

RESEARCH ARTICLE

How the Characteristics of Live-Streaming Environment Affect Consumer Purchase Intention: The Mediating Role of Presence and Perceived Trust

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ABSTRACT Live-streaming commerce has become increasingly prevalent in recent years and has significantly impacted consumer purchasing behavior. This study aims to assess the impact of live-streaming environmental features, presence, and perceived trust on consumer purchase intention, building upon the stimulus-organism-response (SOR) model. The authors obtained 392 valid responses from a survey, which were analyzed using PLS-SEM to yield statistical insights. The study found that live-streaming environmental features directly impact presence, perceived trust, and purchase intention while also indirectly affecting purchase intention through perceived trust. Additionally, perceived trust directly affects purchase intention, and presence indirectly influences purchase intention through perceived trust. This research contributes to the existing literature on consumers' purchase intention in live-streaming commerce. Additionally, this study expands the comprehension of how environmental cues during live streaming affect purchase intention by examining the mediating roles of presence and perceived trust. As a result, this research provides a reference for enhancing the marketing effectiveness of live-streaming commerce.


INDEX TERMS E-commerce, environmental features, live-streaming, presence, purchase intention, stimulus-organism-response model (SOR), trust.

I. INTRODUCTION

Driven by the advancement of information technology, live streaming has rapidly grown in the online gaming [1], [2], e-sports, and tourism sectors [3], [4]. The emerging business model of "Live streaming+" presents significant potential. Since 2019, the COVID-19 pandemic has increased the demand for contactless online shopping among consumers [5], [6]. Traditional online shopping has limitations, such as inconsistencies between product descriptions and actual goods and suboptimal shopping experiences. Live-streaming commerce improves consumers' shopping experience by offering a more authentic and immersive sense of

presence [7]. The integration of 5G technology elevates live-streaming commerce with low latency, high resolution, and reliable transmission [8], compensating for conventional e-commerce's limitations and accelerating live-streaming commerce expansion.

Live-streaming growth has created a need to investigate consumer purchase intention in live-streaming commerce literature. Purchase intention refers to a consumer's inclination toward buying specific products or services based on their perception of product information, external factors, and attitudes. It is a subjective psychological activity [9], [10], [11] and substantially predicts consumer behavior. As such, purchase intention represents a popular research topic in marketing and consumer behavior. E-commerce scholars commonly posit that purchase intentions do not differ significantly between online and offline modes. Instead, differences

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arise mainly due to variations in consumption settings and methods [12].

Previous research on consumer purchase intention in live-streaming commerce has mainly focused on intermediary variables such as perception [13], trust [14], and presence to examine the influence of external and objective factors [15], including the visual design of live broadcasting rooms [16], interaction between individuals [17], service quality [18], live streaming features [13], and streamer styles [19]. Moreover, studies analyzed the impact of environmental characteristics of live-streaming commerce on consumers' purchase intention. Such as interactivity [20], [21], visibility [22], authenticity, vividness [21], and entertainment [23]. However, the literature lacks a holistic view of the environmental characteristics of live-streaming commerce influencing consumers' purchasing intentions. Therefore, this study utilizes the higher-order constructs method, providing a holistic view of the environmental characteristics of live-streaming commerce. Furthermore, literature revealed that presence and perceived trust are associated with consumer engagement behavior [24] and purchase hesitation [25], yet few studies have examined them as mediating variables of purchasing intention, particularly in sequential mediation analysis. Therefore, this study, guided by the stimulus-organism-response (SOR) model [26], utilizing the higher-order constructs method, provides a holistic view of the environmental characteristics of live-streaming commerce in influencing consumer purchase intention, examining the mediating roles of presence and perceived trust to bridge the literature gap.

This paper contributes to the literature in various ways. Theoretically, this study utilizes the higher-order constructs method to provide a comprehensive perspective on the environmental characteristics of live-streaming commerce that influence consumers' purchasing intentions. Additionally, it evaluates the varying contributions of different features within the live-streaming commerce environment. Third, this study explores the impact of environmental features on consumer purchase intention via presence and perceived trust. The research explicitly identifies a sequential mediating effect of presence and perceived trust. Practically, Live-streaming platforms and e-commerce sellers can enhance their performance by understanding the distinctive characteristics of the live-streaming commerce environment. Advancing the platform through practical guidance and inspiring e-commerce sellers to create an authentic and comfortable live-streaming experience can ultimately increase consumers' willingness to purchase.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

A. SOR MODEL

The SOR model, which is an extension of the stimulus-response (SR) model, was introduced by Mehrabian and Russell [26] in environmental psychology. The model includes an organism variable in the traditional SR model. The SOR

model primarily aims to explain or predict individuals' convergence or divergence tendencies in response to changes in their cognitive and emotional states caused by external stimuli [27]. The SOR model consists of three variables: S (stimulus), O (organism), and R (response). S represents external factors that can motivate and affect the individual, O denotes the individual's mental change process, including activities such as perception, psychology, and thinking, and R refers to the willingness or behavior produced after the individual's mental activity. This model emphasizes the mediating role of an individual's internal emotional and cognitive changes between external stimuli and behavioral outcomes, in contrast to the original SR model. It has been extensively utilized to examine the influence of shopping environments and service scenarios on consumer behavior [13], [28], [29].

Eroglu et al. [28] utilized SOR theory to analyze online shopping behavior, in which the online shop environment is the "stimulus," consumers' personality traits and emotional state are the "organism," and consumers' purchasing behavior is the "response." Additionally, online shopping environments can affect consumers' purchase intention by eliciting perceived trust and perceived risk [29]. Furthermore, the characteristics of the livestreaming environment can influence consumer purchase intention via perceived usefulness [30]. Additionally, Shang et al. [31] observed that the changes in the cognition and emotion of consumers can moderate the relationship between live-streaming commerce and consumer purchase intention. The literature suggests that traditional online shopping and live shopping elicit different stimuli that may impact consumers' emotions and cognition, ultimately affecting their purchasing intentions and consumption patterns [13], [16], [30]. The selection of "stimulus" and "organism" variables can differ depending on specific research contexts and perspectives.

B. LIVE-STREAMING COMMERCE

Live streaming is a prevalent form of interactive multimedia entertainment on the internet. Webcasts cover various fields, such as games, tourism, education, and e-commerce [1], [4], [32]. Live-streaming commerce is a type of network broadcasting that integrates e-commerce with live-streaming to enhance commodity sales. Presently, the following methods are primarily utilized to implement live-streaming commerce. First, E-commerce platforms like Taobao, Jingdong, and Vipshop have integrated live-streaming functions to expand the sales approach of e-commerce businesses on their platform. Second, content platforms like Douyin and Kuaishou integrate e-commerce and live streaming to generate additional revenue streams.

As education levels have risen, individuals' consumption patterns have significantly transformed, with a growing inclination towards online shopping. [33]. The utilization of technologies such as the Internet of Things (IoT), information sensing technology, and radio frequency identification (RFID) has significantly accelerated the growth of

e-commerce [34]. However, the drawbacks of conventional e-commerce, such as information asymmetry between buyers and sellers and negative consumer shopping experiences, have become more apparent, leading to a decline in its benefits over time [25]. Live-streaming commerce is an innovative expansion of the conventional online shopping model. Live streaming allows consumers to participate in various entertainment activities, obtain multi-sensory product information, and communicate with others in real time [35], [36]. This innovative business model provides opportunities for growth within the e-commerce sector. Advancements in network infrastructure and the widespread use of smart mobile devices reinforce the progress of live-streaming commerce. In recent years, live-streaming commerce has undergone significant evolution, incorporating facets such as product presentation, social transaction attributes, and product sales [7], [37].

Hou [38] discovered that users watch live-streaming commerce for social and entertainment purposes rather than shopping. Users favor live-streaming commerce due to both the hedonic intention (enjoyment of watching favorite streamers) and the utilitarian intention (acquiring information about intended commodities) [39]. Additionally, users continue to utilize live-streaming commerce due to the exceptional quality of content and frequent social interaction within live-streaming rooms [4], [40]. According to Hu et al. [41], the reason for users' continued viewing of live-streaming commerce is their personal experience and group identity, as explained by the social identity theory. The primary objective of live-streaming commerce is achieving traffic monetization. Therefore, factors influencing consumer purchase intention have become a crucial research topic for scholars.

Live-streaming commerce is a process streamers undertake that significantly impacts consumers' purchasing decisions. Streamers' recommendations and performance explanations can enhance fans' trust in the products, positively affecting consumer purchase intentions and loyalty [42]. The attributes of streamers, including their charm, recommendations, displays, and interactive features, directly impact the internal state of consumers and their intentions to make a purchase. In addition, the professionalism and popularity of streamers can positively influence consumers' perceived trust in a product [20].

The psychological state of consumers can be influenced by presence and consumer perception, thereby affecting their purchase intentions [43]. Therefore, integrating live-streaming technology into e-commerce platforms provides customers with an ideal shopping experience, enabling them to display products and interact with other users in real time. Consequently, buyers and sellers have been consistently exchanging real-time information, creating a sense of presence and a reduction in psychological distance. Which, in turn, increases consumer confidence in sellers [44].

Consumers' expectations for shopping experiences constantly evolve with the advancement of the economy.

Therefore, the shopping environment plays a vital role in significantly influencing consumer satisfaction and purchase intention [45]. The offline shopping environment is comprised of the physical setting where shopping centers provide services for customers to engage in shopping and associated activities. This entails the design of shopping centers, the external social environment, and the layout of surrounding spaces [46]. A favorable shopping environment, consisting of elements such as pleasing background music, appropriate color coordination, hygienic surroundings, and competent customer service personnel, can enhance consumer satisfaction, boost consumer appeal, increase consumer shopping contentment, and subsequently, positively influence consumer purchase intention [45]. Therefore, we assert that the environmental characteristics of live-streaming commerce can affect customer intention.

C. ENVIRONMENTAL CHARACTERISTICS OF LIVE-STREAMING COMMERCE

Due to the low cost and easy accessibility of live streaming, numerous e-commerce sellers prefer this method, as a single live-streaming event can yield significant returns. Currently, the market for live-streaming commerce is undergoing significant expansion. The digital nature of e-commerce has resulted in increased consumer demand for precise and genuine product information [47]. During live-streaming, products are presented as they are without post-production editing or camera switching. This leads to accurate shopping scenes and enhances the transparency of information. Furthermore, live-streaming commerce offers a high level of visualization of the online shopping experience, including the sales processes and information exchanges [7].

As living standards are improving, consumer expectations for shopping experiences are continuously rising. Consumers engage in shopping not only to fulfill their material needs but also to satisfy their psychological desires for relaxation and recreation during the shopping process, resulting in diverse entertainment experiences [38]. The entertaining nature of live-streamed content, alongside the humorous expressions of streamers, presents a formidable amusement source, effectively captivating consumers and eliciting emotional bonds [13], [19]. During live streaming, customers can engage with vendors in real-time, enabling them to understand their customers' needs and preferences comprehensively, adjust the emphasis of product explanations in real-time, and enhance interaction efficiency and service quality [44].

Scholars have analyzed the effects of various environmental factors in live-streaming commerce on consumer purchase intention from different perspectives. Zhao et al. [20] and Sohn et al. [22] determined interactivity and visibility as characteristics of live-streaming commerce based on presence and visual complexity, respectively. The empirical results demonstrate that interactivity and visibility positively influence consumer purchase intentions. Tong [21] identified authenticity, interactivity, and vividness as essential

characteristics of live e-commerce environments. Empirical research indicated that authenticity and interactivity had a more significant influence on consumer purchase intentions than vividness, which had a relatively minor impact. Ma and Mei [23] investigated the impact of perceived usefulness, perceived risk, perceived entertainment, and perceived interaction on consumers' purchasing behaviors. The study indicated that only perceived entertainment and perceived interaction had a significant positive impact on consumers' purchasing behaviors. However, the literature lacks a standard definition for the characteristics of the live-streaming environment. This study adopts interactivity, authenticity, visibility, and entertainment as subdimensions to address this gap based on the research of previous scholars. These selected subdimensions are significant and extensively researched in the literature [20], [21], [22], [23], forming a hierarchical construct of the characteristics of the live-streaming environment.

Interactivity is the exchange of information between two or more individuals [48]. Traditional e-commerce relies on instant chat software or message feedback systems for communication between consumers and merchants. However, these methods often experience delays [49]. Live-streaming commerce allows consumers to directly communicate with merchants through real-time messaging on the live-streaming interface, thus enhancing the efficiency and timeliness of their interaction. During live streaming, sellers participate in promotional activities such as lucky draws, discounts, and gift-giving to engage with consumers and improve the shopping experience, creating an energetic atmosphere in the live-streaming room [17]. By interacting during these activities, sellers and consumers can form an emotional connection, which enhances consumers' trust in the merchants [38]. Interactive activities have the capability to attract and engage consumers, ultimately enhancing their attention towards a product and stimulating their intention to purchase. [47].

Authenticity refers to an individual's objective assessment of the information's genuineness [50]. The conventional online shopping model may introduce the possibility of misrepresentation due to the static nature of the product information presented through images and text [25]. Live streaming enables the real-time and comprehensive presentation of commodities to consumers through the camera [13]. The increased difficulty of modifying product information may result in accurately presenting comprehensive details [51], thereby positively influencing presence, perceived trust, and purchase intention.

Visibility means that live streaming allows information to be communicated to consumers through visual channels [52]. High-definition live video enhances the visual aspect of shopping, provides more realistic and comprehensive product information, and minimizes information inconsistencies for consumers [53], [54]. Enhanced visibility can increase the perceived tactile experience, thereby increasing consumer presence [22]. Live-streaming commerce incorporates human

images into the shopping experience, increasing consumers' perceived trust [55]. As a result, it influences consumer purchase intention.

Entertainment refers to consumers' relaxed and enjoyable experiences with live-streaming commerce [44]. Live streaming entertainment can stimulate consumer interest and encourage viewership. Providing frequent and engaging bullet screen information, sweepstakes, and red envelope activities during broadcasts can increase consumer satisfaction and foster a welcoming and harmonious shopping environment, facilitating closer connections between sellers, products, and consumers, simulating an authentic shopping experience [17]. The sensation experienced by customers can potentially increase their perception of the merchant's authenticity and benevolence, thereby enhancing their perceived trust and shopping presence and ultimately motivating their inclination to make a purchase. Therefore, we hypothesize that:

H1a. Characteristics of live-streaming commerce positively impact customer purchase intention.

H1b. Characteristics of live-streaming commerce positively impact customer presence.

H1c. Characteristics of live-streaming commerce positively impact customer perceived trust.

D. PRESENCE

As a concept derived from telepresence in communication, presence refers to the user's perception of the media environment [56]. In the context of interpersonal communication and social interaction, presence refers to the level of interaction and connection between individuals through various communication channels [57]. Presence refers to the perception of virtual presence experienced by media users regarding the authenticity of the media environment [58], [59]. During live streaming, the exchange of information and interactive entertainment activities between individuals can facilitate the creation of a shopping environment that simulates the presence of others [60]. Furthermore, showing products from all angles and allowing streamers to demonstrate the use of products can provide consumers with a realistic experience similar to in-person communication, creating an "immersive" shopping experience for consumers and reinforcing the notion that "seeing is believing." As a result of positive emotional interactions, consumers and sellers can develop a stronger sense of intimacy and trust [59], which increases the consumer's intention to purchase. Therefore, we hypothesize that:

H2a. Presence positively impacts the customer's perceived trust.

H2b. Presence is mediating between characteristics of live-streaming commerce and perceived trust.

E. PERCEIVED TRUST

Perceived trust is a subjective assessment of the trustworthiness of others and is a critical element in encouraging

consumers to make purchase intentions, particularly in the context of high-risk e-commerce environments [61]. Traditional online shopping is constrained by the virtual environment, creating an inaccessible, abstract, and virtual shopping experience. This can lead to various uncertainties, such as transaction security risks, false product information, and unstable control [62]. As a result, some consumers may be reluctant to choose online shopping. In this scenario, consumers' perceived trust serves as the basis for their online shopping choice [14]. The application of network broadcasting technology in live-streaming commerce enables the presentation and transmission of product information in a clear and comprehensive manner, which reduces consumers' perceived uncertainty toward sellers and minimizes the impact of various uncertainty factors on consumers [63].

Consequently, consumers' perceived trust is strengthened. Effective trust-building between sellers and consumers can be achieved through positive interactions, which can help to reduce the distance between them. Numerous studies have confirmed the positive correlation between perceived trust and consumer purchase intention [14], [64]. Therefore, we hypothesize that:

H3a. Perceived trust has a significant positive effect on purchase intention.

H3b. Perceived trust mediates between presence and purchasing intention.

H3c. Perceived trust mediates between characteristics of live-streaming commerce and purchase intention.

H3d. Perceived trust and presence mediate between characteristics of live-streaming commerce and purchase intention.

F. THEORETICAL FRAMEWORK

The SOR model is appropriate for explaining how environmental factors affect the internal cognitive state of consumers. This research is well aligned with the SOR model. The theoretical framework of the study, based on the literature review and hypotheses mentioned above, is shown in Fig. 1. This framework examines the impact of environmental factors in live-streaming commerce on consumer purchase intention. Additionally, it examines the mediating role of presence and perceived trust in the relationship between environmental factors and purchase intention.

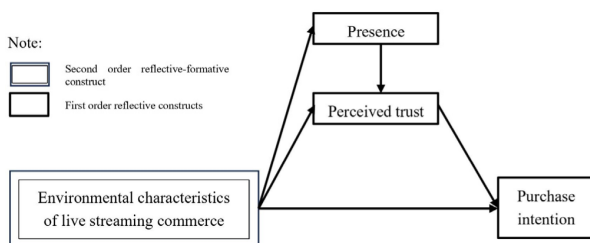


FIGURE 1. Theoretical framework.

III. METHODOLOGY

A. QUESTIONNAIRE DESIGN

We reviewed pertinent literature to understand established questionnaires to improve the reliability and validity of the

questionnaire. Subsequently, we modified the existing maturity scale to align with the research theme of this study. The existing scale was modified to align with the research topic of this paper. Experienced online broadcast shopping users were invited to conduct a preliminary survey on the questionnaire during the design stage to improve its alignment with the research situation, clarity of description, and accuracy of results. Revise the questionnaire based on the feedback from the preliminary survey respondents to improve comprehension and accuracy in the formal survey. Appendix shows the questionnaire instruments.

The survey consists of three sections. Consumer demographic variables include gender, age, education level, income level, and occupation. The second section relates to the use of live-streaming shopping platforms, including questions about the respondent's exposure to live-streaming commerce, frequency of viewing, purchase history on such platforms, and the frequency of their purchases. The third section consists of a questionnaire covering proposed constructs such as the environmental characteristics of live-streaming commerce (visibility, entertainment, interactivity, authenticity), presence, perceived trust, and consumer purchase intention. Three items were derived from Liu et al. [65] to measure visibility. Three items from Chen and Lin [44] were used to measure entertainment. Three items were adapted from Tong [21] to measure interactivity. Four items were adapted from Beverland et al. [50] to measure authenticity. Six items measuring presence were derived from Zhao et al. [20] and Ou et al. [59]. Three items measuring perceived trust were adapted from Gefen and Straub [66]. Four items measuring purchase intention were adapted from Lu and Chen [67]. The third section of the questionnaire used a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

B. DATA COLLECTION

This study collects surveys from individuals who watched live streaming. This study collects data through an online survey, which allows for wider coverage without regional restrictions. This method reduces data collection time and cost using mobile phones and smart devices instead of paper questionnaires. The methodology involves distributing questionnaires through social networking platforms such as WeChat, Weibo, QQ, and live-streaming commerce. Questionnaires were distributed between October and December of 2022. 392 respondents were deemed valid for further analysis.

IV. ANALYSIS AND RESULTS

A. QUANTITATIVE ANALYSIS TOOLS

The Partial Least Squares (PLS)-Structural Equation Modeling (SEM) method was employed to evaluate the structural model and hypotheses. As noted by Lowry and Gaskin [68], PLS-SEM has advantages over covariance-based SEM. PLS-SEM is suitable for small sample sizes and does not require

data distribution. PLS-SEM is capable of analyzing reflective and formative constructs. PLS-SEM is more effective in dealing with measurement errors caused by variables. The study utilized a two-step analysis method, as suggested by Anderson and Gerbing [69]. The study used SmartPLS3.2.8 to test the measurement model using partial least squares in the first step and bootstrapping to test the structural model in the second step.

B. DESCRIPTIVE STATISTICAL ANALYSIS

Table 1 provides information on the demographic characteristics of the survey respondents and their use of live-streaming shopping. Male respondents make up 35.5% of the sample in terms of gender. Female respondents comprise 64.5% of the sample, indicating the importance of the female consumer group in live-streaming commerce. The majority of the sample (62.5%) falls in the 19-25 age range, with 32.1% falling in the 26-35 age range, indicating that the demographic engaged in live-streaming commerce is predominantly young. The majority of respondents (70.9%) had a bachelor’s degree, while 17.4% had a graduate degree, indicating a generally high level of education among the sample. 52.3% of the sample had an income below 2000, while 21.4% had an income between 2000 and 5000. This suggests that their income level limits the purchasing power of consumers using live-streaming commerce. Students and employees of enterprises and public institutions are significant consumers of live-streaming commerce.

The survey indicates that approximately 74.0% of the participants have engaged in live-streaming commerce to purchase products, and 76.0% watch live-streaming with a frequency of twice a month or less. The survey results indicate that the sample population for live-streaming commerce viewers is predominantly female, young, and has limited purchasing power.

C. MEASUREMENT MODEL ASSESSMENT

This section evaluates construct reliability and validity to ensure the robustness of hypothesis testing [70]. Reliability refers to the consistency and stability of the questionnaire. Measures commonly utilized to assess reliability are Composite Reliability (CR) and Cronbach’s Alpha [71], [72]. A measurement model is considered to have good reliability if its CR exceeds 0.7 [72] and its Cronbach’s Alpha exceeds 0.6 [73]. Table 2 presents the CR and Cronbach’s Alpha values obtained in this study. The CR values and Cronbach’s Alpha coefficients for all constructs are deemed satisfactory, with values greater than or equal to 0.900 and 0.834, respectively, signifying strong reliability.

Validity evaluates the rationality and validity of a questionnaire. A higher validity score suggests better conformity between the objectives of the questionnaire and its results. Measuring validity involves structural validity, consisting of convergence and discriminant validity [71], [72]. Convergence validity measures the degree of correlation between

TABLE 1. Sample characteristic (n = 392).

Measure	Items	Frequency	Percentage (%)
Gender	Male	139	35.5%
	Female	253	64.5%
Age	≤18	10	2.6%
	19-25	245	62.5%
	26-35	126	32.1%
	≥35	11	2.8%
	Income level	≤2000	205
	2000-5000	84	21.4%
	5001-8000	74	18.9%
	8001-10000	11	2.8%
	≥10000	18	4.6%
Education level	≤High school	2	0.5%
	Junior College	44	11.2%
	Undergraduate Degree	278	70.9%
	Graduate student	68	17.4%
Occupation	Student	207	52.8%
	Staff of public institutions	51	13.0%
	Individual business	12	3.1%
	Enterprise staff	78	19.9%
	Other	44	11.2%
Whether they have purchased live-streaming commerce products	Yes	290	74.0%
	No	102	26.0%
The frequency of purchase (per month)	≤2	298	76.0%
	3-7	71	18.1%
	≥8	23	5.9%

each observed variable and the latent variable, commonly evaluated using factor loading and average variance extracted (AVE) measurements. Factor loading [72] and AVE [71] should exceed a value of 0.5. All items had factor loadings ranging from 0.782 to 0.944, and all constructs had AVE values ranging from 0.743 to 0.867, indicating satisfactory convergent validity. Discriminative validity evaluates a construct’s ability to distinguish itself from other constructs [74]. The study demonstrates good discriminative validity for the constructs when the square root of the average of all constructs exceeds the correlation coefficient between the construct and other constructs. The results are presented in Table 3, indicating that the necessary discriminative validity criteria are met.

The specific weights of each indicator are displayed in Table 4 after assessing the contribution of the first-order formative indicators of authenticity, entertainment, interactivity, and visibility [75].

D. STRUCTURAL MODEL ASSESSMENT

The structural model examines the correlation between latent variables, confirms the validity of the paper’s hypothesis, and evaluates the model’s explanatory power and the significance of its path. We conducted 5000 repeated samples with a 95% confidence interval level to ensure data stability. Primary evaluation measures include the coefficient of determination, path coefficient, and indirect effect test.

TABLE 2. Reliability and validity.

construct	item	Factor loading	Cronbach's α	CR	AVE
Interactivity	IN 1	0.869	0.834	0.900	0.750
	IN 2	0.901			
	IN 3	0.828			
Entertainment	EN 1	0.929	0.923	0.951	0.867
	EN 2	0.944			
	EN 3	0.920			
Authenticity	AU 1	0.782	0.883	0.920	0.743
	AU 2	0.870			
	AU 3	0.921			
	AU 4	0.869			
Visibility	VI 1	0.914	0.909	0.943	0.846
	VI 2	0.934			
Presence	PR 1	0.829	0.933	0.947	0.749
	PR 2	0.835			
	PR 3	0.879			
	PR 4	0.871			
	PR 5	0.893			
Perceived trust	PT 6	0.884	0.899	0.937	0.832
	PT 1	0.883			
	PT 2	0.939			
Purchase intention	PT 3	0.913	0.929	0.949	0.824
	PI 1	0.904			
	PI 2	0.915			
	PI 3	0.912			
	PI 4	0.900			

Note: AVE = average variance extracted; CR = composite reliability; IN=interactivity; EN=Entertainment; AU=Authenticity; VI=Visibility; PR=Presence; PT=Perceived trust; PI=Purchase intention.

TABLE 3. Discriminant validity of the measurements.

Construct	IN	EN	VI	AU	PR	PT	PI
IN	0.866						
EN	0.398	0.931					
VI	0.362	0.825	0.920				
AU	0.553	0.651	0.589	0.862			
PR	0.367	0.632	0.672	0.649	0.865		
PT	0.451	0.541	0.510	0.702	0.687	0.912	
PI	0.385	0.630	0.582	0.738	0.679	0.712	0.908

Note: The bold number on the diagonal is the square root of the mean variance of the construct. IN=interactivity; EN=Entertainment; AU=Authenticity; VI=Visibility; PR=Presence; PT=Perceived trust; PI=Purchase intention.

TABLE 4. Index weights of second-order construct.

construct	Index	weight
Characteristics of live-streaming commerce environment	authenticity	0.391***
	entertainment	0.317***
	visibility	0.300***
	interactivity	0.185***

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

1) COEFFICIENT OF DETERMINATION

The research model is evaluated through the coefficient of determination (R^2), which ranges from 0 to 1. The R^2 metric has three critical values: 0.19, 0.33, and 0.67. Chin [75] proposes that a model possesses strong explanatory power when its R^2 value is greater than or equal to 0.67, moderate explanatory power when the R^2 value falls between 0.33 and 0.67, and weak explanatory power when the R^2 value is greater than 0.19 but less than 0.33. In the constructed model, the explanatory ability is moderate, which is evidenced by

the explanation degrees of presence (0.524), perceived trust (0.544), and purchase intention (0.622).

2) PATH COEFFICIENT ANALYSIS

The path coefficient was determined using PLS, with path significance evaluated through Bootstrapping. The T-value was employed for hypothesis validation and path significance. A 0.95 set confidence level was used for the study. When $T > 1.96$ and the p-value is less than or equal to 0.05, the path coefficient is considered significant, confirming the hypothesis. Table 5 presents the path coefficients depicting the relationships between “characteristics of live-streaming commerce environment → purchase intention”, “characteristics of live-streaming commerce environment → presence”, and “characteristics of live-streaming commerce environment → perceived trust”. The corresponding coefficients are 0.464 ($t = 9.816 > 1.96$), 0.724 ($t = 26.716 > 1.96$), and 0.390 ($t = 6.379 > 1.96$). The findings indicate that the environmental factors of live-streaming commerce significantly impact the sense of presence, perceived trust, and purchase intention, thus supporting H1a, H1b, and H1c. Furthermore, supporting H2a validity is the path coefficient of “presence → perceived trust” at 0.404 ($t = 5.838 > 1.96$), which suggests a positive influence of presence on perceived trust. The research concluded that the path coefficient between “perceived trust → purchase intention” is 0.396 ($t = 8.001 > 1.96$), providing support for H3a and implying that perceived trust has a notable impact on the consumer’s purchase intention. Table 5 shows the path coefficients.

TABLE 5. Path coefficient and significance level.

Research hypotheses	Direct Path	Path coefficient	t-value	significance level	Hypothesis test
H1a	CIE→PI	0.464	9.816	$p < 0.001$	support
H1b	CIE→PR	0.724	26.761	$p < 0.001$	support
H1c	CIE→PT	0.390	6.379	$p < 0.001$	support
H2a	PR→PT	0.404	5.838	$p < 0.001$	support
H3a	PT→PI	0.396	8.001	$p < 0.001$	support

Note: CIE=Characteristics of live-streaming commerce environment; PR=presence; PT=perceived trust; PI=Purchase intention.

3) TEST OF MEDIATION EFFECT

The study evaluated the mediating effect using bootstrapping with a confidence level of 0.95 and conducting 5000 sampling iterations. The path mediating effect was evaluated primarily through specific indirect effects. Analysis revealed the significance of the indirect “environment characteristics of live-streaming commerce → presence → perceived trust” effect (0.293, $t = 5.603$, $p < 0.05$) supporting hypothesis H2b. The path analysis indicates that the indirect effect of “presence → perceived trust → purchase intention” is significant (0.160, $t = 4.197$, $p < 0.05$), supporting hypothesis H3b. The indirect effect of the path “characteristics of a live-streaming commerce environment → perceived trust → purchase intention” is also significant at 0.154 ($t = 5.680$, $p < 0.05$), provided

that H3c is valid. The indirect effect of 0.116 with a t value of 4.074 (>1.96), supporting hypothesis H3d, is substantial along the path “environment characteristics of live-streaming commerce → presence → perceived trust → purchase intention.” Table 6 presents the exact findings.

TABLE 6. Results of mediating effect test.

Research hypothesis	Indirect path	Indirect effect	Total effect	t-value	Significance level	Hypothesis test
H2b	CIE→PR→PT	0.293	0.683	5.603	p<0.001	support
H3b	PR→PT→PI	0.160	0.160	4.197	p<0.001	support
H3c	CIE→PT→PI	0.154	0.734	5.680	p<0.001	support
H3d	CIE→PR→PT→PI	0.116	0.734	4.074	p<0.001	support

Note: CIE=Characteristics of live-streaming commerce environment, PR=presence, PT=perceived trust, PI=Purchase intention.

V. DISCUSSION

The online shopping environment of live-streaming commerce has undergone substantial changes compared to traditional e-commerce. Live-streaming commerce meets consumers’ social and consumption needs by allowing them to view live streams and purchase products at any time and from anywhere. It makes up for conventional e-commerce’s shortcomings in product display and interactive engagement while unlocking significant marketing prospects. This study investigates the environmental characteristics of live-streaming commerce, their connection with consumer purchase intentions, and the mediating effect of presence and perceived trust.

The study utilizes the SOR model to illustrate the factors that impact consumer purchase intention in live-streaming commerce. The live-streaming environment (S) comprises interactivity, authenticity, visibility, and entertainment, which can affect the consumer’s sense of presence (O), which in turn influences their perceived trust (O). Ultimately, the consumer’s perceived trust (O) in the live streamer and the platform can influence their purchase intention (R). Consistent with Eroglu et al. [28], the characteristics of the online shopping environment can be the stimulus that influences consumers’ emotional state and purchasing behavior as the “response.” The environments can elicit perceived trust in consumers, influencing their purchase intention [29].

This study suggests that the environmental features of live-streaming commerce, including interactivity, authenticity, visibility, and entertainment, directly affect presence, perceived trust, and purchase intention. The findings are consistent with prior research [20], [21], [22], [23], indicating that displaying transparent commodity information, presenting real-time information, enabling high-quality social interaction, and facilitating multi-sensory participation of consumers during live streaming can enhance consumers’ understanding of commodities and sellers, decrease the

perceived distance in online shopping [44], and increase consumers’ presence [22], [55]. Live streaming is subject to real-time online supervision by the audience, which enhances the authenticity and reliability of the information conveyed by the merchants. Additionally, live streaming can foster familiarity and proximity between merchants and consumers, developing positive and enduring relationships [44]. Perceived trust has also been found to impact consumer purchase intention positively, which is consistent with the findings of Beverland et al. [50].

This study revealed that authenticity is the primary contributor to the live-streaming commerce environment, followed by entertainment, visibility, and interactivity. This finding is consistent with Ma and Mei’s research [23], which shows that consumers value the authenticity of information during live-streaming shopping. Additionally, consumers watch live-streaming commerce to purchase desired products while entertained [38]. Live-streaming commerce caters to consumers’ needs by offering an enjoyable and informative shopping experience. Moreover, this approach increases transparency in the shopping process [7], [53] and minimizes the chances of sellers making false promises, as the nature of live-streaming makes it challenging for streamers to conceal their identities, reducing the virtual and anonymous nature of live-streaming [76]. Additionally, interactivity contributes the least to the live-streaming commerce environment among the four factors. Live shopping simplifies and streamlines the vast online network’s product information search process by altering the interactive aspect of traditional online shopping. As live shopping becomes increasingly common, consumers may become accustomed to the interactive format of live streaming, resulting in a gradual reduction in the stimulation of their purchase intention. Consumers might participate in live-streaming interactions for entertainment purposes rather than solely for product information [38].

Consistent with prior studies, the environmental features of live-streaming commerce can have an indirect and positive impact on perceived trust through the presence and an indirect and positive impact on purchase intention through perceived trust [35], [77]. The findings suggest that the characteristics of the live-streaming commerce environment can indirectly affect consumer purchase intention, with presence and perceived trust serving as intermediate factors. Live streaming enables the display of commodities and offline shopping scenes in high-definition and real-time. It also allows intimate, two-way interaction between sellers and consumers, creating a sense of presence for goods, stores, sellers, and co-viewers. Live streaming can enhance consumers’ trust in sellers’ ability to provide high-quality goods and services, increasing purchase intention [20].

In line with Lv et al. [78] and Lu et al. [79], it appears that the mere presence of live-streaming commerce has an indirect yet positive impact on consumers’ purchase intention due to impacting perceived trust. Live-streaming commerce is still in its early development stages concerning purchasing goods. Consumers exhibit rational behavior when shopping

via live streaming, and their purchase intention is influenced by perceived trust, given the limitations of bounded rationality. Trust is essential for consumers to form purchase intention [61]. Live streaming improves emotional communication and decreases perceived distance, thereby enhancing consumers' sense of presence. As a type of online shopping, live shopping generates consumer concerns regarding the virtual shopping environment and transaction security. The uncertainty surrounding the transaction further exacerbates these concerns. Roy et al. [80] propose that perceived trust acts as an intermediary between presence and consumer purchase intention.

VI. CONCLUSION, IMPLICATIONS, AND LIMITATIONS

A. CONCLUSION

The study utilizes the SOR model to investigate the effects of live-streaming commerce environmental characteristics, presence, and perceived trust on consumer purchase intention. The SOR model posits that environmental stimuli (S) lead to internal responses (O), which in turn lead to behavioral responses (R). In the context of live-streaming commerce, the environmental stimuli include interactivity, authenticity, visibility, and entertainment. The internal responses include the consumer's sense of presence and perceived trust. The behavioral response is the consumer's purchase intention.

The study reveals that authenticity is the most significant element among the four characteristics of the live-streaming commerce environment. In contrast, entertainment, visibility, and interactivity have comparatively lesser contributions. Live-streaming commerce environmental characteristics directly affect presence, perceived trust, and purchase intention. Additionally, presence indirectly influences purchase intention via perceived trust. Furthermore, perceived trust directly influences purchase intention.

B. THEORETICAL IMPLICATIONS

Live-streaming commerce has proliferated in recent years while the demand for online shopping remains strong. Therefore, investigating the determinants affecting consumer purchase intentions in live-streaming commerce has become increasingly important. Previous studies have analyzed how the characteristics of the live-streaming commerce environment influence consumer purchase intentions across multiple dimensions. This study utilizes the hierarchical constructs approach to provide an all-encompassing perspective of the environmental characteristics of live-streaming commerce that affect consumers' purchasing intentions. The hierarchical constructs assist in creating a more straightforward model by diminishing the number of path model connections [81]. This study simplifies the relationships between multiple environmental factors and other constructs in a path model by summarizing them into a higher-order construct. Furthermore, this study uncovers the diverse contributions of various environmental elements within the live-streaming commerce environment through the formulation of

hierarchical constructs, addressing the literature gap. Additionally, this study investigates how environmental characteristics may affect consumer purchase intentions through presence and perceived trust. It expands upon existing literature regarding the mediating function of presence and perceived trust in influencing consumer purchasing intentions by explicitly identifying a sequential mediating effect of presence and perceived trust.

C. MANAGERIAL IMPLICATIONS

Live-streaming commerce is becoming increasingly popular among consumers as a marketing tool, resulting in a rise in transaction volume for e-commerce. The rapid expansion of live-streaming commerce intensifies internal competition. Enhancing consumer purchase intention is essential for the long-term progress of live streaming. Live streaming platforms and e-commerce sellers are actively exploring ways to boost consumer purchase intention. The study shows that environmental factors in live-streaming commerce significantly enhance consumer purchase intention. Additionally, the factors of presence and perceived trust warrant adequate consideration.

The live streaming should accurately depict the products. AR and VR technologies can improve the live streaming experience by providing a more immersive and lifelike three-dimensional presentation. Clothing products can be marketed through real people modeling them and displaying their details. Cosmetic products can be promoted by presenting their trial results and disclosing their ingredients. Incorporating authenticity into live-streaming commerce can enhance the on-site shopping experience and trigger consumers' purchasing intentions.

Merchants ought to prioritize the establishment of an entertaining atmosphere during live broadcasts. Consumers watch live streaming mainly for leisure and stress relief. Through analyzing big data, merchants can recognize their target audience and curate entertainment activities to cater to their characteristics. This enables the creation of a captivating shopping environment that draws and maintains potential customers.

Additionally, merchants should amplify the interaction format to bolster its impact. Merchants can use interactive tools on live streaming platforms to plan and organize activities that align with product characteristics and engage consumers in meaningful communication. Merchants must heed consumer feedback, such as bullet screens or messages, to engage with them and increase customer retention.

Merchants should consider the broadcast room's scene layout. The live streaming room's decoration, lighting, color coordination, and product display should effectively showcase the dynamic visibility of live shopping. Web design should not be underestimated; straightforward web content, realistic web images, and aesthetically pleasing web design are crucial. Integrating web content and live content can enhance consumers' understanding of products.

TABLE 7. Survey instruments.

Constructs	Items	Kurtosis	Skewness
Interactivity	1. The streamer actively respond to the audience's questions.	0.304	-0.716
	2. The streamer actively communicate with the audience.	0.912	-0.834
	3. The streamer liven up the atmosphere of the live streaming through various forms.	0.512	-0.708
Entertainment	1. Live streaming makes you feel relaxed and fun.	0.143	-0.548
	2. Live streaming can make you feel happy and satisfied.	0.206	-0.481
	3. Watching live streaming relax your mood and relieve your pressure.	0.052	-0.570
Visibility	1. The furnishings in the broadcast room are comfortable.	0.079	-0.457
	2. The design of the broadcast room is pleasing.	-0.261	-0.305
	3. The layout of the live streaming interface is attractive.	-0.104	-0.375
Authenticity	1. You trust the streamer's items' quality and efficacy.	0.246	-0.364
	2. Live streaming show products from multiple angles.	0.659	-0.693
	3. Live streaming enhances product knowledge.	0.598	-0.648
	4. You can learn more about commodities by watching live streaming.	0.788	-0.740
Presence	1. Live streaming makes you feel like you're there.	-0.268	-0.317
	2. Live streaming immerses you in the seller's environment.	-0.105	-0.253
	3. Watching the live streaming feels like browsing in a store.	-0.501	-0.212
	4. Live streaming can reduce physical and psychological distance between viewers.	-0.246	-0.505
	5. Watching live streaming seems like real dialogue.	-0.118	-0.516
	6. Live streaming feels like interacting with people.	-0.385	-0.257
Perceived trust	1. The streamer are trustworthy.	0.126	-0.300
	2. The live streaming room's products are reliable.	0.180	-0.291
	3. The live streaming platform is trustworthy.	0.254	-0.397
Purchase intention	1. Live streaming improves consumption.	0.362	-0.537
	2. Live streaming greatly influences your purchase decision.	-0.017	-0.514
	3. You want to watch live to find your favorite products.	0.116	-0.600
	4. Watching the live streaming make you want to buy products.	0.009	-0.536

Merchants should improve their streamer training to ensure that their streamers demonstrate appropriate speech and behavior, maintain a positive self-image, and regulate their emotions effectively. Live-streaming commerce largely targets a young audience between the ages of 18 and 35 who are able to differentiate and search for product information. As a result, streamers are required to possess professional knowledge. Before live streaming, streamers need to gather

up-to-date information on commodities and industry developments from various sources. They can provide consumers with knowledgeable and genuine product introductions during live streaming, utilizing their professional expertise, sales experience, and personal insights. Furthermore, they can immediately respond to any product-related inquiries raised by consumers.

D. LIMITATIONS AND RECOMMENDATIONS

Though this study provides several theoretical and managerial contributions, several limitations are observed. The complexities of the live-streaming environment lack a unified definition in the literature. Thus, this paper identifies interactivity, authenticity, visibility, and entertainment as the characteristics of the live-streaming commerce environment, leaving many others to be explored. Future research ought to integrate other crucial characteristics, such as risk-related ones, into the framework. Furthermore, emotional factors can also serve as intermediary variables besides the sense of presence and perceived trust. Future studies may incorporate factors regarding streamers' traits and consumers' emotions into the research frame to examine consumer purchase intention.

APPENDIX

See Table 7.

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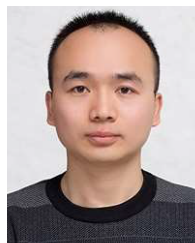
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