

# Effect of Atmospherics on Impulse Purchases in Live Streaming: Based on Structural Equation Model

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**Keywords:** Physical Atmospherics, Social Atmospherics, Impulse Purchases, e-Commerce Live Streaming, Taobao Live.

**Abstract:** With the emergence and development of e-commerce live streaming, academia has begun to pay attention to the factors affecting customer behavioral intention. This study aims to refine the subcategories of physical and social atmospheric elements in the e-commerce live-streaming setting and investigate how the physical atmosphere and streamer- and viewer-based stimuli induce customers' perceived arousal and credibility, which increases their impulse purchases. The study surveyed 509 Taobao Live users in China to test our hypotheses. Structural equation modeling was employed using AMOS 20.0 and the overall fit of the structural model was highly acceptable. The results of the structural equation modeling indicated that customers' perceived arousal is positively affected by visual appeal, other viewers' engagement behaviors and streamer's affective delivery. Customers' perceived credibility is positively affected by the streamer providing elaborate information. Customers' perceived arousal and perceived credibility positively affect their impulse purchase behavior.

## 1 INTRODUCTION

Live streaming provides a new way to shop (Sun, 2019). Compared to traditional e-commerce (e.g., brand community, word of mouth and vivid descriptions), live-streamed shopping has some unique characteristics, including the displaying of products from different angles; the revealing of the seller's face, personality and office/studio; and the answering of customer questions in real time, showing other viewers' instant response and behaviors, which constitute of atmospherics fundamentally different with that of traditional e-commerce. In China, the market value of live-streamed shopping reached RMB 5.2 billion in 2019, an increase of 52% from that in 2018 (Hu, 2020).

As the market share of e-commerce live streaming continues to grow, scholars have begun to pay attention to consumer behaviors in e-commerce live streaming, like customer engagement (Hu, 2020) and purchase behavior (Zhang, 2020). An impulse purchase is described as an unplanned, compelling and hedonically complex purchasing process in which customers make a sudden and immediate purchase without preshopping intentions (Chan, 2017). Compared with physical shopping, consumers

are more impulsive when shopping online (Wu, 2020). Previous studies found the effect of some atmospherics elements on customers' impulse purchases in the context of offline store, such as layout (Flamand, 2017), music, lighting and staff (Barros, 2019). However, to date, few studies have paid attention what elements constitute of atmospherics in e-commerce live streaming, and whether and how these elements affect customers' impulse purchases. As such, this study aims to identify the elements of physical and social atmospherics in e-commerce live streaming and use the Stimulus-Organism-Response (S-O-R) framework to investigate how customers' impulse purchases are impacted by physical and social atmospheric elements of e-commerce live streaming.

## 2 THEORETICAL BACKGROUND AND HYPOTHESES

The S-O-R framework was proposed by Mehrabian and Russell (Mehrabian, 1974) and assumes that the environment contains stimuli that affect people's

internal, or organismic, states (O), which in turn lead to approach or avoidance responses (R). The stimuli in the S-O-R framework are represented by a set of attributes that affect consumer perceptions (Mehrabian, 1974). These attributes are the starting point for the formation of consumer behavior; that is, they are clues that stimulate consumer cognition and awareness to take action. Organisms are the second component of the S-O-R framework. Consumers' affective and cognitive reactions to an environment are deemed to be organismic responses (Mehrabian, 1974). Affective reactions are related to an individual's emotional response when he or she is stimulated by the environment (Xiang, 2016). A cognitive reaction is defined as the "mental process occurring in an individual's mind when he or she interacts with the stimulus" (Eroglu, 2001). In line with the S-O-R model, responses represent the final outcomes and decisions of users, which include approach or avoidance behaviors (Mehrabian, 1974).

In the current study, we will incorporate elements of the physical and social atmospherics of e-commerce live streaming as stimuli and investigate the effect of these stimuli on consumers' affective (arousal) and cognitive reactions (perceived credibility) as well as the subsequent effect on customers' responses (i.e., impulse purchases).

Visual appeal is a critical dimension of physical atmospherics (Bitner, 1992). With reference to Tang and Zhang (Tang, 2020), this study defines visual appeal as a set of decoration, design and layout characteristics that are related to the attractiveness of an e-commerce live-streaming studio. Arousal is a state of feeling that varies from feelings of excitement, stimulation, alertness or activeness, to feeling of being tired, sleepy, or bored (Chan, 2017). Existing studies have confirmed that visual appeal is an important aspect of shopping environments because they can create a pleasurable interaction and increase consumers' excitement. For example, Barros et al. found that the design of traditional retail stores positively effects the arousal of consumers (Barros, 2019). Eroglu et al. demonstrated that the decoration of site atmospherics positively influences users' arousal (Eroglu, 2001). Based on the influence of visual appeal on users' arousal in the shopping environment, this study speculates that in the e-commerce live-streaming setting, visual appeal has a positive impact on arousal.

**H1.** Customers' perception of visual appeal is positively related to arousal.

Social atmospherics have been investigated in terms of salespersons and other customers (Baker, 1992). In this study, we investigated social

atmospheric cues in terms of other viewers and streamers.

According to Manning theory (Wicker, 1973), to maintain a particular setting, the behaviors of a certain number of people are necessary. Past research has suggested that the expressive behavioral patterns of other customers, like other viewers' clapping after a play and shouting and booing at a sports game (Uhrich, 2012), as well as other customers' purchasing behaviors at a flea market (Grove, 1997). In the context of this study, other viewers' engagement behaviors refer to behaviors such as making purchases, "liking" the live stream, sharing with friends, joining fans, and interacting with the streamer. In the live-streaming context, other viewers' engagement behaviors can be seen in full view. We propose that these behaviors are preferable environmental components and sources of amusement during live-streaming activities, which can increase customers' excitement. Based on the above discussion, we propose the following hypothesis:

**H2.** Other viewers' engagement behaviors are positively related to customers' arousal.

Affective delivery is mainly accomplished through an individual's facial expression (e.g., a smile) and manner of speaking (e.g., in a positive, passionate tone) (Wichroski, 1994). In the context of service interaction, studies have found that emotional contagion creates a ripple effect from employees to customers; that is, the positive emotions displayed by frontline employees have an impact on customers' positive emotions (Tsai, 2002). An employee smiling at customers may be contagious, which will change the emotional state of customers and further affect their perception and evaluation of their service exposure (Tsai, 2002). We believe that in the context of e-commerce live streaming, streamers' positive affective delivery, including smiles and passionate tones, will positively affect customers' emotional experience. Based on the above discussion, we propose the following hypothesis:

**H3.** Streamers' affective delivery is positively related to customers' arousal.

Elaborate information often includes more details about the product and how and where the product can be used in specific contexts (Mudambi, 2010), which reduce potential risks and increase the level of trust among consumers. For example, in virtual communities, elaborate posts and comments will help users gain a better understanding of the topic, feel support from others and make better decisions (Zhang, 2008). In the context of this research, the elaborate information provided by a streamer implies

that he or she may have more consumption experience and product-related knowledge, thereby providing consumers with credible knowledge about products and services. We propose that streamers who are high in expertise are likely to possess greater awareness and knowledge of the products they recommend, a fact reflected by the elaborateness of their information. Based on the above discussion, we propose the following hypothesis:

**H4.** The providing of elaborate information is positively related to customers' perceived credibility.

Affective reactions have been proven to be prominent determining factors of impulse purchase behaviors (Chan, 2017). Past studies have suggested that customers' perceived arousal is linked to their increased risk taking (Wu, 2020) and, subsequently, their purchase fever (Adam, 2019). Customers with excited emotions are more likely to be impulsive in spending more money and purchasing more products. In the context of e-commerce live streaming, excited customers are more inclined to experience purchase fever, which encourages them to buy products that they did not originally intend to purchase. Hence, we propose the following hypothesis:

**H5.** Perceived arousal is positively related to customers' making impulse purchases.

Impulse purchases usually occur under the condition that customers believe that such purchases are appropriate (Rook, 1995). Research in the context of e-commerce has also highlighted the influence of trusting beliefs on users' intention to follow an e-retailer's advice (McKnight, 2002). Some scholars have found that the credibility of online stores plays a critical role in customers' purchasing decisions (Kim, 2008). Trust can make people have positive feelings about online sellers and, thus, increase their willingness to purchase from these sellers. In this context, viewers' perceived credibility of streamers makes them believe that the product is of high quality and worth buying, which induces viewers to follow streamers' advice and finally leads viewers to make impulse purchases. Based on the above discussion, we propose the following hypothesis:

**H6.** Perceived credibility is positively related to customers' making impulse purchases.

### 3 METHODS

To increase the reliability and validity of each question, we conducted a pilot study before our main survey. The pilot study helped us refine the survey questionnaire, solve small problems related to some

measurement items, and improve the readability of the items.

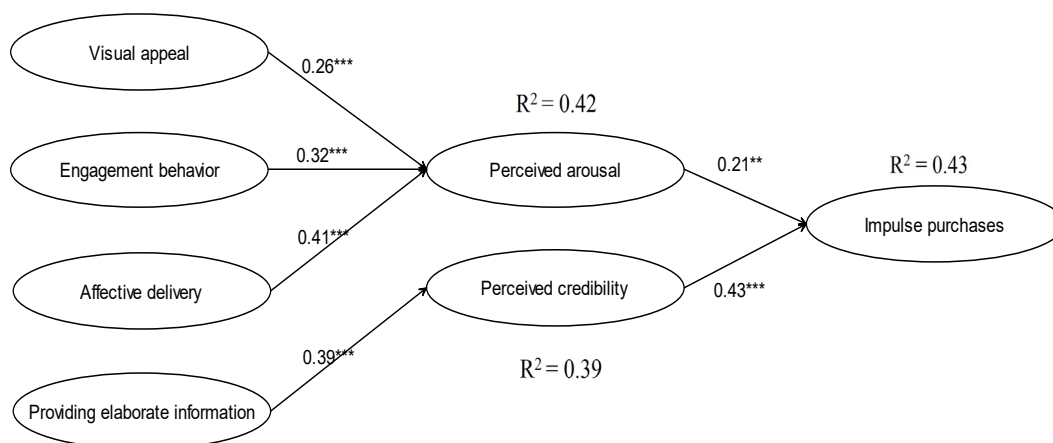
To test our theoretical model, we selected Taobao Live—the largest e-commerce live-streaming platform in China—as an appropriate source of data for our main survey. The questionnaire was set up on Wenjuanxing, a Chinese online market research website, which is able to forward the link of the questionnaire to potential respondents. Since this research focuses on customers' willingness to engage in live-streaming activities, we first ask participants to finish a question to screen out those who have not previously watched live-streaming activities on Taobao Live. In the end, 532 responses were obtained. After removing invalid questionnaires, 509 valid questionnaires were obtained.

The measures used were adapted from the literature and slightly modified to fit the context of e-commerce live streaming. All the items used 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree). We choose items from Blázquez (Blázquez, 2014) to measure visual appeal. Engagement behavior was measured using items drawn from (Hu, 2020). Affective delivery was measured using items drawn from (Tsai, 2002). Items were adapted from Mudambi and Schuff (Mudambi, 2010) to measure providing elaborate information. We adapted items from Barbin and Darden (Babin, 1995) to measure perceived arousal. The scale measuring Perceived credibility were adapted from Filieri et al. (Filieri, 2015). Impulse purchase was measured using items drawn from Beatty and Ferrell (Beatty, 1998).

We conducted Harman's one-factor test to check for common method variance. As a result, a total of 7 factors with eigenvalues greater than 1 were extracted, and the first factor explained 16.53% of the total variance. Since the number of factors greater than 1 is obtained and no one factor can explain most of the covariance of the variables, this shows that there is no common method bias in our survey.

Subsequently, to test the measurement validity of the scale, this study used AMOS 20.0 to conduct a confirmatory factor analysis. The results showed a good model fit to the data:  $\chi^2 = 578.76$ , yielding a value of  $\chi^2/df = 1.59$ , CFI = 0.95, TLI = 0.94, NFI = 0.92 and RMSEA = 0.04. The standard loadings of the retained items ranged from 0.70 to 0.90. The average variance extracted (AVE) of each construct was greater than 0.5, which implied that the scales have good aggregate validity. The composite reliability (CR) and Cronbach's alpha coefficient were both greater than 0.70, indicating high reliability.

To estimate the discriminative validity of the



Notes. \* $p < .05$ ; \*\* $p < .01$ ; and \*\*\*  $p < .001$ .

Figure 1: Results of the structural equation modeling analysis.

scale, this study compared the square root of the AVE score of each construct with the correlation coefficient between the construct and other constructs. The results showed that the square root of the AVE score was higher than the correlation coefficient of any other variables, thus indicating an acceptable level of discriminant validity.

Structural equation modeling was employed using AMOS 20.0 to test our proposed hypotheses. The overall fit of the structural model was highly acceptable:  $\chi^2 = 505.96$ ,  $df = 364$ , yielding a value of  $\chi^2/df = 1.39$ ; CFI = 0.92, TLI = 0.91, NFI = 0.90 and RMSEA = 0.06. Figure 1 shows the results of the structural equation modeling analysis.

The results showed that the path coefficient between visual appeal and perceived arousal was  $\beta = 0.26$  ( $p < 0.001$ ), indicating that visual appeal are positively associated with customers' perceived arousal, thus supporting H1.

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The perception of other viewers' engagement behavior was positively related to customers' perceived arousal ( $\beta = 0.32$ ,  $p < 0.001$ ), thus supporting H2.

The results showed that a streamer's affective delivery was positively related to customers' perceived arousal ( $\beta = 0.41$ ,  $p < 0.001$ ), thus supporting H3.

The effect of streamers providing elaborate information on customers' perceived credibility was significantly positive ( $\beta = 0.39$ ,  $p < 0.001$ ), thus supporting H4.

Customers' perceived arousal ( $\beta = 0.21$ ,  $p < 0.01$ )

and perceived credibility of streamers ( $\beta = 0.43$ ,  $p < 0.001$ ) were positively related to customers making impulse purchases.

## 4 CONCLUSION

This study was designed to investigate the influencing effect of atmospheric elements on customers' perceived arousal and credibility, and subsequently on their impulse purchases.

The results indicate that visual appeal positively affects viewers' perceived arousal and, subsequently, their making impulse purchases. Although previous research has identified effects of the decor of brick-and-mortar stores (Barros, 2019) and the appealing design of traditional e-commerce websites (Chan, 2017; Eroglu, 2001) on customers' purchase behavior, to date, few studies have investigated the effects of visual appeal on consumer behavior in e-commerce live streaming. The current study extends prior studies to demonstrate the effect of visual appeal on customers making impulse purchases in the context of e-commerce live streaming.

Other viewers' engagement behavior has been proven to be positively related to customers' arousal and their subsequent impulse purchases. Unlike traditional e-commerce, live streaming can show the real-time responses of other viewers. This study first investigates the promoting effect of other viewers' behavior on customers' purchases in the context of e-commerce live streaming.

The findings show that streamers' affective delivery is positively related to customers' perceived arousal from live-streaming activities. The phenomenon of "emotional contagion" (Tsai, 2002)

occurs between streamers and customers. Customers can perceive more excitement when a streamer's affect is delivered in a joyful and passionate manner. Thus, a streamer plays a very important role in live streaming (Hou, 2020). Existing studies have confirmed the influence of the appearance appeal of an entertainment streamer on audiences' attitude changes (Hou, 2020), but few studies have investigated the effects of sale streamers' affective delivery on viewers' purchase behavior.

The results indicate that streamers providing elaborate information positively affect customers' perceived credibility, which in turn positively impacts consumers making impulse purchases. This finding seems to be consistent with the notion of past research that an individual will use central cues to infer whether an information source is credible (Racherla, 2012). In this study, the elaborate information provided by a streamer can be regarded as a central cue, which enables customers to assess whether he or she is credible.

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