

Exploring How the Characteristics of Live Streaming Affect Impulse Buying Behaviour in Live Streaming Commerce: The Mediating Effect of Trust and Flow Experience

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Abstract

This research aims to examine the effect of the characteristics of live streaming on consumers' impulsive buying behaviour. The study adopts the stimulus–organism–response theory (S-O-R), as a theoretical framework. The study used a self-administered questionnaire for data collection. The respondents were 291 viewers who had of in watching live streaming. The data was analyzed using the partial least squares structural equation model (PLS-SEM) technique with SmartPLS software. The results show that social presence and entertainment positively affect consumers' flow experience and trust, while personalization only affects trust but not flow experience; both flow experience and trust have positive effects on impulsive purchase and play a mediating role on the relationships between social presence, entertainment, and impulsive buying behaviour. The findings of this study extend existing theoretical research on live streaming commerce and provide some practical implications for streamers and e-retailers.

Keywords: livestream characteristics, flow experience, trust, impulsive buying, livestream

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1 INTRODUCTION

With the rapid development of social media and other network technologies, live streaming commerce has emerged as a new business model in recent years (Ma et al., 2022). By Jan 2023, there were 4.76 billion social media users over the world, equivalent to around 60 percent of the total global population (Meltwater & We Are Social, 2023). Data show that in 2022, 23.7% of global users were using social media to watch live content (Ceci, 2023). According to Global Industry Analysts, Inc (2023), the global live video streaming platform market was estimated at US\$11.9 billion in the year 2022. It is predicted that by 2030 this figure will reach a value of US\$42.2 billion, with a compound annual growth rate of 17.1% over the period from 2022 to 2030. Therefore, many operators of e-commerce shopping platforms have integrated live streaming into their business platforms to allow streamers to showcase their products and to boost sales (Chan et al., 2022). Live streaming commerce presents a promising avenue for boosting sales performance (Lo et al., 2022; Khoi & Le, 2023) because it urges viewers to make purchases during live streaming sessions, leading to their impulsive buying behaviour. Consequently, the better merchants understand the mechanisms driving viewers' behaviours, such as impulsive buying, the more effectively they can leverage live streaming commerce to enhance their businesses (Yu et al., 2022; Khoi & Le, 2023).

Impulsive buying behaviour refers to an unplanned buying behaviour that arises among customers when they are stimulated (Yang et al., 2022). According to prior research (Hausman, 2000), 30–50% of all retail sales are from impulse buying whereas almost 90% of customers make purchases on impulse. In the online context, impulse consumption accounts for approximately 40% of online shopping (Liu et al., 2013). Therefore, online impulsive buying is an important tendency in commerce, including live streaming commerce (Khoi & Le, 2023). Indeed, there is a significant contribution of impulse buying to firms' product sales in live streaming commerce (Lo et al., 2022). Hence, it is necessary to explore the consumers' impulsive buying behaviour in live streaming commerce.

In the context of live streaming e-commerce, prior research has primarily focused on various object factors, including interface design (Yang et al., 2022), exterior design (Gong et al., 2020), website design (Cui et al., 2022). Product features have mainly been examined through the perspective of product price and promotion (Huang & Suo, 2021; Zhang et al., 2022b; Lo et al., 2022) and usefulness (Lee & Chen, 2021; Xiang et al., 2022). Additionally, attention has been directed towards dimensions such as social presence (Ming et al., 2021; Dong et al., 2023; Li et al., 2022b), entertainment (Yan et al., 2022; Lv et al., 2022), and interaction (Li et al., 2022a; Yu et al., 2022; Lv et al., 2022). Despite the growing popularity of live streaming and its impact on consumer impulsive buying behaviour, scant attention has been paid to the characteristics of e-commerce live streaming (Lv et al., 2022) to provide a comprehensive picture of the fundamental features inherent to this communication platform, such as social presence (Ming et al., 2021; Dong et al., 2023; Li et al., 2022b), personalization (Khoi & Le, 2023), and entertainment (Yan et al., 2022; Lv et al., 2022). Indeed, social presence helps bridge the psychological gap between viewers and streamers, fostering a sense of connection and immediacy (Ming et al., 2021). Personalization enhances the shopping experience by tailoring it to individual preferences (Cui et al., 2022), and entertainment provides enjoyment and reduces stress (Chen & Lin, 2018). These factors together improve viewers' attitudes towards the information presented and increase the persuasiveness of livestream sessions, thus triggering impulsive buying. Secondly, although previous studies have confirmed the positive link between social presence, personalization, entertainment, and impulsive buying behaviour (Dong et al., 2023; Cui et al., 2022), inconsistency still exists regarding such relationships (Deng et al., 2023; Khoi & Le, 2023). Besides, the mediating mechanism for the link from the characteristics of live streams to impulse buying behaviour is limited. This is in line with the call of Deng et al. (2023) for more studies that delve deeper into whether there is a mediating variable between social presence and impulsive purchases in live streaming commerce.

To address the gaps in the literature, the current study aims to investigate the mediating mechanisms linking the characteristics of live streaming, including social presence and impulsive purchasing via trust, which is an affective condition related to consumers' trust in the product and the streamer in livestream commerce (Ming et al., 2021). Flow experience stands for a cognitive condition in which the people watching a live stream are so focused on the content of that live stream that they are not easily disturbed by the outside world (Chen & Lin, 2018). Particularly, drawing on the S-O-R model (stimulus-organism-response), this study examines the characteristics of live streaming, namely, social presence, personalization, and entertainment, as stimuli which affects the consumer's trust and flow experience (as organism), leading to consumers' impulsive purchase behaviour (as response).

2 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Literature Review

2.1.1 S-O-R Theory

Mehrabian and Russell (1974) proposed S-O-R (Stimulus-Organism-Response) theory to explain how the environment influences human behaviour. 'Stimulus' refers to stimuli from external environmental factors; 'Organism' reflects a person's internal condition when that individual experiences a stimulus; and 'Response' is the individual's behaviour in response to stimuli. According to Cui et al. (2022), the S-O-R model can be applied to both offline and online contexts. In the live streaming context, when consumers engage with live streaming sessions, they may be influenced by various external stimuli, such as products, real-time interactions, marketing tactics, and other environmental factors. During this process, consumers actively extract relevant information from the stimuli, prompting them to construct a "cognitive framework" based on subjective perceptions before responding accordingly (Zhang et al., 2022b). Indeed, prior studies have applied the S-O-R framework to examine impulsive purchasing behaviour in the context of live streaming commerce (Ming et al., 2021; Dong et al., 2023; Khoi & Le, 2023). In these studies, stimuli are mainly traditional online environmental stimuli such as social presence, e.g., other viewers and products (Ming et al., 2021; Dong et al., 2023), interactivity and experience (Lo et al., 2022; Yu et al., 2022; Dong et al., 2023), price, and sales promotions (Zhang et al., 2022b; Lo et al., 2022), and marketing stimuli, including gamification (Yu et al., 2022). Only few studies have examined the distinctive characteristics of live streaming as stimuli for impulsive buying. For example, Ming et al. (2021) focused on the social presence of live streamers, while Yu et al. (2022) investigated live-streamers' professionalism, and Khoi & Le (2023) examined real-time interactivity. By integrating social presence, personalization, and entertainment as stimuli impacting on impulsive behaviour, the current study contributes holistic knowledge to this field.

2.1.2 Impulsive Buying Behaviour

Impulse buying refers to an unplanned purchase behaviour that is the result of an exposure to a stimulus, and decided on the spot (Piron, 1991; Xu et al., 2020). Indeed, impulsive purchases are triggered by quick reactivity and convenience (Lee & Chen, 2021). Many factors cause consumers to make impulsive purchases, including the influence of the shopping environment, personal internal preferences, personality traits, external environmental stimuli, and the current situation of the purchase (Lin et al., 2023). Online shopping is more likely to result in impulse purchases than traditional shopping (Wu et al., 2020), since virtual operations give consumers the illusion that they are not spending their money (Park et al., 2012). In live streaming commerce, streamers demonstrate every feature of the product, let viewers check it out, and communicate with them in real time (Xu et al., 2019). This form of engagement takes place between streamers and viewers, and product description can easily induce impulsive buying because both ends of the screen are pulling in the same way (Wongkitrungrueng & Assarut, 2020).

2.1.3 The Characteristics of Live Streaming

This study identifies three concepts, social presence, personalization, entertainment as characteristics of live streaming. Social presence is defined as a kind of psychological cognition that one is interacting with the other users and perceives the existence of others in a virtual space (Jiang et al., 2019; Deng et al., 2023). Social presence is the idea that a particular press or interaction environment can increase the closeness of people's relationships and the degree of non-media interaction engagement (Chen & Liao, 2022). In the live streaming context, social presence is more significant because the live streaming platform contains multiple social cues and immediate feedback functions (Deng et al., 2023). Indeed, streamer-viewer interactions can help to shorten the emotional distance between consumers and the streamer, create strong social presence, and stimulate consumers' positive affect (Li et al., 2023).

In the live streaming context, personalization reflects the provision of product information that meets and satisfies viewers, such as personalized content, format, and timing based on viewers' requests, generating fit and relevance between the information provided and viewers' needs (Khoi et al., 2023). During a live stream, streamers provide personalized services to consumers in order to shorten the distance with consumers (Xu & Ye, 2020; Lin et al., 2021). Personalized recommendations will optimize consumer shopping choices (Cui et al., 2022), and they can provide consumers with a more interactive and enjoyable shopping experience, making it easier for them to immerse themselves and find satisfaction and enjoyment in the shopping process.

Entertainment is a type of action that keeps the audience's attention and interest. Its goal is to make the audience joyful or interested, or to reduce stress by providing a momentary vacation from reality, helping them to forget about their troubles (Chen & Lin, 2018). Ma et al. (2022) argued that entertainment reflects the degree to which an experience is delightful, interesting, or pleasurable. Live streaming commerce is accepted as a highly entertaining shopping platform (Lo et al., 2022; Zhang et al., 2022b). According to Xu & Ye (2020), live streaming content such as games, shows, and celebrity shows can provide a great entertainment experience.

2.1.4 Trust

Online trust refers to the confidence consumers have in the accuracy of the information provided during live streaming sessions, their belief in a company's sincerity, and their overall impression of the reliability of the live streaming platform (Bart et al., 2005). In the context of live streaming commerce, trust extends to both the product being showcased and the streamer presenting it (Ming et al., 2021). According to Wongkitrungrueng et al. (2020) and Ming et al. (2021), consumer trust in a product reflects the extent to which viewers perceive the product's attributes, quality, and post-purchase support to align with the streamer's description. On the other hand, trust in the streamer pertains to viewers' confidence in the streamer's empathy towards consumers and their ability to deliver personalized and high-quality service (Wongkitrungrueng and Assarut, 2020; Ming et al., 2021).

2.1.5 Flow Experience

The flow experience represents a state wherein individuals engrossed in watching a live streaming session become deeply immersed in its content, rendering them undistracted by external stimuli (Chen and Lin, 2018). This immersive state is often accompanied by a sense of joy and fulfillment. Within the flow state, viewers remain oblivious to their surroundings, filter out negative influences, maintain focus on the task at hand, and exhibit a high degree of self-control (Dong et al., 2023). According to Cui et al. (2022), the flow experience plays a crucial role in stimulating impulsive purchasing intentions when consumers engage with live videos. Hence, it is anticipated that the flow experience serves as the intermediary between stimuli and consumers' impulse buying behaviour during live streaming sessions (Huo et al., 2023).

2.2 Hypothesis Development

2.2.1 Social Presence, Trust, and Flow Experience

In e-commerce, social presence has a significant influence on consumer trust in peer-to-peer (P2P) transactions (Ye et al., 2020). In the context of live streaming, social presence helps bridge the psychological gap between viewers and streamers, and it can help viewers better understand the products they desire, thereby increasing viewers' sense of trust (Ming et al., 2021). In addition, social presence also helps enhance viewers' enjoyment and positively influences viewers' sense of belonging, which can increase viewers' trust in online sellers and shorten the psychological and social distance (Chen & Liao, 2022).

Technological devices allow consumers to connect with streamers and others in real time, creating a sense of social presence (Li et al., 2021). When they are immersed in virtual shopping activity, viewers tend to experience a state of pleasure and generate a flow state (Ming et al., 2021). As social presence can ultimately change consumers' perceptions and attitudes, consumers' flow experience in live streaming shopping might be enhanced (Huo et al., 2023). If the audience feels that they exist online and are connected across space-time with others in the live stream room, then the audience watching the live stream is more likely to have a good flow experience (Dong et al., 2023). Thus, the following hypotheses are proposed:

H1a. Social presence has a positive effect on consumers' trust in live streaming commerce.

H1b. Social presence has a positive effect on consumers' flow experience in live streaming commerce.

2.2.2 Personalization, Trust, and Flow Experience

Consumers will feel closer and have a better purchasing experience if their personalization demands are addressed (Xu & Ye, 2020). Wu et al. (2016) show that personalization shapes consumers' attitude towards and trust in a website when consumers shop on a social commerce platform via providing convenient personalized services to consumers (Chen et al., 2022). Moreover, when consumers have low privacy concerns, personalization affects consumer trust in e-commerce (Chen et al., 2022). In live streaming commerce, streamers can establish an emotional connection with

consumers through personalized personalities and contagious expressions, thereby increasing consumer trust in the streamers and recommended products (Wongkitrungrueng & Assarut, 2020).

In live streaming, streamers offer personalized information that can help viewers sort through useful information or recommend information that is relevant to their interests, meaning that it facilitates shortening the distance with consumers (Xu & Ye, 2020). The viewer can then get a sense of enjoyment during the interaction and get a better experience, from which the viewer has a stronger flow experience (Cui et al., 2022). Hence, the following hypotheses are proposed:

H2a. Personalization has a positive effect on consumers' trust in live streaming commerce.

H2b. Personalization has a positive effect on consumers' flow experience in live streaming commerce.

2.2.3 Entertainment, Trust, and Flow Experience

Liu et al. (2022) proposed that entertainment positively affects consumers' trust in tourism e-commerce live streaming platforms. In live streaming, viewers just need to watch streamers wear and show clothes, which can be enjoyable and the viewing experience is almost like watching a fashion show, thus increasing their trust in the streamers and their productions (Ma et al., 2022). Occasionally, live streaming channels hold sweepstakes, hand out cash vouchers, and run limited flash discounts to attract consumers (Xue et al., 2020). If the consumer is one of the lucky ones, they will feel that they have really bought a bargain. Indeed, the delight derived from such bargain hunting is one of the reasons people shop online (Wongkitrungrueng & Assarut, 2020).

Chen & Lin (2018) believe that watching live streams will either make the audience feel happy and entertained, or relieve stress and leave their worries behind by temporarily taking a break from reality. When an activity brings enough pleasure to an individual, a flow experience occurs (Webster et al., 1993). Live streaming spreads rich content, interesting stories, and visual appeal, thus allowing users to focus and enjoy the experience (Li & Peng, 2021). The more fun the live stream is, the more likely the user is to feel relaxed and happy, thereby getting involved in the live stream. Moreover, Liu et al. (2022) have shown that entertainment has a significant influence on tourists' flow experience in tourism e-commerce live streaming. Therefore, the following hypotheses are proposed:

H3a. Entertainment has a positive effect on consumers' trust in live streaming commerce.

H3b. Entertainment has a positive effect on consumers' flow experience in live streaming commerce.

2.2.4 Trust, Flow Experience and Impulse Buying Behavior

Trust is extremely important in online shopping, since it can decrease the perceived risk of becoming a victim of opportunistic behaviour (Yan et al., 2022). When viewers consider streamers trusted and knowledgeable, they are more likely to engage in unplanned consumption (Setyani et al., 2019). In live streaming commerce, Ming et al. (2021) find out that consumer trust can trigger impulse buying behaviour. Consumer trust has a significant positive effect on consumers' impulse buying behaviour under the mode of hunger marketing in live streaming commerce (Zhang et al., 2022b).

Consumers shopping online are liberated from the constraints they might encounter in physical stores, which increases the possibility of impulse buying behaviour (Chan et al., 2017). Compared with traditional online shopping, consumers can have more freedom and control when joining a live streaming shopping platform, which will also give them a better consumption experience and make them have impulsive consumption intentions (Dong et al., 2023). When watching a live stream, impulsive purchase intention is strongly influenced by the flow experience as the consumer is immersed in excitement and satisfaction (Ming et al., 2021; Paraman et al., 2022; Cui et al., 2022). Hence, hypotheses are proposed as follows:

H4a. Trust has a positive effect on impulsive buying behaviour in live streaming commerce.

H4b. Flow experience has a positive effect on impulsive buying behaviour in live streaming commerce.

2.2.5 The Mediating Role of Trust

In the context of live streaming, social presence helps stimulate viewers' enjoyment and willingness to maintain behaviour by enhancing commitment and trust in the online community (Chen & Liao, 2022). Additionally, trust has a positive impact on impulse buying behaviour in live streaming commerce (Ming et al., 2021). Furthermore, trust plays a mediating role in the impact of social presence on purchase intention (Ma et al., 2022). Although impulsive purchase behaviour is different from regular purchase intention, based on the above arguments it can be hypothesised that consumer trust is built by social presence and words. That helps induce impulsive buying behaviour.

Personalization positively impacts consumer trust in e-commerce (Chen et al., 2022). In live streaming commerce, personalization has a positive impact on consumers' trust in the streamer (Zhang et al., 2022a). Meanwhile, trust has a significant relationship with impulse purchase intention (Ming et al., 2021). In addition, personalization has also been shown to have an indirect impact on impulsive buying behaviour through psychological states such as inspiration, delight (Khoi & Le, 2023) or consumption vision and telepresence (Khoi et al., 2023). Considering that trust is also a cognitive and emotional state of humans, it can also be hypothesized that trust plays a mediating role in the relationship between personalization and impulse buying behaviour.

In live streaming commerce, highly entertaining live streaming will make consumers feel happy and comfortable, thereby creating trust for them (Liu et al., 2022). When consumers trust the streamer and the product, this will easily lead to impulse purchases (Ming et al., 2021). Additionally, trust has also been tested and found to play a mediating role in the relationship between entertainment and purchase intention (Ma et al., 2022; Liu et al., 2022). Although impulsive purchase behaviour is different from regular purchase intention, based on the above arguments it can be hypothesized that entertainment helps increase consumer trust and from there it helps induce impulsive buying. Therefore, the following hypotheses are proposed:

H5a. Trust has a mediating effect between social presence and impulse buying behaviour in live streaming commerce.

H5b. Trust has a mediating effect between personalization and impulse buying behaviour in live streaming commerce.

H5c. Trust has a mediating effect between entertainment and impulsive shopping behaviour in live streaming commerce.

2.2.6 The Mediating Role of Flow Experience

In live streaming commerce, the higher the social presence consumers perceive, the more immersed they are in the flow experience (Dong et al., 2023; Huo et al., 2023). Followed by consumers being immersed in a state of flow experience, they will easily make impulsive purchasing decisions. Dong et al. (2023) also demonstrated that social presence has a direct impact on consumers' impulsive consumption intention. Furthermore, flow experience may play a mediating role in the relationship between social presence and impulse buying (Huo et al., 2023).

Cui et al. (2022) have demonstrated that personalization has a positive impact on consumers' flow experience in live streaming commerce. Flow experience has a positive impact on customers' impulsive buying behaviour (Ming et al., 2021; Cui et al., 2022). Furthermore, personalization has also been shown to have an indirect impact on impulse purchases through psychological states such as inspiration, delight (Khoi & Le, 2023), or consumption vision and telepresence (Khoi et al., 2023). Considering that flow experience is also a cognitive and emotional state of humans, it can therefore be hypothesized that flow experience plays a mediating role in the relationship between personalization and impulse buying behaviour.

Entertainment in live streaming e-commerce can significantly influence consumers' flow experience, perceived value, and attitudes (Chen & Lin, 2018). Meanwhile, consumers' flow experiences have an impact on attitudes, and when consumers immerse themselves in the live streaming environment, they unconsciously want to participate and are stimulated to make impulsive purchases by the streamers (Dong et al., 2023). Liu et al. (2022) have demonstrated that consumers' flow experience mediates the relationship between entertainment and purchase intention in travel e-commerce live streaming. The authors hypothesized that the same logic could be applied to impulse buying behaviour. Therefore, to test the mediating role of flow experience, the following hypotheses are proposed:

H6a. Flow experience has a mediating effect between social presence and impulse buying behaviour in live streaming commerce.

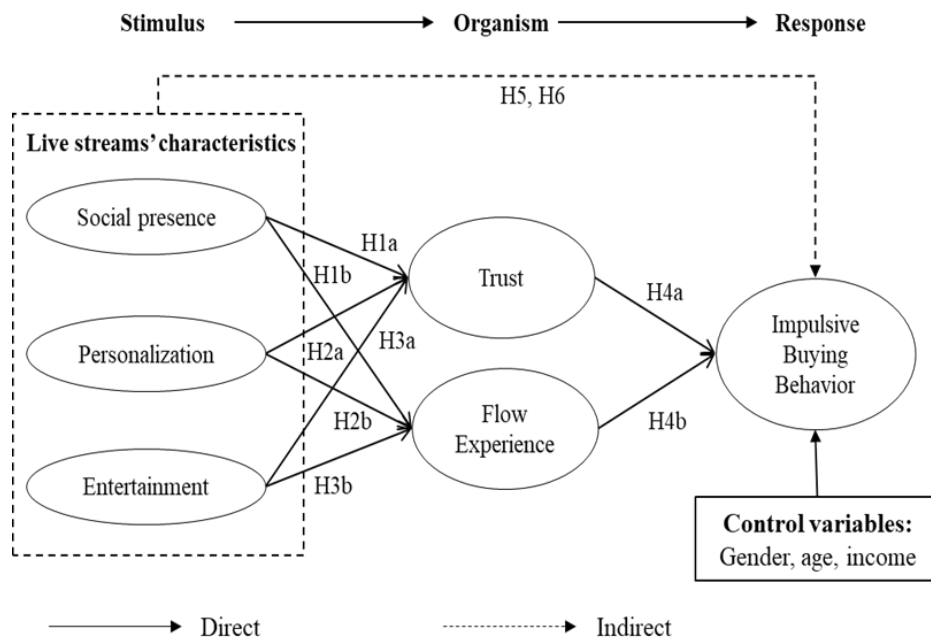
H6b. Flow experience has a mediating effect between personalization and impulse buying behaviour in live streaming commerce.

H6c. Flow experience has a mediating effect between entertainment and impulse buying behaviour in live streaming commerce.

2.2.7 Control Effects

Following previous studies on impulsive purchases in the live streaming context, this study adds three demographic characteristics as control variables, namely gender, age, and income (Khoi et al., 2023).

Figure 1. The proposed research model.



3 METHODOLOGY

3.1 Measurement

The scales of the studied structure are adopted from previous studies. Four items about social presence are used from Deng et al. (2023). Three items on personalization are used from Khoi et al. (2023). Three items measuring entertainment and 4 items measuring flow experience are used from Chen & Lin (2018). The trust scale has four items applied from Ming et al. (2021). Finally, the impulsive purchase scale has four items borrowed from Xu et al. (2020). All items use a 5-point Likert scale with a range from 1-'strongly disagree' to 5-'strongly agree'. Measurements and corresponding items are presented in the Appendix.

3.2 Sample and Data Collection

To collect data, this study developed a questionnaire. This study adopted the back-translation technique to ensure that the scales were appropriate for the current context in Vietnam (Khoi & Le, 2023). A bilingual expert converted the original scale items from English to Vietnamese, and made some minor edits to ensure that the Vietnamese version is consistent with the English version, as well as improving words and expressions. The Vietnamese questionnaire was evaluated by a lecturer with a doctoral degree in business administration before it was used for group discussion. A group discussion was then conducted with 08 viewers who had made a purchase on a live streaming shopping platform. Since the questionnaire was clearly understood by viewers, it was used for formal data collection.

The target respondents of the data collection were viewers who watched live streams on a live streaming shopping platform. The survey was conducted from July to August 2023 using convenience sampling and snowball sampling methods. Due to the various forms of live streaming at present, respondents were instructed to recall a live stream which they had recently watched or were most impressed with and the following questionnaire would be related to that live stream. A screening question "Have you watched a live stream in the past months?" (Lv et al., 2022) was applied to exclude respondents who answered "NO." The online questionnaire was distributed to targeted respondents through different social media in different regions of Ho Chi Minh City, Vietnam.

A total of 322 questionnaires were collected and 31 were excluded because of unreliable information. Therefore, there were 291 questions remaining for data analysis, resulting in a response rate of 90.4 %. The characteristics of the collected sample are presented in Table 1.

Table 1. Demographics of respondents (N = 291)

	Frequency	Percent		Frequency	Percent
Gender			Income (million VND)		
Male	99	34.0	< 10	158	54.3
Female	192	66.0	10- < 15	87	29.9
Total	291	100	15- < 20	29	10.0
			>= 20	17	5.8
Age			Total	291	100
			Online Shopping Experience (Year)		
Under 22	85	29.2	Under 1	43	14.8
22-30	189	64.9	1- < 2	64	22.0
31-40	15	5.2	2- < 3	55	18.9
Older than 40	2	0.7	3 and higher	129	44.3
Total	291	100	Total	291	100
			Live streaming viewing frequency (times/month)		
Education Background			From 1-3	186	63.9
Senior high school and below	6	2.1	From 4-6	56	19.2
Bachelor or College	253	86.9	From 7-9	21	7.2
Postgraduate	32	11.0	10 and higher	28	9.6
Total	291	100	Total	291	100

3.3 Data Analysis

This study applied a partial least squares structural equation model (PLS-SEM) with SmartPLS 3.2.9 software to conduct data analysis, including validation and testing of the measurement model and structural model. PLS-SEM is reasonable for researchers to study the measurement model parameters and calculate the structural path coefficients (Chin et al., 2003). To validate the measurement model, we followed the instructions of Hair et al. (2019) to use factor loadings, Cronbach's Alpha and composite reliability (CR) to evaluate the reliability of the studied structures, extracted mean variance (AVE) to evaluate the convergence validity, and Fornell & Larcker (1981) and HTMT matrix criteria to evaluate the discriminant validity. To test the structural model, the path coefficients, VIF and confidence intervals were used to assess the significance of the proposed relationships. This study also used the coefficient of determination (R^2), Cohen's effect size (f^2) and a Blindfolding procedure to evaluate the research model quality (Hair et al., 2019).

4 RESULTS

4.1 Measurement Model

Table 2. Construct reliability and convergent validity

Constructs and indicators	Loadings	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Social presence	0.83-0.89	0.88	0.88	0.92	0.74
Personalization	0.81-0.86	0.79	0.81	0.87	0.70
Entertainment	0.84-0.91	0.86	0.86	0.91	0.78
Trust	0.78-0.88	0.86	0.86	0.90	0.70
Flow experience	0.73-0.86	0.82	0.83	0.88	0.65
Impulsive buying	0.77-0.87	0.85	0.86	0.90	0.69

As shown in Table 2, all factor loading coefficients are greater than 0.7, and both Cronbach's Alpha and CR values are greater than 0.7, indicating that reliability is acceptable. Furthermore, all AVE values are greater than 0.5, supporting the convergent validity of the structures. **Table 3** shows that the square root of the AVE of one structure is greater than its correlation with other structures. In addition, the HTMT matrix proves that all values are less than 0.85. Therefore, the value of discriminating between constructs is accepted.

Table 3. Discriminant validity

Fornell-Larcker Criterion						
	1	2	3	4	5	6
Social presence	0.86					
Personalization	0.59	0.83				
Entertainment	0.62	0.56	0.88			
Trust	0.72	0.59	0.57	0.84		
Flow experience	0.58	0.39	0.52	0.54	0.81	
Impulsive buying	0.58	0.44	0.44	0.53	0.56	0.83
HTMT Matrix						
	1	2	3	4	5	6
Social presence						
Personalization	0.68					
Entertainment	0.71	0.67				
Trust	0.82	0.70	0.66			
Flow experience	0.68	0.47	0.62	0.65		
Impulsive buying	0.67	0.52	0.52	0.62	0.66	

4.2 Common Method Bias

The study conducted Harman's single-factor test by performing exploratory factor analysis for all scale items. All factors explain 69.1% of the variance in the structures of this study, of which the first factor explains 44.61%, less than 50%, and the last factor explains 4.61%. Thus, common method bias is not a threat in the present study (Cooper et al., 2020).

4.3 Structural Model Evaluation

Direct effects: As shown in Table 4, the test results indicate that H2b is not supported as personalization has no effect on flow experience (H2b: $\beta = -0.01$, $p > 0.05$). The rest of the suggested direct effects are supported by the data. In more detail, social presence has a positive effect on trust (H1a: $\beta = 0.51$, $p < 0.001$) and flow experience (H1b: $\beta = 0.42$, $p < 0.001$). Personalization has a positive effect on trust (H2a: $\beta = 0.22$, $p < 0.001$). Entertainment has a positive effect on trust (H3a: $\beta = 0.13$, $p < 0.05$) and flow experience (H3b: $\beta = 0.26$, $p < 0.001$). Trust (H4a: $\beta = 0.32$, $p < 0.001$) and flow experience (H4b: $\beta = 0.38$, $p < 0.001$) have positive impacts on impulsive buying.

Table 4. Hypothesis testing results

Paths	Hypotheses	Std. β	T-values	P Values	Conclusions
Direct effects					
SP -> TR	H1a	0.51	10.47	0.000	Support
SP -> FE	H1b	0.42	6.61	0.000	Support
PE -> TR	H2a	0.22	4.14	0.000	Support
PE -> FE	H2b	-0.01	0.10	0.920	Not support
EN -> TR	H3a	0.13	2.21	0.027	Support
EN -> FE	H3b	0.26	3.94	0.000	Support
TR -> IB	H4a	0.32	5.32	0.000	Support
FE -> IB	H4b	0.38	6.08	0.000	Support
Indirect effects					
SP -> TR -> IB	H5a	0.17	4.36	0.000	Support
PE -> TR -> IB	H5b	0.07	3.11	0.002	Support
EN -> TR -> IB	H5c	0.04	2.16	0.031	Support
SP -> FE -> IB	H6a	0.16	4.25	0.000	Support
PE -> FE -> IB	H6b	0.00	0.10	0.921	Not support
EN -> FE -> IB	H6c	0.10	3.43	0.001	Support
Control effects					
Gender -> IB		0.15	3.30	0.001	Effect
Age -> IB		-0.07	1.40	0.162	No effect
Income -> IB		0.05	1.03	0.304	No effect

Note. **SP**: Social presence; **PE**: Personalization; **EN**: Entertainment; **TR**: Trust; **FE**: Flow experience; **IB**: Impulsive buying

Indirect effects: Experimental results show that social presence has an indirect impact on impulsive buying through trust (H5a: $\beta = 0.17$, $p < 0.001$) and flow experience (H6a: $\beta = 0.16$, $p < 0.001$). Personalization has an indirect impact on impulsive buying through trust (H5b: $\beta = 0.07$, $p < 0.01$), but no indirect impact on impulsive buying through flow experience (H6b: $\beta = 0.00$, $p > 0.05$). Entertainment has an indirect impact on impulsive buying through trust (H5c: $\beta = 0.04$, $p < 0.05$) and flow experience (H6c: $\beta = 0.10$, $p < 0.01$).

Control effects: Gender ($\beta = 0.15$, $p < 0.01$) positively influenced impulsive buying while age ($\beta = -0.07$, $p > 0.05$) and income ($\beta = 0.05$, $p > 0.05$) did not exert significant effects on this variable.

4.4 Assessing Research Model Quality

The results (Table 5) show that the proposed research model explains 40% of the variance of impulse buying. The coefficient f^2 of the direct effect ranges from 0.02 to 0.33, indicating that the impact is small and medium. The results also indicate that personalization does not affect the flow experience. A blindfolding procedure was applied to evaluate the predictive ability of the research model. The results, as shown in Table 5, show that the Q^2 values are all between 0.25 and 0.5. Therefore, we suggest that the research model has average predictive power (Hair et al., 2019).

Table 5. Model quality indicators

Coefficient of determination (R^2)	Effect size (f^2)	VIF
$R^2_{TR} = 0.57$	$f^2_{SP \rightarrow TR} = 0.33$	$VIF_{SP \rightarrow TR} = 1.86$
$R^2_{FE} = 0.37$	$f^2_{SP \rightarrow FE} = 0.16$	$VIF_{SP \rightarrow FE} = 1.86$
$R^2_{IB} = 0.40$	$f^2_{PE \rightarrow TR} = 0.07$	$VIF_{PE \rightarrow TR} = 1.69$
Q^2	$f^2_{PE \rightarrow FE} = 0.00$	$VIF_{PE \rightarrow FE} = 1.69$
$Q^2_{TR} = 0.39$	$f^2_{EN \rightarrow TR} = 0.02$	$VIF_{EN \rightarrow TR} = 1.79$
$Q^2_{FE} = 0.25$	$f^2_{EN \rightarrow FE} = 0.06$	$VIF_{EN \rightarrow FE} = 1.79$
$Q^2_{IB} = 0.26$	$f^2_{TR \rightarrow IB} = 0.11$	$VIF_{TR \rightarrow IB} = 1.44$
	$f^2_{FE \rightarrow IB} = 0.20$	$VIF_{FE \rightarrow IB} = 1.45$

Note. **SP**: Social presence; **PE**: Personalization; **EN**: Entertainment; **TR**: Trust; **FE**: Flow experience; **IB**: Impulsive buying

5 DISCUSSION AND IMPLICATIONS

5.1 Discussion

Live streaming is currently gaining increasing popularity. Comprehending the underlying mechanisms that influence viewers' behaviours, such as impulsive purchasing, can optimize live streaming commerce to boost merchants' business. Indeed, there is a significant contribution of impulse buying to firms' product sales in live streaming commerce (Lo et al., 2022). This study aims to examine the effect of the characteristics of live streaming on the consumers' impulsive buying behaviour. Adopting the S-O-R model as a theoretical framework, this research uses three distinctive features of live streaming: social presence (Dong et al., 2023; Deng et al., 2023), personalization (Cui et al., 2022; Khoi et al., 2023) and entertainment (Chen & Lin, 2018; Lv et al., 2022) as the stimulus that promotes impulsive buying (Xu et al., 2020) as a response through trust and flow experience (Ming et al., 2021) as organisms. In this study, both direct and indirect associations between stimuli, organism, and response are examined. The findings showed that almost all the proposed hypotheses were supported.

The findings indicate that social presence has a positive impact on both trust and flow experience. This research result is consistent with previous studies suggesting that social presence has a positive impact on consumers' trust (Ming et al., 2021; Ma et al., 2022) and flow experience (Dong et al., 2023; Huo et al., 2023). Live streaming plays a key role in creating a social media presence, so when consumers participate in live streaming, they need to take their time and focus completely on the content being presented and the interactions in real time. At this point, the consumer experiences a continuous process of attention, loss of self-control, and gain of enjoyment (Huo et al., 2023). Similarly, entertainment also has a positive impact on both trust and flow experience. This finding is consistent with the results of previous studies showing that entertainment enhances consumers' trust and flow experience (Chen & Lin, 2018; Li & Peng, 2021; Liu et al., 2022). If the live streaming context provides consumers with a sense of entertainment, they are more likely to immerse themselves in the computer world and interact online with computers and other individuals, which may result in a desire to purchase products (Lv et al., 2022). However, while personalization positively impacts trust, it does not influence flow experience. This research result is different from the findings of Cui et al. (2022), suggesting that the relationship between personalization and flow experience is significant. This may be derived from the fact that a tailored recommendation can assist users in minimizing skepticism and perceived risk while engaging in live streaming commerce, thereby bolstering trust in both the streamer and the featured products. However, to truly immerse viewers in a state of flow, additional elements such as a sense of enjoyment and allure are essential. This suggests that while personalized recommendations serve to instill confidence in viewers, they may not be sufficiently compelling, enticing, or innovative to fully induce a flow state. From the point of view of SOR, social presence, personalization and entertainment can be seen as stimuli that elicit trust and flow experience as an organism in a live streaming context. Indeed, social presence can reduce the consumer's uncertainty towards the seller and personalization can meet consumers' individual needs. The entertainment of live streaming e-commerce can make them feel delight. More importantly, social presence, personalization and entertainment are stimulating factors that reduce psychological distance, promoting the perception that live streamers are "real people" who care for and value viewers. To sum up, the results highlight the value of investigating the distinct characteristics of live streaming as triggers for impulsive purchases.

Research has experimentally confirmed that trust and flow experience influence impulsive buying (Ming et al., 2021; Zhang et al., 2022b; Dong et al., 2023). Consistent with the SOR model, trust and flow experience are the mediators that drive impulsive buying as a response. Trust and flow experience created positive emotions and flows, which triggered impulsive purchase. Thus, a higher degree of trust and flow experience leads to stronger impulsive buying. Furthermore, research also shows that trust and flow experience have mediating effects between live streaming characteristics and impulsive purchases. In more detail, in line with the previous studies of Ma et al. (2022), Liu et al. (2022), and Khoi et al. (2023), trust plays a mediating role in the relationship between social presence, personalization, and entertainment and impulsive buying. From the perspective of SOR, social presence, personalization and entertainment can be seen as stimuli that enhance consumers' trust, which in turn triggers impulsive buying behaviour. Meanwhile, flow experience only has mediating effects between social presence, entertainment and impulsive buying in the live streaming context. This result is consistent with Liu et al. (2022) and Huo et al. (2023), who suggested that social presence and entertainment can urge consumers to impulsively make purchases by enhancing the flow experience. In contrast, personalization has no indirect impact on impulsive buying via flow experience, which is

different from the research of Cui et al. (2022), who argue that personalized recommendations can motivate consumers to impulsively make purchases by enhancing the flow experience.

5.2 Theoretical Implications

This study provides a deeper and broader understanding of how and why the distinctive characteristics of live streaming can drive impulsive buying behaviour. The present study contributes to understanding how impulsive buying behaviour must be the result of various stimuli capable of eliciting cognitive and affective organisms among viewers (Lv et al., 2022; Lo et al., 2022; Khoi & Le, 2023). Furthermore, the findings confirmed direct and indirect effects between components, establishing a comprehensive understanding about how and why live streaming drives impulsive buying.

The previous studies on live streaming commerce have mainly focused on product characteristics and interactivity, while ignoring the features of e-commerce live streaming, such as social presence, personalization, and entertainment. This study explored and compared the effects of social presence, personalization, and entertainment in a more systematic and comprehensive way. The findings confirmed that the social presence and entertainment of the live streaming features have positive effects on consumers' impulsive buying via trust and flow experience, but personalization has an insignificant effect on impulsive buying through flow experience. These results enrich the research content of e-commerce live streaming.

Moreover, while previous studies in the live streaming context have suggested a variety of cognitive/affective responses linking stimuli and impulsive purchases, trust and flow experience seem to have been less noticed regardless of their importance in generating shopping behaviour and promoting impulsive purchase. Therefore, the present study certainly contributes to understanding the cognitive/affective organism (trust and flow experience) that can drive impulsive purchasing behaviour in the context of live streaming. The findings confirmed that trust and flow experience are necessary conditions to associate the characteristics of live streaming with impulse buying. Indeed, making purchasing decisions in live-streaming e-commerce poses challenges for consumers due to high uncertainty and perceived risks. However, trust in the streamer and the product can mitigate decision costs in this context (Ming et al., 2021). Meanwhile, consumers' flow experience makes them want to participate in the live streaming unconsciously and generates impulsive buying behaviour under the stimulation and guidance of the streamer. This mechanism certainly provides a more comprehensive understanding of the path to impulse buying.

5.3 Managerial Implications

The results show that it is important for merchants to increase impulsive purchases in the context of live streaming (Lv et al., 2022). In general, the SOR model suggests that streamers who aim to increase viewers' impulsive purchases during live streaming must have the right stimuli to drive viewers' cognitive and emotional responses. According to the findings of the present study, the appropriate stimuli can be social presence, personalization, and entertainment, while the cognitive and affective responses of trust and flow experiences should be stimulated. With the existence of these perceptions, impulsive buying behaviour is more likely to occur. Therefore, during live stream sessions, streamers should have tools to measure these perceptions in order to better drive effective live streaming scenarios. To sum up, streamers should understand the different characteristics of live streaming and their ability to boost impulsive buying behaviour.

Moreover, improving social presence, personalization, and entertainment is also important since these characteristics can drive impulsive buying behaviour by eliciting trust and flow experience as bridges. To create consumers' social presence, merchants need to manage the ambient design of the live streaming room to mimic real shopping environments and train streamers to enhance their interaction with consumers over time (Huo et al., 2023). For example, when streamers sell furniture such as tables, chairs, wardrobes, etc., it is better to decorate the broadcast room to look like a living room, where the streamer and consumers can introduce and ask questions as in the real world of sales. Furthermore, streamers need to be professionally trained to answer and explain consumers' product-related questions and concerns clearly. To enhance personalization, streamers need to respond to viewers' requests for product information, answer viewers' questions, and interact with viewers with images, video, audio, and text (Khoi & Le, 2023). A personalized recommendation, which can better meet consumer preferences and needs, gives consumers a good flow experience, makes consumers feel excited and satisfied, and promotes the generation of impulsive purchases (Cui et al., 2022). In terms of entertainment, streamers should create an atmosphere for the live streaming to attract viewers' attention. Streamers could also post some interesting content, discuss interesting entertainment topics, and organize a variety of entertainment activities (Liu et al., 2022).

Finally, trust and flow experience have crucial practical implications for driving impulsive buying behaviour because they can boost impulsive buying needs. To encourage viewers to generate flow experience, streamers need to create engaging content that meets the viewers' expectations (Xu et al., 2019), and entices them to continue watching and purchasing. In addition, streamers can connect emotionally with consumers through friendly words, and insightful explanations. Passionate interactions are recommended strategies for them. When viewers express confusion about live streaming content, streamers should provide accurate answers in a timely manner to satisfy consumers' curiosity about the product (Liu et al., 2022). These methods enhance the consumer flow experience, thereby increasing the impulsive purchase intention of the consumer. To generate viewers' trust, merchants should establish strict recruitment standards to invite high-quality, reputable streamers, as trusted streamers help facilitate consumer trust in the information or products presented (Liu et al., 2022). Moreover, streamers can organize fun activities, such as sweepstakes and flash sales (Ma et al., 2022) so that viewers can trust the company's products and services. The streamer could also give some suggestions about the purchase according to the consumer's shopping situation so that the consumer feels understood and thereby trusts the seller and the product more.

6 LIMITATIONS AND FUTURE RESEARCH

This study has some limitations that should be noted. First, this study's conclusion does not verify the positive impact of personalization on flow experience. This implies that the personalized suggestions may not be sufficiently enjoyable to fully induce a flow state. This result, which is different from the conclusion of previous researchers, may lead to a new model in which enjoyment acts as a mediator between personalization and flow experience, encouraging further research. Second, this study investigates the effects of trust and flow experience on impulsive buying. Apart from trust and flow experience, consumers' presence, perceived value, and perceived risk may have an influence; the role of these factors should be considered in future research. Third, the atmosphere and real-time interaction are essential for live streaming compared to other contexts. Therefore, these distinctive factors need to be investigated. Finally, the samples come from Vietnam. Whether the same situation holds true for consumers in other countries requires further investigation.

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APPENDIX.

MEASUREMENT SCALES

Item	Content	Factors Loadings	Sources
Social presence			
SP1	While I watch e-commerce live streaming, the other users can feel my presence.	0.83	(Deng et al., 2023)
SP2	While I watch e-commerce live streaming, my emotions are affected by the other viewers.	0.88	
SP3	While I watch e-commerce live streaming, I feel close to other viewers.	0.89	
SP4	While I watch e-commerce live streaming, the distance between the other viewers and me is narrowed.	0.84	
Personalization			
PE1	When viewing live streaming, the streamers offer professional suggestions that suit me according to my shopping situation	0.83	(Khoi et al., 2023)
PE2	When viewing live streaming, the streamers can focus on my needs for products or services	0.81	
PE3	When viewing live streaming, the streamers provide personalized products or information for my personal needs	0.86	
Entertainment			
EN1	Watching the live streaming is entertaining.	0.84	(Chen & Lin, 2018)
EN2	Watching the live streaming relaxes me.	0.91	
EN3	Watching the live streaming gives me pleasure.	0.90	
Trust			
TR1	I believe in the information that streamers provide through live streaming.	0.85	(Ming et al., 2021)
TR2	I believe streamers in live streaming are trustworthy.	0.88	
TR3	I do not think that streamers would take advantage of me.	0.78	
TR4	I trust that the products I receive will be the same as those shown on live streaming.	0.83	
Flow experience			
FL1	When watching the live streaming, I do not realize how time passes.	0.81	(Chen & Lin, 2018)
FL2	When watching the live streaming, I often forget the work I must do.	0.86	
FL3	Watching the live streaming gives me a temporary escape from the real world.	0.82	
FL4	When watching the live streaming, I am not easily distracted by other things.	0.73	
Impulsive Buying			
IB1	While watching the live streaming, I buy things that I had not intended to purchase.	0.84	(Xu et al., 2020)
IB2	While watching the live streaming, I often buy things spontaneously.	0.83	
IB3	While watching the live streaming, I often buy things without thinking.	0.87	
IB4	While watching the live streaming, I feel like buying more things than I need.	0.77	