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The Influence of Characteristics of E-commerce Live Streaming on Impulsive Purchase Intention: The Mediating Role of Consumer Sentiments

Bingnan Liu, Gumporn Supasettaysa*, Thanakon Ratchatakulpat

Faculty of Business Administration, Rajamangala University of Technology Phra Nakhon, Thailand,10300

bingnan-l@rmutp.ac.th, gumporn.s@rmutp.ac.th (Corresponding author), Thanakon.r@rmutp.ac.th

Abstract. Driven by the wave of digitalization, e-commerce live streaming has injected new vitality into e-commerce. Its powerful ability to attract and monetize traffic has prompted numerous enterprises to enter the arena. The marketing logic of e-commerce live streaming has undergone qualitative changes compared to traditional e-commerce. By enhancing consumer decision-making efficiency, strengthening user stickiness, and incorporating entertainment attributes, it has become an important scenario for consumers' daily shopping. Although existing research has focused on online shopping behavior, how the multidimensional characteristics of e-commerce live streaming trigger consumers' impulsive purchase intention remains an urgent issue for academia and practitioners to explore. Based on the Stimulus-Organism-Response (S-O-R) model, this study constructs a theoretical model of "characteristics of e-commerce live streaming (independent variable) - consumer sentiment (mediating variable) - impulsive purchase intention (dependent variable)". The characteristics of e-commerce live streaming are divided into five dimensions: recommendation, interest, interactivity, online product display, and transaction volume. Consumers sentiments are divided into two dimensions: arousal and pleasure. Through questionnaire surveys, 515 valid data points were collected, and empirical analysis was conducted using SPSS 26.0 and AMOS 28.0. The results indicate that: (1) e-commerce live streaming features have a significant positive impact on consumer sentiment; (2) Consumer sentiment have a significant positive impact on impulsive purchase intention; (3) E-commerce live streaming features have a significant positive impact on impulsive purchase intention; (4) Consumer sentiment play a significant mediating role between e-commerce live streaming features and impulsive purchase intention. This study reveals the intrinsic correlation between e-commerce live streaming features and impulsive purchase intention, providing insights for businesses to optimize their e-commerce live streaming marketing strategies and enhance consumer impulsive purchase intention.

Keywords: Characteristics of E-commerce Live Streaming, Consumer Sentiment, Impulsive Purchase Intention, S-O-R model

1. Introduction

In recent years, the Chinese government has actively promoted the development of e-commerce live streaming: in June 2020, the State Council supported foreign trade enterprises to expand domestic sales through live streaming, and in September encouraged physical commerce to carry out live streaming sales; in 2021, the Ministry of Commerce issued a document to strengthen the standardization of live streaming e-commerce; in 2023, the central government clearly regulated the development of live streaming e-commerce and promoted the construction of digital e-commerce and live streaming bases for agricultural products (Ministry of Commerce, 2023). According to data from the China Internet Network Information Center (2023), as of December 2023, the number of Chinese internet users reached 1.092 billion, with online shopping users accounting for 83.8% and live streaming shopping users reaching 597 million (54.7% of the total internet users). The interactivity and real-time nature of e-commerce live broadcasting enhance consumer trust, and the convenience of mobile devices enhance user engagement, which has become the core means for retail enterprises to stimulate impulse purchase.

Unlike traditional offline shopping, online shopping breaks through the constraints of time and space, which can easily trigger consumers' impulsive behavior. E-commerce live streaming further catalyzes impulsive purchases by reducing perceived uncertainty and narrowing psychological distance. One of the core objectives of retail enterprises in conducting e-commerce live streaming is to stimulate consumers' impulsive purchases. However, existing research mostly focuses on the impact of traditional e-commerce price discounts and website factors on emotions, with insufficient exploration of the correlation between live streaming contexts (such as anchor characteristics, real-time interaction) and Consumer Sentiment. Furthermore, there is a lack of in-depth analysis of the mechanism through which characteristics of e-commerce live streaming affect impulsive purchase intention through emotions. To address these deficiencies, this paper sets the following research objectives, aiming to provide a more comprehensive theoretical framework and empirical evidence to serve as a reference for future research:

1. Analyzing the impact mechanism of characteristics of e-commerce live streaming on Consumer Sentiment: Based on the S-O-R framework, verifying the differentiated impacts of five dimensions: recommendability, interest, interactivity, online product display, and transaction volume, on consumer arousal and pleasure;

2. Exploring the mediating role of consumer sentiment: Combining media richness theory, analyzing the transmission mechanism of arousal and pleasure in the "characteristics of e-commerce live streaming - impulsive purchase intention" pathway, and verifying the strength of the mediating effect through structural equation modeling;

3. Provide guidance for e-commerce live streaming practices: Guide enterprises to optimize the selection and training system for anchors, design live streaming scenarios and interaction modes, propose differentiated emotional marketing strategies, and enhance conversion rates and user experience.

This study is based on the Stimulus-Organism-Response (S-O-R) model and constructs "characteristics of e-commerce live streaming"

The theoretical model of "(independent variable) - consumer sentiment (mediating variable) - impulse purchase intention (dependent variable)" divides e-commerce live streaming features into five categories: recommendability, entertainment value, interactivity, online product display, and transaction volume

In terms of dimensions, consumer sentiment is divided into two dimensions: arousal and pleasure. A total of 515 valid data collected through questionnaire surveys provide a reliable foundation for analyzing the aforementioned relationships.

2. literature Review

2.1 E-commerce live streaming and impulse Purchase theory

E-commerce live streaming is a marketing model where hosts showcase products, engage in real-time interaction, and promote sales through audio and video technology, integrating the real-time nature of "live streaming" with the transactional attributes of "e-commerce" (Peng et al., 2021). Existing research categorizes its characteristics into single dimensions such as interactivity, professionalism, and entertainment. This study, taking into account the specificity of live streaming scenarios, expands it to five dimensions: Recommendation: Hosts recommend products based on their professional knowledge or actual experience, conveying authoritative information (Han, 2020); Entertainment: Enhancing the viewing experience through humorous language, red packet interactions, and other forms of entertainment (Liu et al., 2020); Interactivity: Hosts and consumers achieve deep communication through bullet comments and real-time Q&A (Wei et al., 2021);Online product presentation: Introducing product details through intuitive and multi-angle approaches to enhance information authenticity (Zhao). Transaction volume: Real-time transaction data triggers consumer herd mentality, strengthening purchase confidence (Rook & Fisher, 1995).

Addo et al. (2021) found a significant positive correlation between live streaming interactivity and consumer engagement, as well as purchase intention; Yuan et al. (2021) pointed out that the utilitarian and trust values of live streaming enhance repurchase intention; Lim (2020) verified that viewers' identification with the host enhances brand loyalty through emotional interaction. However, existing research often focuses on a single characteristic and lacks analysis of the synergistic impact of multiple dimensions.

Consumer emotions are psychological and physiological responses triggered by external stimuli, manifesting as positive states such as pleasure and excitement in shopping scenarios (Izard & Buechler, 1980). Based on Russell's circumplex model of emotion, this study adopts a two-dimensional division of "arousal-hedonic": arousal refers to the level of excitement experienced by consumers during live streaming (such as the reverse measurement of excitement and drowsiness); hedonic refers to the sense of satisfaction and happiness experienced by consumers during live streaming (Koo & Ju, 2010).

Shiau et al. (2021) found that brand experience during shopping festivals influences purchase intention through emotions such as satisfaction; Li et al. (2023) verified that the attractiveness and interactivity of live streamers stimulate impulse Purchase by enhancing consumer pleasure; Hua et al. (2024) pointed out that the interactivity and entertainment value of live streaming enhance purchase intention through emotional transmission. However, existing research has insufficiently explored the correlation between unique live streaming scenarios (such as real-time transaction volume) and emotions.

Impulsive purchase intention refers to the instantaneous, unplanned purchasing tendency of consumers triggered by external stimuli. It is influenced by marketing stimuli (such as price discounts), situational factors (such as the atmosphere of live streaming), and individual traits (such as impulsivity) (Beatty & Ferrell, 1998; Stern, 2022). In e-commerce live streaming, features such as real-time interaction and product display tend to reduce consumers' decision-making rationality, triggering impulsive intention (Lo et al., 2022).

Gong et al. (2019) found that the live streaming atmosphere influences impulsive purchase intention through the mediation of immersive experience; Liu et al. (2020) demonstrated that live-streaming

characteristics influence impulsive behavior through trust and emotional engagement.; Sun et al. (2023) pointed out that perceived value (especially emotional value) significantly enhances the willingness to make impulsive purchases. However, existing research has not fully verified the mediating mechanism of emotions in the relationship between "live streaming features - impulsive purchases".

2.2 Model establishment

According to the definition by A. L. Z. (2020), impulsive purchase intention is a complex individual psychological process influenced by various environmental and psychological factors, manifested as sudden, spontaneous, and unplanned purchasing behavior. Franque (2022) further elaborated that impulse purchases can be categorized into four types—remind-type, pure-type, planned-type, and suggestion-type—based on factors such as whether the purchase satisfies immediate desires, is based on past experiences, is driven by emotions or rational analysis, involves prior planning, and the duration of decision-making. Sun Binbin's (2023) research demonstrates that perceived value significantly influences impulsive buying tendencies, with both factors positively correlating with purchase intention. The study reveals that different dimensions of perceived value—functional, emotional, and social value—exert distinct effects on purchase intention. For instance, enhancing emotional and social value can foster emotional resonance and social recognition, substantially boosting immediate purchase intent and triggering impulsive buying behavior. In the live streaming e-commerce scenario, Mian Y (2023) pointed out that the real-time dynamic interaction and multi-sensory audio-visual stimulation of virtual anchors can induce a sense of urgency and excitement in consumers, further exacerbating the tendency towards impulsive purchases; He Y et al. (2022) demonstrated that both utilitarian and hedonic incentives effectively stimulate consumer purchases in both online and offline environments.; Xin et al. (2024) pointed out that consumers' perception of product value (evaluated from utilitarian and hedonic dimensions) in live streaming scenarios promotes impulse purchase intention, a conclusion consistent with the research results of Fu et al. (2023).

Based on the above research, this paper constructs a research framework for the impact of characteristics of e-commerce live streaming on impulse purchase intention, with characteristics of e-commerce live streaming as the independent variable, Consumer sentiment as the mediating variable, and impulse purchase intention as the dependent variable, as shown in Figure 1:

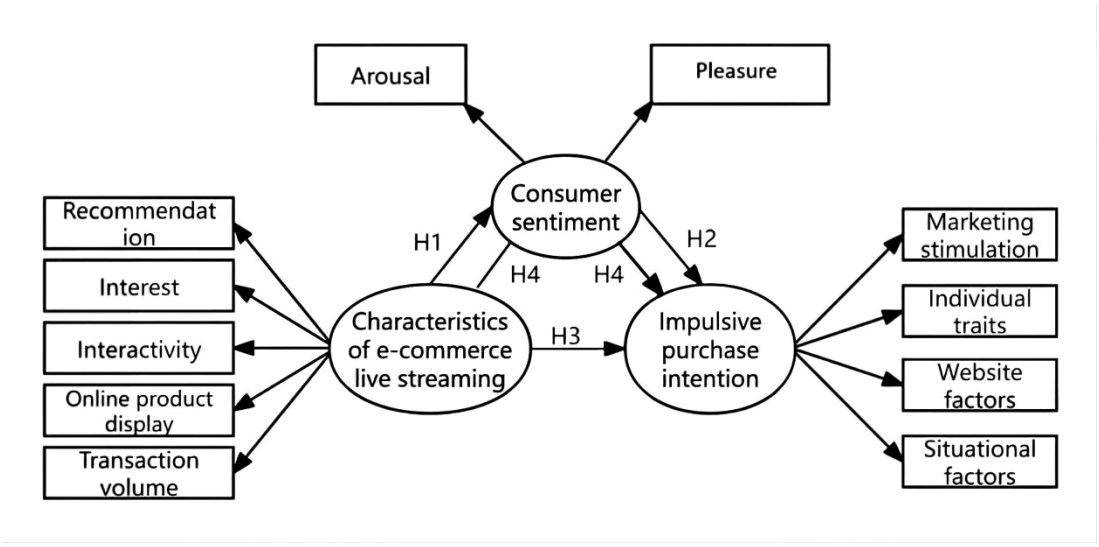

Fig.1: Research Framework

2.3 hypothesis proposal

2.3.1 The relationship between characteristics of e-commerce live streaming and consumer sentiment

Park and Lin (2020) confirmed that live streaming platforms have opened up new avenues for celebrity endorsements. Combining the research on celebrity endorsements with the matching hypothesis in the context of Chinese internet celebrity live streaming e-commerce, they investigated the impact of different types of matching on consumer attitudes. The results showed that product-source matching affects consumers' perception of source attractiveness and credibility, while product-content matching affects attitudes towards the utilitarian and hedonic aspects of content. Source credibility, hedonic attitudes, and self-product matching can enhance purchase intention. Li (2020) pointed out that the significant feature of live streaming e-commerce is that consumers and sellers can interact in real time, creating an immersive and highly engaging shopping experience. Through real-time interactions such as sharing experiences, comparing products, and providing support, an interactive learning process is formed. Sun et al. (2019) and Dehouche & Assarut (2020) conducted a comparative analysis of live-streaming e-commerce and traditional e-commerce models, identifying three key differences: Firstly, the way products are displayed. Traditional e-commerce relies on text and images to describe products, while live streamers showcase products through real-time video, conveying more detailed product information. Secondly, the real-time nature of interaction. In traditional e-commerce, consumers need to exit the product page to communicate with sellers, whereas in live streaming e-commerce, consumers can directly ask questions through the chat interface, and sellers respond in real time. Thirdly, personalized service. In live streaming e-commerce, consumers can inquire about specific products and receive targeted responses. This personalized service and guidance significantly influence purchasing behavior. Furthermore, Dehouche and Assarut (2020) adopted a mixed research method (combining quantitative and qualitative approaches) to analyze data from Facebook live streaming sellers, assess the nature and scope of interaction indicators, outline the dynamic interactive live streaming sales process, and categorize four sales methods and twelve customer acquisition and retention strategies. This seller-driven classification of sales methods aligns with the relationship-building process and outcomes, providing a framework for understanding the relationship-building mechanism in live streaming e-commerce.

Mikalef (2020) pointed out that different forms of product information guide consumers to process information in different ways and through different cognitive processes. Existing research has shown that images have unique appeal to consumers, and unique product display forms can win high attention from users. Online product display is crucial in e-commerce live streaming, which has a positive impact onConsumer Sentiment and can promote the generation of purchase intention. Conformity behavior is a common behavioral pattern among consumers in real life. In the e-commerce live streaming environment, transaction volume is regarded as an important indicator to measure the popularity of the live stream, and this psychology further enhances consumer trust, enabling them to make purchasing decisions in a more relaxed and pleasant state. Based on a comprehensive analysis of the above aspects, this paper proposes the following research hypothesis:

H1: The characteristics of e-commerce live streaming have a positive impact on consumer sentiments.

2.3.2 The relationship between impulsive purchase intention and consumer sentiment

The key prerequisite for impulse shopping is consumer sentiment. Although consumer sentiment are internal emotional responses, they are closely related to consumer behavior. Taking live streaming as an example, viewers not only choose products they want to purchase, but also pay attention to the

emotional experience during the purchasing process. Shiau et al. (2021) confirmed the mediating role of emotions in purchasing behavior, pointing out that marketing activities, brand experiences, price value, and other evaluative responses during shopping festivals can trigger consumer satisfaction and other emotions, which in turn prompt subsequent coping behaviors (Paudel S R, Thapa P. 2025).

When consumers are in a high mood, impulsive purchase behavior often occurs - at this time, consumers' cognitive control over purchasing decisions weakens, and the influence of emotions on behavior significantly increases. Excitement, pleasure, and other emotions triggered by marketing stimuli will prompt consumers to take actions to regulate and express these feelings. Furthermore, Hua et al. (2024) examined the dual impacts of e-commerce technologies. They demonstrated that visible features like interactivity and entertainment (positive attributes) can boost purchase intent through experiential learning, whereas excessive live-streaming frequency and varied content sources (negative aspects) may overwhelm consumers' cognitive load, ultimately diminishing their willingness to buy. For instance, when consumers develop a strong desire for a certain product, they may maintain this heightened state of excitement through purchasing behavior. In such consumption scenarios, consumers tend to simplify the information processing process, no longer deeply analyzing or carefully considering relevant information or alternative options. Instead, they are more likely to make quick purchasing decisions based on immediate feelings and impulses, rather than through comprehensive comparison and evaluation (2020) pointed out that the salient feature of live streaming e-commerce is the real-time interaction between consumers and sellers, creating an immersive and highly engaging shopping experience.

Emotional or affective states significantly influence users' information processing methods: When individuals are in a positive emotional state, their self-efficacy is enhanced, generating strong positive feedback and motivation. However, the motivation to delve into in-depth information processing is relatively weakened at this time, leading them to rely more on simplified information or cues to make purchasing decisions. In some cases, consumers may adopt a strong impulse to buy as a behavioral strategy for emotional regulation. Based on the theory of competitive arousal, Chen et al. (2024) investigated the relationship between audience emotional intensity and consumption amount and frequency during live streaming, revealing how emotional dynamics among audiences and between audiences and streamers influence purchasing behavior.

During e-commerce live streaming, if consumers exhibit irrational psychological states, they tend to overestimate their economic status and underestimate potential risk factors, making them more prone to impulsive consumption driven by pleasant emotions. At this stage, consumers' positive emotions significantly influence their decision-making process, leading them to exhibit a psychological state of "cautiousness and optimism coexisting". Gao, W. (2023) pointed out that when unable to physically interact with products, viewers must quickly assess product credibility. Consistent with this, Iyer et al. (2020) empirically verified that positive emotional states (such as excitement) actively drive impulsive purchase intentions, proposing a dual mechanism where "high arousal pressure" and "positive emotions" independently promote unplanned purchases through different pathways - the former by weakening cognitive control, and the latter by enhancing hedonic motivation. Based on the above research, this paper argues that when consumers experience arousal, pleasure, and other positive emotions during live streaming, these emotions stimulate their impulsive purchase desires: positive emotions can reduce consumers' rational control and enhance their desire and motivation to purchase products; in addition, the fun and interactivity of e-commerce live streaming can exacerbate consumer emotional fluctuations, making them more prone to impulsive purchasing behavior under the influence of the live streaming atmosphere. That is to say, as consumers' positive emotions increase, their probability of making impulsive purchases also increases accordingly. Therefore, it can be inferred that users' positive emotional responses (high pleasure, high arousal) have a positive impact on impulsive purchase intentions. Based on the above analysis, this paper proposes the following hypothesis:

H2: Consumer sentiments have a positive impact on impulse purchase intentions.

2.3.3 The relationship between characteristics of e-commerce live streaming and impulsive purchase intention

The characteristics of e-commerce live streaming have a particularly significant impact on consumer purchasing behavior. Among all forms of e-commerce, e-commerce live streaming is the fastest growing model. The development of e-commerce live streaming is driven by multiple factors, including content innovation and sharing models on Mogujie, support from well-known e-commerce platforms such as JD.com and Taobao, and the deep layout and integration of short video content creation platforms such as Tiktok and Kwai. After breaking through the constraints of geography, time, and space, e-commerce live streaming enables more direct and efficient interaction with users. In recent years, with the rapid development of the e-commerce live streaming industry, more and more e-commerce enterprises have regarded live streaming as an important marketing tool.

Zhang et al. (2021) found that compared to traditional shopping methods, gamification mechanisms (such as unique reward systems and badge upgrades) in online shopping are more likely to prompt consumers to engage in impulsive Purchase behavior. Shi et al. (2022) observed in their study of online shopping behavior that impulsive purchases account for a significant proportion of transactions on certain platforms and for specific product types. Meanwhile, Xu et al. (2020) and other researchers have confirmed that consumers' online shopping behavior is influenced by multiple factors such as platform design, promotional activities, and social interactions. Research shows that over 60% of consumers who visit e-commerce platforms not only make planned purchases but also ultimately make unplanned purchase decisions. In the online shopping scenario, impulsive Purchase has become a common feature of consumer behavior. Yang and Na (2023) conducted a multi-dimensional analysis of online reviews in live streaming e-commerce, based on the dual-factor theory of electronic word-of-mouth and the Stimulus-Organism-Response (S-O-R) model, to deeply explore the impact of online reviews on consumers' purchase intention in live streaming e-commerce, further verifying the important moderating role of perceived risk in consumers' purchase decision-making process. Similarly, Shiau et al (2021) confirmed the mediating role of emotions, indicating that evaluation responses triggered by shopping festivals, such as brand experience and perceived price value, can elicit consumer emotional reactions (such as satisfaction), which in turn prompt them to engage in coping behaviors. Based on the above analysis, this paper proposes the following hypothesis:

H3: The characteristics of e-commerce live streaming have a positive impact on impulse purchase intention.

2.3.4 The mediating role of consumer sentiment

As a group shopping environment, e-commerce live streaming significantly influences consumer sentiment through external environmental factors. During the live streaming process, the level of detail in the recommendation information provided by e-commerce hosts reflects their in-depth understanding and high commitment to the product, which is closely related to the host's professionalism. Zhao, K. et al. (2020) pointed out that in the development of live streaming e-commerce, hosts are the core driving force for sales conversion - not only as product endorsers, but also as key opinion leaders guiding consumer decision-making. Through text mining and analysis of live streaming video content, it was found that certain personality traits (such as openness) of hosts are negatively correlated with cumulative popularity and current fan count, while neurotic traits are positively correlated with their popularity, and professional hosts are more likely to attract a large audience. In addition, Yang et al. (2023) pointed out that e-commerce hosts present product information in a performative manner, which can enhance the viewing experience and thus stimulate consumers' desire to purchase; the inherent entertainment attribute of live streaming stimulates consumers to produce emotions such as excitement and pleasure (Meng, 2020);Xue (2020) further

discovered that a livestreamer's role extends beyond product demonstrations to include designing interactive activities (such as themed discussions and special segments) to create an immersive atmosphere, thereby enhancing viewer retention. Yan et al. (2023) pointed out that internet celebrity hosts, with their highly personalized charm and strong interactive abilities, frequently interact with netizens through various online platforms (such as social networks, video sharing platforms), quickly accumulate a large number of fans, stand out in the digital space, and become influential figures. Lo, P. S. (2022) confirmed that the performance of the host significantly affects the audience's emotions and cognitive behavior - the host attracts viewers into the live streaming room through unique talents and traits, and engages in social interaction through live streaming chats, real-time comments, etc. This not only shortens the psychological distance between the host and the audience, but also enhances audience trust, ultimately increasing purchase intention.

In addition, consumers' herd mentality may lead them to overlook their actual needs, often resulting in strong emotions such as trust, conformity, and excitement. As the number of viewers in live streaming rooms increases, product transactions grow at a faster rate, and users' arousal emotions are more easily triggered. Impulsive Purchase is usually an instant and thoughtless decision-making process, driven largely by subjective emotions. Consumer sentiment include arousal and pleasure, both of which can stimulate impulsive Purchase intentions. Zhang et al. (2023) found that during non-shopping festivals, the relationship between perceived stimulation and impulsive Purchase is partially mediated by perceived utilitarian value (i.e., cognitive response); during shopping festivals, it is fully mediated by perceived hedonic value (i.e., emotional response), and the impact of marketing stimuli on consumer cognition and information processing during shopping festivals is stronger than that during non-shopping festivals. Liang et al. (2023) pointed out that various restrictions and promotional strategies in sales events can prompt consumers to make impulsive Purchase decisions - these strategies make consumers rely on intuitive heuristic cues to quickly judge during the information processing stage, leading to irrational behaviors such as impulsive Purchase. Based on the aforementioned analysis, this paper proposes the following hypothesis:

H4: Consumer sentiments play a mediating role between the characteristics of e-commerce live streaming and impulse purchase intentions.

3. Research Methodology

3.1 Research Design

Adopt a two-stage design of "pre-research - formal research":

Pre-research: Invite 5 marketing experts and 20 live shopping users to revise the questionnaire, test the reliability and validity (Cronbach's $\alpha>0.8$) through a small sample ($n=80$), and optimize the item wording;

Formal survey: In March and April 2024, questionnaires were distributed through "Wjx.cn + live streamer fan groups", and respondents with live shopping experience were screened. A total of 515 valid questionnaires were collected (with an effective rate of 92.7%).

3.2 Study population

As the core research topic of this paper is the impact of e-commerce live streaming features on consumers' impulsive purchase intentions, only consumers who have experience in e-commerce live streaming shopping can truly reflect the service they experienced during the process and generate corresponding purchasing behaviors based on their own feelings. This study adopts simple random sampling, with the research object being consumers' impulsive purchase intentions. The questionnaire is mainly distributed through the Wenjuanxing platform, and only those who are over 18 years old and

have experience in e-commerce live streaming shopping are considered valid respondents.

3.3 research sample

This study explores the impact of e-commerce live streaming features on consumers' impulsive purchase intentions. The researchers comprehensively considered the sample size requirements applicable to the software analysis data in this study. According to the research conducted by Haile, Black, Babin, and Anderson (2010), using Structural Equation Modeling (SEM) for analysis requires a suitable and sufficient sample size to assess the reliability of variable data. Based on the criteria proposed by Kemley and Lee, a sample size of 300-500 falls within the "good" to "excellent" range for SEM analysis.

Therefore, researchers collected data through online questionnaires, primarily targeting adult consumers aged 18 and above, to assess the impact of e-commerce live streaming features on consumers' impulsive Purchase habits. To better understand the effectiveness of short video content marketing on social media platforms, the survey covered people of different age groups, including those aged 20 and below, 21-30, 31-40, and 41 and above.

3.4 variable measurement

The description and measurement of variables are based on scales published in authoritative journals both domestically and internationally, and are appropriately revised in conjunction with the actual research situation. After item screening, a formal survey questionnaire is formed.

3.4.1 E-commerce live streaming feature scale

The research scale on the characteristics of e-commerce live streaming has been relatively mature. This study mainly draws on the theories of scholars such as Luke and Fisher, dividing the characteristics of e-commerce live streaming into five dimensions for measurement: recommendation degree, interest, interactivity, online product display, and transaction volume. The recommendation dimension contains 7 measurement items, the fun dimension contains 3 measurement items, the interaction dimension contains 4 measurement items, the online product display dimension contains 4 measurement items, and the transaction volume dimension contains 4 measurement items.

3.4.2 Consumer sentiment scale

When measuring consumer sentiment, this article primarily considers two dimensions: arousal and happiness. For the assessment of arousal and happiness, the arousal-happiness scale used by Koo and Ju (2010) in their research on consumer sentiment in online shopping was primarily adopted, and the scale was also adjusted according to the specific scenarios of e-commerce live streaming. In the adjusted scale, the two dimensions of wakefulness and pleasure each contain 3 items.

3.4.3 Impulsive purchase intention scale

To measure impulsive purchase intention, this study primarily refers to and adopts the impulsive purchase intention Scale, a single-dimensional measurement tool developed by Beatty and Ferrell (1998), as the core framework for assessing consumers' impulse Purchase tendencies. At the same time, the scale is adjusted accordingly in light of the specific scenario of e-commerce live streaming involved in this study. The adjusted scale consists of a total of 4 items.

3.5 Reliability and Validity

The reliability and validity tests of the questionnaire can reflect the measurement degree of each item to the variable. Reliability reflects the internal consistency among measurement results, while validity reflects the degree of difference in the attributes of survey respondents. Specifically, reliability testing reflects the reliability of the questionnaire, which refers to the consistency level of repeated measurement results for the same subject. If the same scale is used for multiple measurements at

different time points, and the consistency between the final measurement results is high, it indicates that the scale items are clearly stated and have clear meanings, possessing high external reliability. This study employs Cronbach's alpha coefficient as the metric for assessing reliability.The value range of this coefficient is 0-1. The closer the value is to 1, the better the internal consistency of the data, and the higher the acceptability of the scale.

3.6 data collection

In the formal research phase of this study, online questionnaire surveys were selected as the primary data collection method. Scholars Xie and Liang (2018) found that there were no significant differences in the psychological measurement attributes, social desirability bias, and data integrity of respondents between online questionnaires and traditional paper questionnaires. However, Yu et al. (2019) proposed that the development of mobile internet technology, especially the optimization of online questionnaire dissemination methods and incentive mechanisms, has had a profound impact on overall data quality, providing new opportunities for improving and perfecting online survey methods.

This survey primarily targets users who have experience with e-commerce live streaming shopping. To ensure the accuracy and coverage of the data, the research team designed a detailed questionnaire covering multiple dimensions such as live streaming viewing frequency and duration. The questionnaire was widely distributed through online platforms, primarily through fan groups of internet celebrity hosts, supplemented by personal WeChat Moments, Weibo, and other channels.

The "fan celebrity effect" brought by internet celebrity hosts has become a phenomenon that cannot be ignored in today's society. Such hosts attract a large number of loyal followers, and when individuals gather a certain number of fans, this celebrity effect will naturally emerge. Whether fans are attracted by the host's appearance or the products they promote, they may engage in impulsive Purchase behavior. Compared to ordinary users, fans often show higher loyalty and tend to make multiple, continuous purchases, making them the core user group that this survey focuses on.

After contacting the group owner and explaining the purpose of the survey, the research team will share the questionnaire within the group. To encourage group members to fill out the questionnaire diligently and efficiently, respondents for each valid questionnaire will receive corresponding rewards.

3.7 Data analysis

This section primarily utilizes SPSS 26.0 and AMOS 28.0 software for data processing and analysis. Specifically, AMOS 26.0 statistical software is employed to analyze the collected data, while Structural Equation Modeling (SEM) is utilized to verify the hypothesized relationships.

AMOS is an add-on module provided by the IBM SPSS software package, primarily used for structural equation modeling (SEM). AMOS 26.0, as a specific version of this software, provides a powerful and flexible platform for advanced statistical analysis, especially suitable for research that requires in-depth exploration of complex relationships between variables.

The data analysis process is as follows:

Conduct comprehensive and in-depth processing and analysis of the collected basic data, including descriptive statistical analysis, common method bias testing, reliability and validity analysis, as well as correlation analysis between variables; Conduct hypothesis testing, encompassing path analysis, mediation effect analysis, and moderation effect analysis; upon completion of the aforementioned analyses, summarize and discuss the results of data verification.

4. Data Analysis and Results

4.1 Descriptive statistical analysis

This survey covered a total of 515 respondents, analyzing them from multiple dimensions such as gender, age, education level, monthly consumption, and live shopping experience. The results

presented various characteristics.

In terms of gender distribution, there were 265 male respondents, accounting for 51.46%, and 250 female respondents, accounting for 48.54%. The gender ratio was relatively balanced. In terms of age composition, the 21-40 age group was the main group, accounting for 64.66%. Among them, the 21-30 age group accounted for 34.37%, and the 31-40 age group accounted for 30.29%. The young and middle-aged group was the core target of this survey. In terms of education, those with bachelor's degree or above accounted for 80.2%: 59.42% with bachelor's degree, 16.12% with master's degree, and 4.66% with doctoral degree or above. It can be seen that the overall educational level of the sample group is relatively high.

In terms of monthly consumption, the low-to-medium consumption range dominates, with the $400-$1200 range accounting for over 74%, indicating that the consumption behavior of most respondents is relatively stable. According to the data on live shopping experiences, 74.95% of the respondents have had live shopping experiences, among which the proportion of high-frequency shoppers who shop 3-4 times and 5-6 times per week is nearly 48%, and the shopping duration is mostly concentrated between 0.5-1.5 hours. This indicates that live streaming shopping still occupies an important position in the consumer market, with consumers exhibiting high dependency and loyalty towards it.

The aforementioned data provides a rich and valuable reference for further research on consumer behavior, market positioning, and the formulation of marketing strategies. For specific details, please refer to Table 1.

Table 1. Description of sample feature distribution

Item	Option	Frequency	Percentage (%)
1. Your gender:	male	265	51.46
	female	250	48.54
2. Your age:	Below 20	59	11.46
	21-30	177	34.37
	31-40	156	30.29
	41 or above	123	23.88
3.Your educational background:	High school/vocational school or below	102	19.81
	undergraduate	306	59.42
	Master	83	16.12
	Doctoral degree or above	24	4.66
4.Your monthly expenses:	Below $400	41	7.96
	$400–$800	229	44.47
	$801–$1200	156	30.29
	$1201 and above	89	17.28
5.Have you ever had a live shopping experience?	Yes (please go to Q6)	386	74.95
	No (please go to Q8)	129	25.05
6.how often do you	1-2 times a week	45	8.74

watch the live broadcast of e-commerce every week?	3-4 times a week	129	25.05
	5-6 times a week	117	22.72
	7 times or more per week	95	18.45
7. how long do you watch the live broadcast each time?	0.5 hours or less	27	5.24
	0.5-1 hour	175	33.98
	1-1.5 hours	118	22.91
	2 hours or more	66	12.82

When analyzing quantitative data, it is necessary to describe and analyze the overall situation by combining indicators such as mean and skewness. Research indicates that when the absolute value of kurtosis is less than 10 and the absolute value of skewness is less than 3, it suggests that the current data is basically normally distributed.

Table 2. Descriptive statistical results

Variable name	Min	Max	Mean	SD	skewness	kurtosis
Recommendation	1	5	3.553	1.128	-1.078	-0.761
Interest	1	5	3.598	1.122	-0.73	-0.813
Interactivity	1	5	3.546	1.143	-0.972	-0.733
Online product display	1	5	3.572	1.099	-0.861	-0.758
Transaction volum	1	5	3.503	1.164	-1.041	-0.669
Arousal	1	5	3.447	1.122	-1.075	-0.545
Pleasure	1	5	3.414	1.215	-1.077	-0.56
Impulsive purchase intention	1	5	3.79	1.003	-0.13	-1.083

As can be seen from the table above, the kurtosis and skewness coefficients of each variable are all less than 10, indicating that the sample data for that variable follows a normal distribution.

4.2 Reliability Analysis

This study used Cronbach's alpha coefficient to test the reliability of the questionnaire. Generally speaking, when the Cronbach alpha coefficient is higher than 0.7, the scale has good reliability. If the coefficient is higher than 0.8, the reliability is better. However, if the coefficient is higher than 0.9, the reliability of the scale is excellent.

Table 3. Total Statistics and Reliability Coefficients for the Recommendation Scale

Item	RA1	RA2	RA3	RA4	RA5	RA6	RA7
Item–total correlation	0.800	0.766	0.795	0.781	0.774	0.757	0.803
Cronbach‘s α if item deleted	0.920	0.924	0.921	0.922	0.923	0.925	0.920

Note. Overall Cronbach‘s α for the scale = .932.

Table 4. Total Statistics and Reliability Coefficients for the Interest Scale

Item	FA1	FA2	FA3
Item–total correlation	0.674	0.702	0.693
Cronbach‘s α if item deleted	0.781	0.753	0.762

Note. Overall Cronbach‘s α for the scale = .831.

Table 5. Statistics and Reliability Coefficients for the Interactivity Scale

Item	SI1	SI2	SI3	SI4
Item–total correlation	0.743	0.732	0.738	0.722
Cronbach‘s α if item deleted	0.838	0.843	0.840	0.846

Note. Overall Cronbach‘s α for the scale = .876.

Table 6. Statistics and Reliability Coefficients for the Online Product Display Scale

Item	OPD1	OPD2	OPD3	OPD4
Item–total correlation	0.722	0.688	0.726	0.733
Cronbach‘s α if item deleted	0.828	0.842	0.827	0.824

Note. Overall Cronbach‘s α for the scale = .867.

Table 7. Statistics and Reliability Coefficients for the Transaction Volume Scale

Item	TR1	TR2	TR3	TR4
Item–total correlation	0.750	0.765	0.742	0.764
Cronbach‘s α if item deleted	0.859	0.853	0.862	0.854

Note. Overall Cronbach‘s α for the scale = .889.

Table 8. Statistics and Reliability Coefficients for the Arousal Scale

Item	ARO1	ARO2	ARO3
Item–total correlation	0.682	0.672	0.677
Cronbach‘s α if item deleted	0.750	0.760	0.755

Note. Overall Cronbach‘s α for the scale = .822.

Table 9. Statistics and Reliability Coefficients for the Pleasure Scale

Item	PLE1	PLE2	PLE3
Item–total correlation	0.788	0.797	0.678
Cronbach‘s α if item deleted	0.787	0.778	0.886

Note. Overall Cronbach‘s α for the scale = .871.

Table 10. Statistics and Reliability Coefficients for the Impulsive Purchase Intention Scale

Item	IPI1	IPI2	IPI3	IPI4
Item–total correlation	0.656	0.678	0.675	0.709
Cronbach‘s α if item deleted	0.812	0.803	0.805	0.789

Note. Overall Cronbach‘s α for the scale = .844.

The reliability analysis of each variable in this study showed that the Cronbach's alpha coefficients of all scales were higher than 0.7, which met the reliability criteria. This indicates that the reliability of the questionnaire has been tested and can be used for subsequent research analysis.

4.3 Validity and factor analysis

By using SPSS, the significance values were found to be less than 0.05, indicating that the questionnaire data is suitable for factor analysis.

Table 11. Bartlett tests

dimension	chi-square	df	*p*
Characteristics of e-commerce live streaming	7087.341	231.000	0.000
Consumer sentiments	1522.579	15.000	0.000
Impulsive purchase intention	810.231	6.000	0.000

The above table shows that the data passed the Bartlett sphericity test ($p<0.05$) and is suitable for factor analysis.

4.4 correlation analysis

In statistics, research often begins with univariate analysis, progressing to analyze bivariate relationships, and can also investigate multivariate relationships. Correlation analysis aims to quantify the strength of linear correlation between variables and serves as a method and tool for assessing the strength of statistical relationships between variables. Correlation analysis examines the strength and direction of the direct linear correlation between two variables. Regardless of the primary or secondary factors, both variables are included as outcome variables in the correlation analysis.

Meanwhile, the commonly used correlation coefficient (R) describes the degree of linear correlation between variables: the sign of the correlation coefficient R indicates the direction of the direct linear relationship between two variables, with $R>0$ indicating positive correlation, $R<0$ indicating negative correlation, and $R=0$ indicating zero correlation; the absolute value of R indicates the degree of linear correlation between two variables, with the absolute value closer to 1 indicating a higher degree

of correlation, and closer to 0 indicating a lower degree of correlation. The Pearson correlation coefficient (also known as the product-moment correlation coefficient) is a commonly used indicator for quantitatively describing the degree of linear correlation.

Table 12. Pearson correlation analysis results

	Impulsive purchase intention	Characteristics of e-commerce live streaming	Consumer sentiments
Impulsive purchase intention	1		
Characteristics of e-commerce live streaming	0.347	1	
Consumer sentiments	0.463	0.182	1

$p<0.05$ $p<0.01$

The data in the table indicates that there is a significant positive correlation between impulsive purchase intention and characteristics of e-commerce live streaming ($r=0.347$, $p<0.01$). This suggests that the more prominent the interactive nature and display format of live streaming, the stronger the impulsive purchase intention of consumers, with a moderate positive correlation between the two;

The intention to make impulsive purchases is strongly and significantly positively correlated with consumer sentiment ($r=0.463$, $p<0.01$), indicating that the stronger the positive emotions (such as arousal and pleasure) consumers experience in the live streaming scenario, the more likely they are to engage in impulsive purchasing behavior. The influence of emotions on the intention to make impulsive purchases is more direct and significant;

The characteristics of e-commerce live streaming are significantly positively correlated with consumer sentiment ($r=0.182$, $p<0.01$), indicating that live streaming design (such as the attractiveness of the host, the interest of the content, etc.) may indirectly promote impulsive purchase intention by stimulating positive consumer sentiment, forming a potential influence path of "characteristics of e-commerce live streaming → consumer sentiment → impulsive purchase intention".

In summary, live streaming platforms can stimulate consumer sentiment by optimizing live streaming features (such as enhancing interactivity and enhancing content attractiveness), thereby promoting impulsive purchasing behavior. Emotions may be a key mediating variable connecting live streaming features and purchase intention.

4.5 Structural equation modeling and hypothesis testing

4.5.1 model fitting

The model fit index is a statistical metric that quantifies how well a theoretical structural model aligns with observed data. Various types of fit indices can be calculated based on factors such as model complexity, sample size, correlation, and absorbability. In this study, we first evaluated the constructed structural model to ensure it met all structural requirements, with the test results presented in the table below.

Table 13. Model fit results

Fit parameters	CMIN	DF	CMIN/DF	GFI	IFI	TLI	CFI	RMSEA
outcome	456.865	454	1.205	0.940	0.990	0.989	0.990	0.020
standard			3.	>0.8	>0.8	>0.8	>0.8	<0.08

According to the results in the table, the overall model fits well, and the fitted values of all indicators are within the recommended range.

4.5.2 Path coefficient and hypothesis testing

The parameter estimation results are presented in the table below. Model evaluation begins with a significance test for the path coefficients, assuming the coefficients to be zero. AMOS provides a convenient testing method called "Critical Ratio (CR)", along with the corresponding p-value for the CR value, which can be used to determine the statistical significance of the path coefficients. If the p-value corresponding to the CR value is less than 0.05, the path coefficient is considered significant.

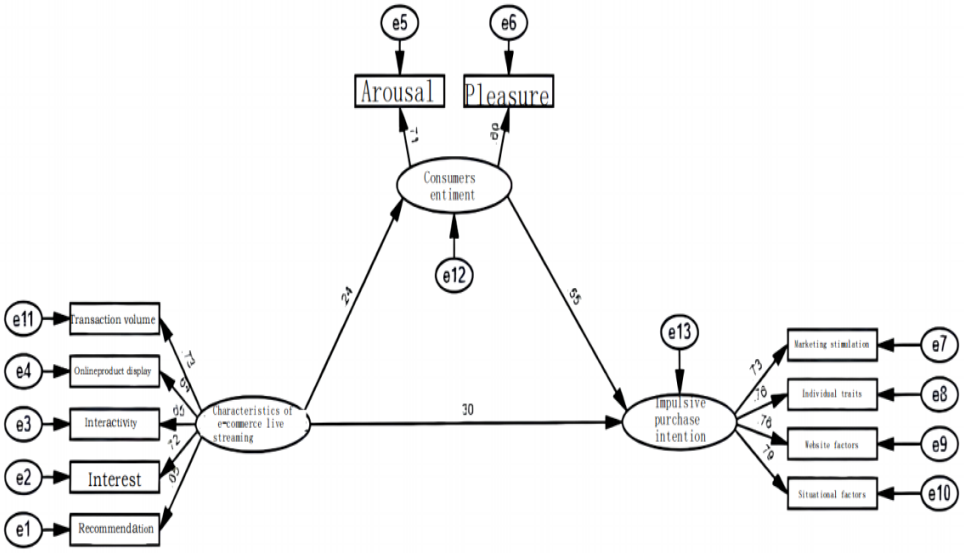

Fig.2: Structural equation model

Table 14. Structural model path analysis results

path			β	S.E.	C.R.	p
Consumer sentiment	--->	Characteristics of e-commerce live streaming	0.233	0.064	3.679	
Recommendation	--->	Characteristics of E-commerce Live Streaming	0.674			
Interest	--->	Characteristics of E-commerce Live Streaming	0.792	0.093	11.297	
IInteractivity	--->	Characteristics of E-commerce Live Streaming	0.691	0.09	10.541	
Online product display	--->	Features of E-commerce Live Streaming	0.683	0.088	10.538	
Transaction volum	--->	Characteristics of e-commerce live streaming	0.774	0.096	11.523	
Impulsive purchase	--->	Consumer Sentiments	0.545	0.089	7.435	

intention					
Impulsive purchase intention	--->	Characteristics of e-commerce live streaming	0.311	0.066	5.836
Arousal	--->	consumer sentiments	0.787		
Pleasure	--->	consumer sentiment	0.701	0.116	7.785

The above results indicate that hypothesis H1 is validated: the path coefficient of e-commerce live streaming features on consumer sentiment is 0.233 (S.E. = 0.064, C.R. = 3.679, $p < 0.001$), and the p-value reaches the acceptable level ($p < 0.001$), indicating that e-commerce live streaming features have a significant positive impact on consumer sentiment. Hypothesis H1 is confirmed, that is, the more prominent the features of live streaming, such as recommendability and interest, the more it can stimulate positive consumer sentiment.

Assuming H2 verification result: The path coefficient of consumer sentiment towards impulsive purchase intention is 0.545(S.E. = 0.089, C.R. = 7.435, $p < 0.001$), with a standardized path coefficient of 0.545 ($p < 0.001$), indicating that consumer sentiment have a significant positive effect on impulsive purchase intention. Hypothesis H2 is confirmed, that is, the stronger the emotions such as pleasure and arousal generated by consumers during live streaming, the more likely they are to trigger impulse Purchase behavior.

Assuming the verification result of H3: the path coefficient of e-commerce live streaming features on impulsive purchase intention is 0.311(S.E. = 0.066, C.R. = 5.836, $p < 0.001$), with a standardized path coefficient of 0.311 ($p < 0.001$), indicating that the characteristics of e-commerce live streaming can directly and positively influence impulsive purchase intention. Hypothesis H3 is supported, meaning that the interactive nature and product display features of live streaming can directly drive consumers to develop impulsive purchase intention.

4.5.3 Mediation effect test (Bootstrap method)

In this study, the Bootstrap method of AMOS 26 software was employed to examine the mediating effect, with the sample size set at 5000 times (usually requires more than 1000 times). Bootstrap method is one of the most commonly used methods to test mediation effects 1. Repeat sampling 1000-5000 times at a 95% confidence level, and observe the upper and lower limits of the confidence interval (CI) - if the interval does not include 0, then the mediating effect is significant; otherwise, the mediating effect fails to pass the test (Efron, B., 1979). The test results are summarized in the table below.

Table 15. Intermetion verification results

Mediation path	Effect type	Estimate	Lower	Upper	p
Characteristics of e-commerce live streaming → Consumer sentiment → Impulsive purchase intention	direct effect	0.384	0.245	0.558	0.000
	indirect effect	0.157	0.079	0.257	0.000
	total effect	0.541	0.392	0.725	0.000

Direct effect: The estimated value of the direct effect of characteristics of e-commerce live streaming on impulsive purchase intention is 0.384, with a 95% confidence interval of [0.245, 0.558] and a p-value of 0.000, indicating that this direct influence path is significantly present, that is, the enhancement of characteristics of e-commerce live streaming can directly increase consumers' impulsive purchase intention;

Indirect effect: The estimated value of the indirect effect is 0.157, with a 95% confidence interval of

[0.079, 0.257] and a p-value of 0.000, indicating that consumer sentiment indeed plays a significant mediating role between characteristics of e-commerce live streaming and impulsive purchase intention. When characteristics of e-commerce live streaming are optimized (whether it is the interest and interactivity of live streaming content or the richness of product display), it will first stimulate consumer sentiment, thereby promoting consumers' impulsive purchase intention;

Total effect: The estimated value of the total effect is 0.541, with a 95% confidence interval of [0.392, 0.725] and a p-value of 0.000. It represents the sum of the direct effect and the indirect effect, further verifying that the comprehensive impact of characteristics of e-commerce live streaming on impulsive purchase intention is highly significant.

5. Discussion

The results of this study indicate that: the characteristics of e-commerce live streaming significantly enhance consumer sentiment (H1 supported): recommendability (professional recommendation by the host) and interest (entertainment content) have the most significant impact on pleasure, while interactivity and online product display have a more pronounced effect on arousal, which is consistent with Yang et al.'s (2023) conclusion that "host performance-based display enhances emotional experience"; Consumer sentiment significantly promote impulsive purchase intention (H2 supported): the impact of pleasure on impulse intention (β=0.382) is slightly higher than that of arousal (β=0.351), indicating that consumers' positive emotional satisfaction is more likely to trigger immediate purchases than an excited state, validating Iyer et al.'s (2020) viewpoint that "emotions reduce self-control"; the characteristics of e-commerce live streaming directly affect impulsive purchase intention (H3 supported): The direct effects of online product display (β=0.287) and transaction volume (β=0.263) are most significant. This is because real-time product presentation reduces information asymmetry, while high transaction volume triggers herd mentality, which is consistent with Xu et al. (2024) 's conclusion that' social presence enhances purchase intention.'Consumer emotions play a significant mediating role (H4 supported): live streaming features indirectly affect purchase intention through emotional transmission, indicating that enterprises cannot stimulate impulsive behavior solely through "hard selling". Instead, they need to strengthen decision-making motivation through emotional resonance, which is consistent with the finding of Zhang et al. (2023) that "emotion is a key bridge for impulsive purchases".

5.1 theoretical contribution

1. Expanding the dimensional division of e-commerce live streaming features: Refining live streaming features into five dimensions, addressing the limitations of existing research focused on "single dimension", and providing a more comprehensive variable framework for subsequent research;

2. Improving the emotional mediation mechanism: verifying the chain path of "characteristics of e-commerce live streaming - emotion - impulsive purchase", filling the theoretical gap of emotional mediation in the live streaming context;

3. Integrating multiple theoretical perspectives: Combining S-O-R and media richness theory to explain how the interactivity and real-time nature of live streaming influence decision-making through emotions, enhancing the applicability of the theory.

5.2 Practical Implications

1. Optimize live broadcast content design:

Enhance recommendation: Train anchors in professional knowledge, recommend products based on actual experience, and improve the credibility of information; increase interest: enhance pleasure through activities such as red envelopes and fun quizzes, extending user stay time; enhance

interaction: Answer questions in real time with bullet comments and design interactive activities such as "like to win" to enhance user engagement.

2. Improve product display and transaction volume presentation:

Employing multi-perspective and dynamic demonstrations to present product details, reducing perceptual uncertainty; displaying real-time transaction volume and positive reviews, leveraging herd mentality to enhance purchasing trust.

3. Accurately trigger consumer sentiment:

For arousal: Enhance excitement through tactics such as "limited-time discounts" and "stock shortage"; for happiness: Create a relaxed live streaming atmosphere and strengthen the emotional connection between the host and the audience.

6. Research Limitations and Future Directions

1. Sample limitations: The sample is primarily drawn from the fans of live streamers, which may introduce selection bias. In the future, stratified sampling can be employed to cover lower-tier cities and middle-aged and elderly groups;

2. Variable limitations: Moderator variables (such as consumer impulsivity traits and product type) were not considered. In the future, the moderating effect of product involvement on the "emotion-impulsive Purchase" pathway could be explored;

3. Limitations of research methods: Using cross-sectional data, it is impossible to reveal the causal temporal sequence between variables. In the future, longitudinal tracking or experimental methods can be used to verify causal relationships;

4. Limitations of live streaming types: The differences between live streaming on e-commerce platforms (such as Taobao) and short video platforms (such as Tiktok) have not been distinguished. In the future, the impact mechanisms of different types of live streaming characteristics can be compared.

7. Conclusion

Based on the S-O-R model, this study empirically examines the relationship between characteristics of e-commerce live streaming, consumer sentiment, and impulsive purchase intention. The results indicate that characteristics of e-commerce live streaming (recommendation, interest, interactivity, online product display, transaction volume) not only directly enhance impulsive purchase intention but also indirectly exert their influence through consumer sentiment (arousal, pleasure). The study reveals the internal mechanism by which e-commerce live streaming triggers impulse Purchase, providing theoretical basis and practical guidance for enterprises to optimize live streaming marketing strategies and enhance consumer emotional experience. At the same time, it provides a new perspective for subsequent research in the field of e-commerce live streaming.

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