

The impact of danmaku information quality on consumers' impulsive consumption behavior

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ABSTRACT

The present study investigates: (a) the mediated mechanism underlying the sense of presence in the relationship between danmaku information quality and consumers' impulsive consumption behavior; and (b) the moderated mechanism of consumers' attitudinal ambivalence in the direct and indirect relationships between danmaku information quality and consumers' impulsive consumption behavior. Valid questionnaire data from 466 Chinese participants (49% male) was used in the study. Participants filled out questionnaires regarding danmaku information quality, sense of presence, consumers' attitudinal ambivalence, and consumers' impulsive consumption behavior. Research findings reflect that danmaku information quality is significantly associated with consumers' impulsive consumption behavior and that consumers' sense of presence partially mediates this relationship. The mediation role of consumers' sense of presence is weaker in predicting consumers' impulsive consumption behavior for consumers with high attitudinal ambivalence, but has a stronger influence for consumers with low attitudinal ambivalence. The present study further explores how the direct and indirect relationships between danmaku information quality and consumers' impulsive consumption behavior are moderated by consumers' attitudinal ambivalence through moderated mediation analysis.

Keywords

danmaku information quality, impulsive buying behavior, sense of presence, attitudinal ambivalence, short video platforms

INTRODUCTION

As live streaming has already been in existence for more than 20 years, it is not a new phenomenon (Cheng, 2020). In 2007, for example, Ustream.tv launched its web streaming platform (Educause Learning Initiative, 2008). However, live streaming only rapidly developed in early 2010, although it had been launched in the early 1990s (Espresso Live, 2022). In 2011, YouTube officially launched its “YouTube Live” live streaming channel. In October 2013, Twitch reported 45 million people playing videos per month (Billings & Hou, 2019). Victor (2022) examined the annual volume of people watching live videos worldwide and found an increase of 47% in live streaming viewers in 2020 compared to the previous year. Deloitte Insights (2020) explored a high permeability and tendency of live streaming services due to COVID-19, finding that almost 80% of US consumers followed more than one video streaming channel (Deloitte, 2022). A video marketing statistics survey reported that 96% of consumers were more likely to watch product description videos (wyzowl, 2022) to gather more details before consumption, indicating that video marketing was the newest and most effective marketing method in 2021.

Live streaming was also shown to be the most popular and efficient marketing strategies in 2021 (Xu et al., 2022). Live streaming technology provides real-time channels and broadcaster-created content for audiences to consume (Lin et al., 2021). Especially during COVID-19, live streaming technology can provide more product details to satisfy the need

for customers to maintain a safe social distance in a consumption context (Pang et al., 2021). In the US, online retailers such as QVC have created their own live stream websites and integrated influencers, including even pets (Bhattarai, 2021). In 2021, retailers such as Walmart, Amazon, Gucci, and Levi's generated more than US\$11 billion and attempted to operate live stream shops (Bhattarai, 2021). However, the concept is still nascent in the US compared to China. In China, live streaming rapidly grew in 2019 and fully bloomed during 2020 (Lee, 2021). Short video platforms, such as DOUYIN and Kwai, have begun to market in various fields with live video to increase viewers' sense of trust and make the products seem more "real" (Guo, 2021). Traditional e-commerce platforms, such as Alibaba's Taobao, Pinduoduo, and Jingdong, have also created new live streaming channels. China's e-commerce platforms attract over 430 million people in a year (Greenwald, 2020). Sun (2021) found that video marketing can help consumers better understand the products, thus influencing their purchase intention. In other words, the urgent purchase atmosphere in live streaming is successful in consumer marketing.

Influenced by the impulsive environment, consumers are more likely to engage in impulsive consumption without thinking things through while watching live shopping channels (Li et al., 2021). The live streaming shopping environment provides more interaction among the live streaming anchors and the consumers, creating a strong interpersonal connection for online shopping (Al-Emadi & Yahia, 2020). During live stream shopping, live streamers and their online store assistants can taste the food and try on the cloths to intuitively display the product to viewers and potential consumers (Wongkitrungrueng & Assarut, 2020). Simultaneously, danmaku on live streaming platforms can answer questions asked by viewers

and provide guidance to consumers, which has been proven to be an efficient method to enable consumers to interact with the influencers and assistants (Sun et al., 2019). During live streaming, viewers engage in a “two-way communication” with other viewers and live streamers (Cheng, 2020).

Prashar (2015) defined the factors that can promote consumers’ impulsive buying as “in-store environment, hedonism, product, and promotional cues and socialization.” Eroglu and Machleit (1993) and Mitchell (1994) found that in-store environment stimuli, such as “colors, sounds, textures and locations,” may increase the possibility of buying tendency among impulsive consumers (Pacheco et al., 2021). Xu (2020) found that consumers’ emotional states are positively correlated with the environmental stimuli and thus lead consumers to impulsive buying in the context of live streaming. Parboteeah (2009) found that, owing to a strong feeling of enjoyment caused by the shopping environment, consumers will display more urgency in buying the products. Lee and Chen (2021) found that “perceived enjoyment” is the key element to facilitate consumers making easier and more impulsive buying decisions, especially during the short live streaming period. Pacheco (2021) found that a negative emotional state could stimulate consumers to buy products impulsively; stressful viewers would interact with the online sellers more frequently.

As well as examining the motivations that make consumers impulsive, the present study also examines the moderating role of consumers’ attitudinal ambivalence. Bee and Madrigal (2013) found that conflicting information can result in consumers’ emotional ambivalence and subsequently influence consumers’ purchase intention. In summary, danmaku, sense of presence, and consumers’ attitudinal ambivalence can be considered as stimuli that may

influence consumers' impulsive consumption behavior. The present study, therefore, attempts to identify the mechanism(s) influencing consumers' impulsive buying and to examine how consumers' attitudinal ambivalence moderates this mechanism.

In a live shopping stream, by sending comments or gifts, danmaku enables interaction among viewers and the live streamer and other viewers. Danmaku comments on the live streaming platform are different from conventional comments. In an e-commerce platform, traditional comments over time, with text and pictures, can be found on the product details page (Liu et al., 2017). However, these comments may incorporate much artificial information that misleads consumers in seeking knowledge of the products. In a live shopping stream, although viewers cannot come into the online shop, they can provide their requirements and ask questions to the live streamer in the chat room. Prashar (2015) discovered that traditional online comments can influence consumers' impulsive buying behavior. During live streaming processes, viewers can browse other danmaku comments to gain product information and receive a response from streamers in a more direct way. Accordingly, danmaku information quality in live streaming should be a key focus area.

The sense of presence in live streaming is a key reason triggering impulsive buying that differentiates it from traditional e-commerce platforms. Attractive video content and advertisements abound in live streaming marketing strategy owing to its real-time connection, shared viewership, and efficient communication in a live chat room (Ang et al., 2018). Viewers can be potential customers when watching a live shopping stream and while interacting with the live seller and other viewers. Cheng (2020) found that product presentation and the social environment of the live stream are the stimuli of the live stream

environment. Ang (2018) also found that a more authentic experience based on social influence cues can induce consumers' subscribing behavior and product searching intention during live streaming. Therefore, the mediation role of consumers' sense of presence will be addressed in the present study.

Ambivalent attitudes can influence people's decision-making process. Sipilä (2017) found that attitudinal ambivalence can negatively influence consumers' purchase processes. Moody (2014) found that attitudinal ambivalence can positively affect users' trust intentions toward an e-commerce website. Armitage and Conner (2000) found that less ambivalence is more predictive in subsequent behavioral intentions and behavior. Jiang and Zhang (2021) found that online sellers can provide efficient information cues to consumers to decrease their contradictory feelings, thus resulting in a high purchase intentions. Boukamcha (2017) found that deeply ambivalent consumers are more susceptible to risks.

The present study on consumers' impulsive buying behavior contributes to the literature in two ways. First, it adopts a moderated mediation framework as a theoretical foundation to reveal the mediator relationship of the sense of presence between danmaku information quality and consumers' impulsive buying behavior. Second, the role of consumers' attitudinal ambivalence is considered as a moderator in the mediation model. These two contributions can both benefit live streamers and consumers in making better decisions in the live shopping era.

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Theoretical background

In early days of the environmental psychology field, Mehrabian and Russell (1974) proposed the stimulus–organism–response (S–O–R) framework to examine the influences of external cues on individuals’ behavior. This model postulates that multifarious aspects of the external environment, such as information quality, can act as stimuli (S) that affect people’s inner state (O), which in turns influence individuals’ behavior (R) (Cheng et al., 2021). The S–O–R framework represents a mechanism to describe individuals’ behaviors by evaluating individuals’ cognitive and affective states engendered by external stimuli (Ming et al., 2021). This framework has been widely used in research associated with impulse buying , e-commerce (Alanadoly & Salem, 2022), s-commerce (Hewei & Youngsook, 2022), retailing (Ürgüplü & Yumurtacı Hüseyinoğlu, 2021), and live streaming (Ming et al., 2021), both in online and offline contexts. The S–O–R framework has become widely used as research tool when effectively assessing the effects of information quality on individuals’ behavior (Fan et al., 2021).

In particular, the model describes the stimulus as the environmental factor driving a state of feeling, which is an organismic state (Ming et al., 2021). In a previous study, Gao et al. (2018) observed that real-time interaction between live streamers and viewers in live streaming fulfils viewers’ needs, bringing a strong sense of presence, which in turns influences consumers’ attitudes and behaviors. Thus, a sense of presence in live streaming is strong stimulus (S) to influence consumers’ impulse buying behavior. In this context, the organism (O) is represented by an individual’s cognitive and affective intermediary states, which

mediate the effects of stimuli on consumer behavior (Fan et al., 2021; Ming et al., 2021). The cognitive state is associated with mental processes, while the affective state in humans' emotional response is associated with environmental cues. This study employs sense of presence to explore individuals' cognitive and affective states in relation to attitudinal ambivalence in live streaming. Finally, response (R) is represented by a consumer's decisions and behaviors grounded on her/his cognitive and affective state. In summary, based on the S–O–R framework, in the present study, the (environmental) stimulus is represented by information quality, the organism is represented by sense of feeling, and the response is represented by consumers' impulse buying behavior.

Hypothesis development

Danmaku information quality and consumers' impulsive consumption behavior

Since the parallelism feeling can be improved and loneliness can be overcome through synchronous video and text content in the visual environment, live streaming also provides the sense of “a stream of consciousness” (Liu et al., 2016); viewers can engage in a richer context and stronger perceived interactivity, which are created by the danmaku system (Xiang & Chae, 2021; Zhou et al., 2019) Unlike traditional comments, danmaku comments are regarded as synchronous comments made in every live streaming video (Chu, 2009). Specifically, because of the synchronized character of danmaku comments (Xiang & Chae, 2021), other characteristics, such as density, relevance, timeliness, and subdivision, can also be considered as consumers' influencing factors (Liu et al., 2017).

Based on the danmaku interface design, the more dense, relevant, timely, specificity the danmaku information is, the more playful the experiences, such as emotional release, a

feeling of company, a sense of belonging, fun, and attentiveness, will be for the user. Hedonic motivations are defined as fun, playfulness, and positive experiences (Chandrruangphen et al., 2021). Zhao and Bacao (2021) found that hedonic motivations of playfulness can increase consumers' behavioral intention. The danmaku system also improves the contextual richness, which subsequently positively influences consumers' engagement behaviors (Xiang & Chae, 2021). Zhou et al. (2019) found that on game streaming platforms, viewers may send virtual gifts more frequently in a higher density danmaku environment. Xu (2020) revealed the correlation between information quality and consumers' impulsive consumption in live streaming commerce. Gong (2020) proved the positive connection between information content and live streaming consumers' impulsive purchasing. Although the influences of comment information on consumers' behavioral intention and of information quality on consumers' impulsive consumption have been discussed by scholars, few scholars have empirically examined the correlation between danmaku information quality and consumers' impulsive consumption behavior. In this paper, we propose that danmaku information quality can drive consumers' impulsive consumption behavior. Thus, the following hypothesis is posited:

H1: The more dense, relative, timely, and specific the danmaku information quality is, the greater the possibility that a live shopping stream viewer will impulsively buy the products/services recommended by the streamer and the platform.

Sense of presence as a mediator

Danmaku information quality and sense of presence

Information quality is used to evaluate the data quality, which plays an important role for data consumers. Wang and Strong (1996) defined information quality as comprising 15 dimensions from the users' perspective. In Lili's (2017) research, the most useful comments (danmaku comments on live streaming platforms) were evaluated using four dimensions: danmaku density; danmaku relevance; danmaku timeliness; and danmaku subdivision. Based on this taxonomy, our study measures danmaku information quality in four aspects: danmaku comment density; danmaku comment relevance; danmaku comment timeliness; and danmaku comment specificity. According to Xu (2020), information quality can influence consumers' cognitive emotional states, thus impacting impulsive consumption behavior during live streaming. Sumiko and Agus (2020) found that viewers' cognitive trust can be positively affected by information quality on YouTube. Habib and Qayyum (2018) found that, during online shopping, consumers' emotional states are deeply affected by the informativeness of online comments or sellers.

Danmaku comments represent a type of social cue on live streaming platforms. (Fei et al., 2021) found that these social cues (herding danmaku messages and interactive danmaku text) stimulate consumers' impulsive behavior. Kukar-Kinney and Xia (2017) found social cues are important for consumers' social evaluations and buying decisions on daily deal websites. Skalski et al. (2009) found that users' sense of belonging and presence can be elevated by an authoritative and humorous media environment and the adoption of short video technology. As consumers are reading and interacting with other viewers and the live streamer, their

cognitive emotion attention on the products will change (Fei et al., 2021); thus, in line with the influence of the attractiveness of influencers and chat rooms, consumers' sense of presence will also change. Wang (2020) found that viewers' sense of presence can be increased by viewing videos from the first-person perspective that are more humorous in nature on short video platforms. Gong (2020) found that information content can decrease consumers' psychological distance, subsequently positively impacting their impulsive buying behavior. Xu (2020) found that information quality affects consumers' cognitive assimilation. In this context, Li (2021) also found that social presentation and information sharing behavior are related to users' danmaku sending behavior. Zhou et al. (2019) found that with more social integration and cognitive benefits, consumers can engage in danmaku interaction with other virtual viewers and increase their feeling of contextual richness.

Although researchers have theoretically tested the influence among information content and information quality, the correlation between danmaku information quality on live streaming platforms and consumers' sense of presence has been little explored. In this paper, we argue that the provision of better danmaku information quality may affect consumers' sense of presence regarding the products, the live streamer, and the chat room during live streaming, thus increasing consumers' sense of presence. We therefore propose the following hypothesis:

H2: The more dense, relative, timely, and specific the danmaku information quality is on a live streaming platform, the stronger the sense of presence the consumer will feel.

Sense of presence and impulsive consumption

Changes in consumers' sense of presence reflect changes in consumers' satisfaction and their trust in sellers, which will in turn affect consumers' loyalty and purchase intention (Kim & Zhang, 2009; Liu et al., 2019; Lu et al., 2016). Specifically, several researches have focused on the correlation between the sense of presence and consumers' purchase intention (Tuncer, 2021). Liu (2019) and Lu (2016) argued that the trust of consumers regarding site members and sellers could determine their purchase intention. When consumers have a high sense of presence from online retailers, they show better social commerce engagement (Xue et al., 2020). According to Ye (2020), consumers' sense of presence can not only influence their trust, but can also increase their enjoyment and sociability, ultimately motivating their purchase intention. Ming et al. (2021) found that social presence can trigger consumers' trust, thus leading to their impulsive buying behavior. Furthermore, as a social cue, sense of presence motivates customers' impulsive consumption behavior during live streaming. Accordingly, the following hypothesis is formulated:

H3: The higher the sense of presence between the platform, streamer, and consumer, the greater the possibility that the consumer will engage in impulsive consumption behavior.

In addition, different viewers use danmaku for information and opinion exchange, thus influencing each other. Thus, danmaku will be more interactive when it generates a sense of presence and a face-to-face experience for consumers (Yi Li & Guo, 2021). In general, online danmaku comments always provide "a feeling of co-viewing" for viewers (Chen et al., 2017; Fang et al., 2018). Li and Shu (2021) found that online interaction could stimulate

consumers' sense of presence; this presence is positively related to their flow experience and leads to impulsive buying on live streaming. In chat rooms, if consumers make more online interactions, such as chatting or asking questions, their sense of presence will be greater and they will be more likely to engage in impulsive shopping. Thus, the sense of presence can promote the influence of danmaku information quality among consumers and increase viewers' impulse buying tendency. Therefore, the following hypothesis is formulated:

H4: A mediating effect of sense of presence exists between danmaku information quality and consumers' impulsive consumption behavior. Specifically, the greater the danmaku information quality, the stronger consumers' sense of presence will be, thus increasing the likelihood that they will demonstrate impulsive consumption behavior for products recommended by the streamer and the platform.

Consumers' attitudinal ambivalence as a moderator

Attitudinal ambivalence is defined as a measurement towards an object or stimuli by individuals' positive or negative evaluation and it is an indirect measurement (Akhtar et al., 2019). Various feelings can cause attitudinal ambivalence, such as satisfaction, unsatisfactory, happiness, sadness, compulsory, positive and negative attitudes, and conflicted (Boukamcha, 2017). In addition, Akhtar (2019) found that the feelings such as "uncertainty, frustration, and sadness" are engendered by attitudinal ambivalence, thus leading to psychological discomfort. Uncertainty and discomfort are the main components of consumers' anticipatory ambivalence (Bee & Madrigal, 2013). Sparks et al. (2001) found that, when buying meat and sweet food, consumers are less likely to make consumption decisions because of their attitudinal ambivalence. Additionally, Bee (2013) found that ambivalence among consumers attenuates

the link between consumers' attitudes and purchase intentions. In this context, the influence of consumers' attitudinal ambivalence on their purchase behavior needs to be further analyzed. In contrast, attitudinal ambivalence sometimes may have positive effects on consumers' behavior. Sipilä (2017) found that positive word-of-mouth can reduce consumers' attitudinal ambivalence. Moody (2014) found that a small amount of ambivalence increases consumers' intentions in the context of websites. Armitage (2000) proved that persuasive communication more effectively drives the purchase determination of consumers with high ambivalence feelings.

Live streaming danmaku platforms provide flat, equal, and real-time interaction between viewers, streamers, and other viewers. Further, the live streaming technology also shows the details of a product on the product details page to facilitate consumers making better decisions. This improves consumers' sense of presence, along with the attractiveness and persuasiveness of live streamers and live stores. In this paper, we argue that consumers with high attitudinal ambivalence are less likely to purchase impulsively even though they read high quality danmaku information and have a high sense of presence. Accordingly, we posit the following hypothesis:

H5: The attitudinal ambivalence factor moderates the impact of sense of presence on consumers' impulsive consumption behavior in a negative way. Specifically, when consumers have a higher attitudinal ambivalence, sense of presence has only a limited influence on them buying products impulsively.

Based on Jiang's (2021) findings that, even for consumers with high contradictory feelings, their attitudes and behaviors can be reversed by receiving additional information on the

products. We argue that consumers with high attitudinal ambivalence are more likely to demonstrate rational consumption behavior, even when faced with a high quality of danmaku information during a live streaming, leading to the following hypothesis:

H6: The attitudinal ambivalence factor moderates the impact of danmaku information quality in a negative way.

H6a: When consumers have high attitudinal ambivalence, high quality danmaku information has only a limited effect on their impulsive consumption behavior.

H6b: When consumers have high attitudinal ambivalence, high quality danmaku information has only a limited effect on their sense of presence.

The proposed model is illustrated in Figure 1.

<Figure 1 about here>

METHODS

Sample and data

Our study used a questionnaire survey to examine the influence of danmaku information quality on impulsive consumption during live streaming, as well as the mediating role of sense of presence and the moderating role of consumers' attitudinal ambivalence in the link between danmaku information quality and impulsive consumption. Mature Western scales were used to ensure accuracy, as well as the standardization of the design of the questionnaire indices and the evaluation of the questions.

The participants (who could be of any age) had to have live streaming experience, such as watching live sports, reality shows, e-commerce shopping streams, etc. The questions were single choice and all based on prior literature.