

Technology Trust in Digital Human Live Streaming and Users' Continuance Watching Intention in Cross-border E-commerce: The Roles of Cross-border Risk Perception, Risk Mitigation, and Flow Experience

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Abstract:

With the maturation of generative AI and digital-human technologies, cross-border livestreaming e-commerce is evolving from a human-host-driven model toward human-machine collaboration and virtual-host-driven operations. In cross-border transactions, information asymmetry, compliance uncertainty, and fulfillment complexity may heighten perceived risk and weaken user retention. Focusing on the emerging context of digital human livestreaming in cross-border e-commerce, this study develops an integrated S-O-R-based model to examine how technology trust influences users' continuance watching intention, and how cross-border risk perception and platform risk mitigation shape this relationship, with flow experience as a mediating mechanism. Using survey data from 285 viewers and structural equation modeling, the results show that technology trust has a significant positive effect on continuance watching intention; cross-border risk perception negatively moderates the trust-intention link, whereas risk mitigation positively moderates it; and flow experience partially mediates the effect of technology trust on continuance watching intention. These findings highlight that, in cross-border digital-human livestreaming, trust must be complemented by risk governance and experience design to form a sustainable "trust-experience-retention" cycle.

Keywords:

Digital Human Livestreaming, Technology Trust, Cross-Border Risk Perception, Risk Mitigation, Flow Experience, Continuance Watching Intention, Structural Equation Modeling

1. Introduction

Livestreaming commerce connects content consumption, real-time interaction, and instant purchasing, and has become a major lever for platforms to acquire new users and improve conversion. [1] Alongside advances in AIGC, speech synthesis, real-time rendering, and conversational agents, "digital humans" (virtual streamers) can

increasingly replace or complement human hosts to deliver scalable, standardized, and always-on shopping assistance.[2] However, digital-human livestreaming also raises new trust challenges: the absence of a real human source, potential identity ambiguity, and unstable interaction quality may weaken perceived credibility, and an excessive degree of anthropomorphism may even trigger the uncanny-valley effect.[3]

These issues are amplified in cross-border settings. Cross-border transactions involve heterogeneous regulatory and data-compliance requirements, longer logistics lead times, more complex after-sales processes, and additional uncertainty in payment and exchange-rate settlement.[4] As a result, users' cross-border risk perception may suppress engagement and reduce continuance behaviors.[5] At the same time, platform-level safeguards—such as transparent rules, traceable logistics, reliable payment protection, and third-party endorsements—can mitigate uncertainty and help convert trust into sustained viewing.[6]

Despite the rapid diffusion of virtual streamers, existing research largely focuses on human hosts or general livestreaming contexts, leaving the continuance mechanism in cross-border digital-human livestreaming underexplored. In particular, the boundary conditions under which technology trust translates into continuance watching intention, and the experience-based pathways through which trust works, remain insufficiently understood.[7] To address these gaps, this study integrates trust, risk, and experience into a single structural model and empirically tests it using survey data and structural equation modeling.[8]

1.1. Research Significance

Theoretically, cross-border digital-human livestreaming combines the high uncertainty of cross-border commerce with the substitution of human interaction by AI-mediated interfaces.[7] This setting provides a timely context to examine how trust, perceived risk, and immersive experience jointly shape continuance behavior within the S–O–R framework.[9]

Practically, platforms face challenges regarding compliant disclosure of virtual identities, privacy protection, and cross-border fulfillment governance.[5] By identifying key determinants of continuance watching intention from the user perspective, this study offers actionable insights for platform governance and experience design.[6]

2. Literature Review and Theoretical Background

2.1 Interaction Cues and Perceived Credibility in Digital Human Livestreaming

Digital-human livestreaming uses virtual avatars to deliver interactive content through speech synthesis, motion capture, facial-expression driving, and dialogue generation.[10] Compared with human hosts, digital humans can provide stable output and scalable deployment, but they may also reduce social presence cues and raise doubts about authenticity.[3] Prior livestreaming studies show that interactivity and vividness can enhance perceived enjoyment and engagement, yet credibility remains central to sustained attention.[11]

Moreover, the design of avatar realism is a double-edged sword. While a more human-like appearance may increase warmth and perceived competence, excessive anthropomorphism combined with subtle imperfections can create discomfort—consistent with the uncanny valley.[1] Therefore, platforms should balance

anthropomorphic design with transparency and interaction stability to facilitate trust formation.[12]

2.2. Technology Trust and Continuance Watching Intention

Technology trust refers to users' overall belief that a system is capable, reliable, secure, and predictable.[13] In livestreaming commerce, trust influences not only immediate purchasing but also whether users are willing to keep watching and revisit the stream.[14] From the technology-acceptance perspective, perceptions of usefulness and ease of use shape behavioral intention, and trust can strengthen the perceived reliability of the technology-enabled service.[5]

From the information-systems continuance perspective, continuance intention is driven by post-adoption evaluations and the expectation of reliable performance over time.[8] In digital-human livestreaming, viewers continuously assess whether the virtual host provides consistent information quality and interaction responsiveness; thus, technology trust is expected to promote continuance watching intention.[6]

2.3. Cross-border Risk Perception and Risk Mitigation

Perceived risk theory emphasizes individuals' subjective evaluation of potential losses. Cross-border e-commerce introduces multiple risk dimensions, including financial risk (payment security, exchange-rate fluctuations, refund uncertainty), privacy and compliance risk (data transfer and platform governance), and performance risk (delivery delays, after-sales disputes, product mismatch).[4] Higher cross-border risk perception can reduce engagement and weaken the conversion of trust into continuance behaviors.[5]

Correspondingly, risk mitigation reflects the platform's governance and assurance capability, such as transparent policies, reliable after-sales commitments, third-party certifications, traceable logistics, and dispute-resolution mechanisms.[6] Risk mitigation can reduce uncertainty, enhance perceived controllability, and thereby strengthen the trust-behavior link in cross-border livestreaming.[10]

2.4. Flow Experience

Flow experience describes a state of deep immersion, intense concentration, and intrinsic enjoyment during an activity.[9] Livestreaming commerce combines information acquisition and entertainment, and its real-time interaction and immersive content can facilitate flow.[3] Prior studies suggest that flow increases time spent, repeat visits, and engagement, and may mediate the effect of trust-related perceptions on continuance outcomes.[2]

2.5. Theoretical Framework and Research Hypotheses

Drawing on the S-O-R framework, this study treats digital-human livestreaming features and platform governance as stimuli that shape users' internal states (trust, risk perception, and flow), which in turn influence behavioral responses (continuance watching intention).[7] Technology trust is expected to directly promote continuance watching intention.[4] Meanwhile, cross-border risk perception represents a contextual boundary that may weaken this effect, whereas risk mitigation represents platform assurance that may strengthen it.[9] Finally, technology trust is expected to enhance flow experience by reducing uncertainty and cognitive load, which then increases continuance watching intention.[8]

H1: Technology trust positively affects continuance watching intention.

H2: Cross-border risk perception negatively moderates the effect of technology trust on continuance watching intention.

H3: Risk mitigation positively moderates the effect of technology trust on continuance watching intention.

H4: Flow experience mediates the relationship between technology trust and continuance watching intention.

2.6. Research Model

Figure 1 presents the structural equation model. Technology trust is modeled as a core antecedent of continuance watching intention; cross-border risk perception and risk mitigation are specified as moderators (interaction effects) on the trust–intention path; and flow experience is modeled as a mediator between technology trust and continuance watching intention.

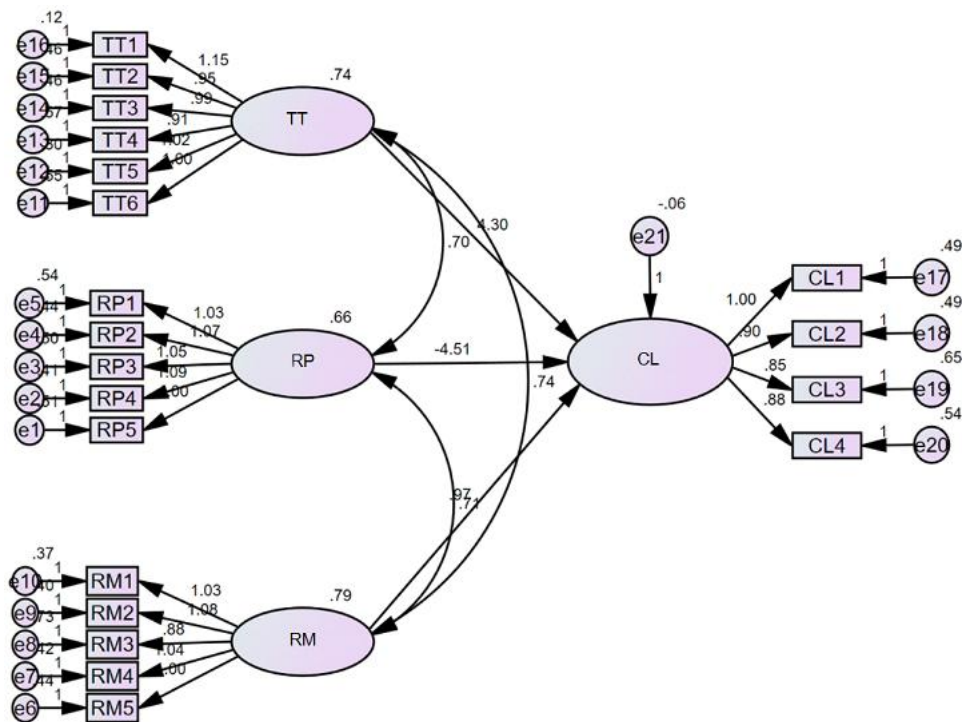


Figure 1. Structural Equation Model and Standardized Path Coefficients.

3. Research Design

3.1. Data Source and Sample

A structured questionnaire survey was conducted among users who had watched digital-human livestreaming sessions in cross-border e-commerce contexts. After screening for completeness and attention checks, 285 valid responses were retained for analysis. The sample size meets common requirements for covariance-based SEM and allows reliable estimation of the proposed model.

3.2. Measures

All constructs were measured using five-point Likert scales (1 = strongly disagree; 5 = strongly agree).[13] Measurement items were adapted from established scales and refined to fit the cross-border digital-human livestreaming context.[9] Technology trust captures perceived capability, reliability, security, and predictability of the digital-human livestreaming technology; cross-border risk perception captures users' perceived uncertainty and potential loss in cross-border transactions; risk mitigation captures platform governance and assurance mechanisms (e.g., rule transparency, enforceable guarantees, traceable fulfillment, third-party endorsements); flow experience captures immersion and enjoyment; and continuance watching intention is measured with four items capturing repeated viewing and sustained attention.[6]

3.3. Analytical Strategy

Data were analyzed using structural equation modeling in AMOS. The analysis proceeded in two steps: first, a confirmatory factor analysis (CFA) assessed reliability and validity of the measurement model; second, the structural model was tested to examine direct, moderating, and mediating effects. Moderation was tested by constructing interaction terms between mean-centered indicators of technology trust and each moderator. Mediation was assessed using bootstrapping to test the indirect effect through flow experience.

3.4. Additional Sample Characteristics

Most respondents reported prior experience with cross-border online shopping and tended to watch livestreams during promotional events or new-product launches.[10] In terms of content preference, respondents valued the completeness of product information, price transparency, and fulfillment efficiency, while also considering the streamer's professionalism and responsiveness.[2] Overall, continuance watching in cross-border digital-human livestreaming reflects both utilitarian motives (information search and decision support) and hedonic motives (entertainment and interactive participation), providing contextual support for incorporating flow experience into the model.[15]

3.5. Ethics and Data Processing

The survey was collected anonymously and did not request personally identifiable information. The questionnaire introduction informed participants that the data would be used only for academic purposes and that they could exit at any time. During data cleaning, missing values and outliers were handled, reverse-coded items were standardized, and all variables were checked for consistency to ensure reliable statistical inference.

3.6. Reliability and Validity Assessment

Reliability was evaluated using Cronbach's alpha and composite reliability (CR), and convergent validity was assessed via standardized factor loadings and average variance extracted (AVE). Discriminant validity was examined using the Fornell–Larcker criterion.

4. Empirical Results

4.1. Descriptive Statistics

Table 1 summarizes the key structural paths and hypothesis-testing results. Overall, the proposed model explains a substantial proportion of variance in continuance watching intention ($R^2 = 0.54$), indicating strong explanatory power in the cross-border digital-human livestreaming context.

Table 1. Key Paths and Model Summary.

Hypothesis	Path / Meaning	Coefficient / Result	Conclusion
H1	Technology Trust → Continuance Watching Intention	0.74	Supported
H2	Cross-border Risk Perception × Technology Trust → Continuance Watching Intention (Moderation)	-4.51	Supported
H3	Risk Mitigation × Technology Trust → Continuance Watching Intention (Moderation)	0.79	Supported
H4	Technology Trust → Flow Experience → Continuance Watching Intention (Mediation)	Positive	Supported

Note: Coefficients are reported based on AMOS estimation. Moderation effects correspond to interaction-term coefficients constructed after mean-centering/standardizing. Statistical significance follows the SEM output.

4.2. Measurement Model Evaluation

The CFA results indicate an acceptable measurement model fit and significant factor loadings. Convergent validity and internal consistency are supported, as all AVE values exceed 0.50 and all CR values exceed 0.70. Specifically, Technology Trust (AVE = 0.74, CR = 0.95), Cross-border Risk Perception (AVE = 0.66, CR = 0.92), Risk Mitigation (AVE = 0.79, CR = 0.94), and Continuance Watching Intention (AVE = 0.74, CR = 0.90). Model fit indices are reported in Table 2. Discriminant validity is evaluated using the Fornell–Larcker matrix in Table 3.

Table 2. Measurement Model Fit Indices.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI	NFI	TLI (NNFI)
Criterion	—	—	—	< 3	≥ 0.90	≤ 0.08	≤ 0.08	≥ 0.90	≥ 0.90	≥ 0.90
Value	294.635	190	0.000	1.551	0.915	0.039	0.081	0.985	0.900	0.985

Table 3. Discriminant Validity (Fornell–Larcker).

Construct	Cross-border Risk Perception (RP)	Risk Mitigation (RM)	Continuance Intention (CI)	Technology Trust (TT)
Cross-border Risk Perception (RP)	0.777			
Risk Mitigation (RM)	0.964	0.889		
Continuance Intention (CI)	0.976	0.901	0.861	
Technology Trust (TT)	0.898	0.881	0.741	0.806

4.3. Structural Model and Hypothesis Testing

The structural model demonstrates good fit ($\chi^2/df = 1.309$, GFI = 0.900, CFI = 0.987, RMSEA = 0.035). Path analysis shows that technology trust significantly and

positively affects continuance watching intention, supporting H1. The interaction-term tests indicate that cross-border risk perception negatively moderates the trust–intention relationship (H2 supported), while risk mitigation positively moderates it (H3 supported). Bootstrapping further confirms that flow experience partially mediates the effect of technology trust on continuance watching intention (H4 supported).

4.3.1. Interpreting the Moderation Effects

To interpret the negative moderation, consider two contextual states of risk perception. When cross-border risk perception is low, users are more likely to rely on technology trust to form stable expectations about information quality and fulfillment, so trust more readily translates into continuance watching.[4] When risk perception is high—due to concerns about payment security, privacy compliance, or fulfillment uncertainty—users tend to adopt a cautious strategy (reduced interaction and delayed decisions), which weakens the marginal effect of trust on continuance watching.[5]

The positive moderation of risk mitigation suggests that platform governance and assurance mechanisms can “unlock” the behavioral value of trust.[6] When the platform provides clear rules, enforceable guarantees, and traceable fulfillment, users’ worry about adverse outcomes decreases, and trust is more likely to be converted into sustained watching.[10]

4.3.2. Interpreting the Mediation Effect

Flow experience acts as an experience-based pathway through which technology trust strengthens continuance watching intention.[9] By reducing uncertainty and cognitive burden, technology trust enables viewers to allocate attention to content and interaction, thereby enhancing immersion and enjoyment.[3] In turn, flow experience promotes longer viewing, repeated visits, and stronger continuance intention.[2]

4.4. Discussion

The findings underscore that trust in the digital-human livestreaming technology is an important driver of retention in cross-border contexts, but its effectiveness is contingent on perceived risk and platform governance.[7] High cross-border risk perception can erode the trust–intention link, whereas credible risk mitigation strategies can reinforce it.[4] Moreover, flow experience provides an affective mechanism that connects trust to sustained engagement, suggesting that “trust building” and “experience design” should be pursued jointly.[9]

5. Discussion, Conclusion, and Implications

This study proposes and validates a trust–risk–experience framework for explaining users’ continuance watching intention in cross-border digital-human livestreaming e-commerce. Technology trust exerts a significant positive effect on continuance watching intention; cross-border risk perception and risk mitigation serve as important boundary conditions; and flow experience partially mediates the trust effect. Overall, the results reveal that sustainable retention requires not only trust in technology but also proactive risk governance and immersive experience management.

5.1. Policy and Governance Implications

Platforms should strengthen cross-border compliance governance and transparent disclosure, including clear identity labeling for virtual streamers, privacy and data-use statements, and standardized dispute-resolution procedures.[6] Given that risk perception weakens the trust–retention link, risk governance should be embedded into the livestreaming journey (e.g., prominent guarantees and traceability cues), rather than postponed to the transaction stage.[4]

5.2. Practical Recommendations

First, improve technology trust by ensuring stable interaction performance, reliable information quality, and consistent service outcomes.[9] Second, reduce perceived risk through visible assurance cues, third-party endorsements, and clear cross-border after-sales commitments.[1] Third, optimize flow experience by structuring information clearly, pacing interaction rhythm, and designing engaging yet non-overstimulating avatar behaviors, thereby cultivating a virtuous cycle of “trust–experience–retention”.[10]

5.3. Limitations and Future Research

Future research may extend this work in three directions: (1) use experiments to manipulate interaction realism, identity-disclosure strength, or privacy prompts to identify causal effects; (2) combine survey data with behavioral logs (e.g., dwell time, interaction frequency, revisit rate) and transaction data to reduce reliance on self-reports; and (3) conduct cross-country comparisons to examine how regulatory regimes, cultural distance, and logistics infrastructure shape the risk structure and trust formation process.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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