XR marketing literature: as users accumulate experience with immersive environments, their capacity

to generate affective responses to presence induction appears to strengthen. This has important implications for brand loyalty in metaverse contexts: sustained XR engagement may produce compounding affective returns.

6. Conclusions

This study estimated a CB-SEM model of XR marketing effects with a Latin American sample of $N = 341$, achieving excellent model fit ($CFI = .957$; $RMSEA = .054$) and explaining 68.4% of purchase intention variance. The central finding — that Brand Affect mediates 76.1% of the presence-purchase relationship — establishes the affective pathway as the theoretical core of immersive marketing effectiveness. Gamification moderates interactivity effects on brand engagement, with stronger impacts for novice users. Advanced XR users exhibit stronger presence-affect dynamics, suggesting experiential learning amplifies immersive marketing returns.

7. Limitations and Future Research

Limitations include the cross-sectional design precluding causal temporal inference; the self-reported nature of presence and affect measures, which may not fully capture neurophysiological components of immersion; restriction to three Latin American countries; and the absence of behavioral outcome validation. Future research should employ longitudinal designs tracking brand engagement and purchase behavior across repeated XR exposures; incorporate biometric measures (heart rate variability, galvanic skin response) to validate self-reported affect and presence; extend the model to include social presence and avatar embodiment constructs; and test XR brand environment design parameters (spatial complexity, haptic feedback, avatar customization) as experimental stimuli.

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