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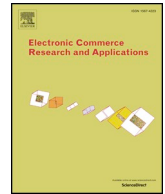
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How live streaming influences purchase intentions in social commerce: An IT affordance perspective

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ABSTRACT

As a new form of social commerce, live streaming shopping is becoming increasingly popular among Chinese consumers, which has aroused great interest among practitioners and researchers. Building a theoretical model from the perspective of IT affordance, our study examines how live streaming influences social commerce customers' purchase intentions in China. We empirically measure the model by surveying customers who have shopped via live streaming shopping platforms including Taobao.com, JD.com, Mogujie.com, and Sina Microblog. Our results show that visibility affordance, metavoicing affordance, and guidance shopping affordance can influence customer purchase intention through live streaming engagement. Our study highlights the importance of understanding the implications of IT affordance for social commerce.

1. Introduction

With live streaming becoming increasingly popular, many vendors on social commerce platforms have adopted live streaming as a tool to improve sales performance in China. This has led to the emergence of a new form of social commerce called live streaming shopping, which has already improved the performance of many social commerce sellers. For example, according to 2019 Taobao Live Streaming Ecological Development Report (Taobangdan and Taobao Live Streaming, 2019), live streaming shopping on Taobao.com helped online vendors to achieve over 100 billion Yuan in sales in 2018. Live streaming has changed traditional social commerce in several ways. First, in traditional online shopping, customers can only learn about products through pictures and text. By contrast, live streaming shopping allows streamers (online sellers) to show products in real-time videos, thus giving customers more detailed product information (Wongkitrungrueng and Assarut, 2018). Second, in traditional social commerce, customers wanting to ask questions about product-related issues must leave the product page to contact the seller. By contrast, live streaming shopping allows customers to ask questions through the bullet screen, which streamers can then answer live in real-time (Wongkitrungrueng and Assarut, 2018). Third, in traditional social commerce, sellers cannot usually guide customers on products and the

lack of face-to-face interactions often causes customers to doubt suppliers' authenticity, which increases the perceived risk of online shopping. Live streaming shopping is manifestly suitable for effectively addressing this issue. Customers can ask questions through the bullet screen, and sellers can answer customers' questions and provide highly personalized services and guidance to customers using real-time live streaming, which can meaningfully influence customer purchase behavior (Chen et al., 2017; Kim and Park, 2013; Zhou et al., 2018).

Live streaming, as a new phenomenon, has so far received insufficient research attention. Moreover, despite the growing popularity of live streaming shopping, very few studies have investigated how customer purchase intention is influenced by live streaming (Yu et al., 2018). While live streaming shopping has been found to build customer engagement (Wongkitrungrueng and Assarut, 2018), it is still unclear whether enhancing customer engagement will positively impact on customer purchase intention in social commerce.

Previous studies of live streaming shopping have mainly focused on the motivations of viewers and streamers to use live streaming (e.g., Chen and Lin, 2018; Sjöblom and Hamari, 2017; Zhao et al., 2018). While some studies have focused on the impacts of live streaming shopping features like the user interface design and gift-giving feature (Ho and Yang, 2015; Yu et al., 2018), most have only considered the perceived values (utilitarian, hedonic, and symbolic) and motivations

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(utilitarian and hedonic) of customers (Cai et al., 2018; Wongkitrungrueng and Assarut, 2018). Because live streaming shopping is essentially a form of human-computer interaction (HCI), it is important to consider both customers' perceptions and live streaming shopping features together. The concept of affordance can help us to consider both the technical features of live streaming shopping and customers' perceptions when interacting with these features (Leonardi et al., 2013; Parchoma, 2014; Treem and Leonardi, 2013). Affordance is formed through the relationship between users and technical features (Dong and Wang, 2018). When customers use and interact with live streaming shopping, affordance is thereby generated (Aladwani, 2017). The concept of affordance has been used in several previous studies of social commerce (e.g., Dong and Wang, 2018; Lin et al., 2019). Thus, we believe that this concept is suitable for studying live streaming shopping as a new form of social commerce.

Affordance theory holds that affordance is the possibility of influencing users to behave in a certain way (Bygstad et al., 2016). However, there is a "black box" between affordance and following behavior. To understand the influence mechanism of IT affordance on customer purchasing, we reviewed the existing literature on live streaming and found that customer engagement has attracted much attention in previous studies. Yu et al. (2018) demonstrated that engagement has a positive impact on viewers' consumption of virtual gifts. In the social commerce context, Wongkitrungrueng and Assarut (2018) found that live streaming can shape customer engagement through customer perceived value and trust. Furthermore, the importance of customer engagement has also been emphasized by scholars in other settings (Lu et al., 2018; Zorah et al., 2018). While customer engagement has been identified as an important antecedent influencing customer purchasing in online shopping (Prentice et al., 2019), few studies have considered both the antecedents and results of customer engagement in the context of live streaming shopping.

Our research aims to investigate how live streaming influences purchase intentions in social commerce. To achieve this goal, we develop a research model emphasizing affordance and customer engagement. The study's novelty and theoretical contributions are three-fold. First, our research proposes the influence mechanism of live streaming shopping on customer purchasing from the perspective of IT affordance and customer engagement. Second, our study considers both the features of live streaming shopping and customers' perceptions thereof. Third, our study considers both the antecedents and results of customer engagement in the context of live streaming shopping. Our study also provides some practical suggestions for sellers and e-commerce platforms to better leverage live streaming for effectively marketing their products.

2. Literature review

2.1. Live streaming in social commerce

Live streaming transmission employs one or more communication technologies that can instantaneously send images and sounds to other locations, allowing users to perceive presence (Chen and Lin, 2018). Live streaming shopping is a new social media form with high HCI. Previous live streaming studies have mainly focused on e-sports and video games (Cheung and Huang, 2011; Sjöblom and Hamari, 2017). However, several recent studies have offered fresh insights into live streaming shopping (Cai et al., 2018; Wongkitrungrueng and Assarut, 2018). Some scholars have adopted the perspective of users' intrinsic and extrinsic motivation to study which factors determine streamers' broadcasting intention in live streaming (Zhao et al., 2018). Other researchers have studied the impact of design features and customers' perceptions of live streaming on use intention (Chen and Lin, 2018; Ho and Yang, 2015).

However, because live streaming shopping entails significant HCI, it is necessary to consider both the technical features and customers'

perception thereof together. As it is easy to view products from different perspectives and ask relevant questions, many customers appreciate the ability to purchase via live streaming shopping (Lu et al., 2018). However, few studies have examined how live streaming shopping influences customers' purchase intentions. Therefore, to study customer purchase intention in the context of live streaming shopping, we comprehensively consider the technical features and customers' perceptions thereof.

2.2. The affordance lens

Based on affordance theory, each environment has the affordance or possibility of a specific action (Aladwani, 2017). The concept of affordance "belongs neither to the environment nor to the individual, but to the relationship between the individual and the environmental cognition" (Parchoma, 2014, p. 361). Affordance refers to "the potential for behaviors associated with achieving an immediate concrete outcome and arising from the relation between an object (e.g., an IT artifact) and a goal-oriented actor or actors" (Bygstad et al., 2016, p. 87). Different research fields have different definitions of affordance. In information systems research, affordance refers to the possibility that an object induces an individual to perform a certain behavior (Volkoff and Strong, 2013). Cabiddu et al. (2014) defined affordance as the potential of behaviors that compose user interaction with social media.

Affordance has different attributes, suggesting that there are different ways to influence user behavior to achieve objectives in a concrete environment (Leonardi, 2011). The affordance's characteristics may vary depending on the context (Koroleva and Kane, 2017). Scholars have attempted to classify the many kinds of affordance. Treem and Leonardi (2013) divided social media affordance into four categories based on previous research: visibility, persistence, editability and association. Combining affordance theory with the theory of public relations, Argyris and Monu (2015, p. 149) divided social media affordance into eight categories: "presentability, monitorability, reach, self-expression, engagement, connectivity, recordability, and availability". Based on the background of online shopping, some researchers have divided IT affordance into six affordances: visibility, metavoicing, triggered attending, shopping guidance, social contacting, and trading (Dong and Wang, 2018).

The concept of affordance has been widely used to understand the relationship between IT and social practice (Treem and Leonardi, 2013). For example, affordance has been widely studied in the fields of social media (Argyris and Monu, 2015) and information systems (Leonardi, 2011; Piccoli, 2016). In the social commerce context, Lin et al. (2019) used the social commerce affordance to understand how swift guanxi is formed between users and sellers. Dong and Wang (2018) investigated how the IT affordances of a social commerce platform build strong and weak ties between customers and sellers. Affordance concerns users' perceptions about technological artifacts (Treem and Leonardi, 2013). In social commerce, affordance derives from the relationship between customers and IT features (Dong and Wang, 2018). When customers use live streaming shopping, they will find live streaming shopping features and form perceptions about them. We thus believe that affordance allows us to consider together the technical features and customers' perceptions thereof, rather than analyzing them separately (Leonardi et al., 2013; Parchoma, 2014; Treem and Leonardi, 2013). Therefore, this study explains how live streaming influences customers' purchase behavior from an IT affordance perspective.

2.3. Customer engagement

Customer engagement has been variously defined as a state of mind, a kind of behavior, and a kind of psychological process. For example, Moliner et al. (2018) defined customer engagement as a kind of emotional connection between customers and brands. As a state of mind, customer engagement can be generated by a customer's experience

(Brodie et al., 2011). Wongkitrungrueng and Assarut (2018, p. 6) defined customer engagement as “customers’ behavioral manifestation toward a brand or firm beyond purchase” in live streaming shopping and found that customers’ perceived value positively impacts on their engagement in live streaming shopping. Some studies, such as Bowden (2009), defined customer engagement as a psychological process. For example, Islam and Rahman (2017) define customer engagement as an organism state based on Stimulus-Organism-Response framework. Our research defines live streaming shopping engagement as a psychological state based on the live streaming shopping context (Brodie et al., 2011).

In video games research, Caroux et al. (2015, p. 368) summarized engagement as including “immersion, presence or perceived realism,” which customers experience in HCI. As a type of HCI media, live streaming shopping essentially creates a virtual shopping environment in social commerce. Wongkitrungrueng and Assarut (2018) have previously indicated that live streaming can facilitate customer engagement. We thus believe that the concept of customer engagement is applicable to live streaming shopping. However, as customers have different engagement-related reactions (psychological or behavioral) to various marketing communications (Kim et al., 2017), the measures of customer engagement should be context-specific. For example, Kim et al. (2017) applied the specific research context to define TV ad engagement as a second-order variable that includes presence and immersion. Because live streaming is real-time social media, the definitions of customer engagement in previous studies (e.g., Kim et al. (2017); Cheung et al. (2015)) may not be applicable to live streaming shopping.

Previous studies have shown that engagement is among the most widely used concepts in marketing research fields like modern advertising and social commerce (Kim et al., 2017; Wongkitrungrueng and Assarut, 2018). Unsurprisingly, customer engagement can influence customer purchase intention in social commerce (Prentice et al., 2019). Several previous studies of live streaming have emphasized the role of customer engagement (Lu et al., 2018; Zorah et al., 2018). However, it is unclear whether customer engagement is a mediating mechanism of live streaming shopping that influences customers’ purchase behavior. Unlike the virtual gifts studied by Yu et al. (2018), live streaming shopping usually entails physical products. Thus, it is important to explore whether customer engagement influences customers’ purchasing decisions in the context of live streaming shopping; to this end, it is necessary to study the antecedents and influences of customer engagement in this context.

Table 1 presents the definitions of every construct in our model. It is worth noting that this study defines presence as a second-order formative variable that includes social presence and telepresence (Ou et al., 2014).

3. Hypotheses development

3.1. IT affordance and live streaming shopping engagement

Dong and Wang (2018) suggested that IT affordance in social commerce includes visibility affordance, metavoicing affordance, and guidance shopping affordance. According to Dong et al. (2016), visibility affordance satisfies the customer’s need to access to products when participating in social commerce activities, and the required technical capability for visibility affordance is to provide customers with visible product information. In live streaming shopping, streamers use live streaming to explain how to use products and to show product details (Lu et al., 2018; Wongkitrungrueng and Assarut, 2018). Dong et al. (2016) asserted that metavoicing affordance meets customers’ need to find valuable information about their target products, and the required technical capability for metavoicing affordance is to provide a function for customers to post their comments. In live streaming shopping, customers can communicate with streamers or make comments through a bullet screen or shared chat rooms (Hamilton et al., 2014; Hu et al., 2017). Thus, customers can ask streamers for relevant information about products, and streamers provide customers with the information they need via chat rooms. Guidance shopping affordance can provide customers with personalized and cooperative services to help them easily find desirable products; the required technical capability for guidance shopping affordance is a function for providing personalized advice to customers (Dong et al., 2016). In live streaming shopping, streamers can provide personalized services based on customers’ needs. Therefore, we propose that IT affordance includes visibility affordance, metavoicing affordance, and guidance shopping affordance in the live streaming shopping context (Dong and Wang, 2018; Lin et al., 2019).

3.1.1. Visibility affordance and live streaming shopping engagement

Live streaming can send images and sounds from one location to another location instantaneously (Chen and Lin, 2018), and live streaming shopping can channel these functions. On the one hand, live streaming shopping is a highly visible form of product presentation via online videos. Because customers need more product information to make purchase decision, they will focus their attention on live streaming shopping to obtain product information, which gives the customers a sense of immersion. Moreover, the vividness of live streaming shopping makes it easier to attract customers. Therefore, customers perceive immersion (Yim et al., 2017). On the other hand, live streaming shopping can transmit detailed videos to customers and the streamer can demonstrate how to use the products through live streaming, which allows the product to be visualized. In this process, customers can see the streamers and so perceive the sellers as “real people,” which leads them to perceive social presence (Li, 2019). In addition, based on visibility affordance, live streaming shopping

Table 1
Construct definitions.

Constructs	Definition
IT affordance	“The possibilities for purchase-oriented action offered by technical objects to customers and sellers, given their capabilities and goals” (Dong and Wang, 2018, p. 51)
Visibility affordance	The possibility of visibly demonstrating the product to customers (Dong et al., 2016)
Metavoicing affordance	The possibility for customers to respond to product content and sellers (Dong and Wang, 2018; Dong et al., 2016)
Guidance shopping affordance	The potential to help customers make purchase decisions by offering personalized services (Dong et al., 2016)
Live streaming shopping engagement	The psychological state of customers who are highly involved in using live streaming shopping and it comprises immersion and presence (Brodie et al., 2011; Caroux et al., 2015; Moliner et al., 2018)
Immersion	Customers’ feeling of being “absorbed in, involved with and engrossed” in live streaming shopping (Yim et al., 2017, p. 92)
Presence	“The extent to which a buyer perceives the immediacy (i.e., physical distance) and intimacy (i.e., psychological distance) between a buyer and a seller ... including social presence and telepresence” (Ou et al., 2014, p. 217)
Social presence	“A buyer’s perception of intimacy with a seller in terms of human contact, human warmth and sensitivity” (Ou et al., 2014, p. 217)
Telepresence	The customer’s “perception that they are present at a seller’s location remote from their own location” (Ou et al., 2014, p. 217).
Purchase intention	The customer’s intention to purchase products or service from sellers via live streaming shopping (Ajzen, 1991; Lu et al., 2016)

provides the customer with detailed and visible product information as if they were watching the product and obtaining the product information at the seller's location, which leads the customer to perceive telepresence. Because social presence and telepresence together constitute the concept of presence (Ou et al., 2014), we propose that visibility affordance helps customers to have the sense of presence. Therefore, we hypothesize that:

H1a: In live streaming shopping, visibility affordance is positively associated with immersion.

H1b: In live streaming shopping, visibility affordance is positively associated with presence.

3.1.2. Metavoicing affordance and live streaming shopping engagement

Regarding metavoicing affordance, users are motivated to seek valuable information about target objects (Dong et al., 2016). Customers with questions about products can directly pose them to streamers through the bullet screen or live chat rooms (Fang et al., 2018; Hamilton et al., 2014; Hu et al., 2017). If customers have any follow-up questions, they can respond to streamers' responses, and streamers will then provide further answers. Therefore, metavoicing affordance enables direct communication between customers and streamers, giving consumers a warm and friendly impression and narrowing the perceived distance between consumers and streamers (Lv et al., 2018). This facilitates consumers focusing their attention on live shopping activities, which helps to generate the sense of immersion and presence. Meanwhile, metavoicing affordance can also improve the interaction between customers and streamers (Dong and Wang, 2018). Some studies have shown that perceived social presence can be enhanced by providing channels for actual interaction with others or by stimulating the imagination of interaction with others (Fang et al., 2018; Hassanein and Head, 2005). Interactivity can positively impact on the formation of the sense of social presence and telepresence (Kim, 2015; Lim and Ayyagari, 2018), and also promotes the formation of immersion (Yim et al., 2017). Therefore, we hypothesize that:

H2a: In live streaming shopping, metavoicing affordance is positively associated with immersion.

H2b: In live streaming shopping, metavoicing affordance is positively associated with presence.

3.1.3. Guidance shopping affordance and live streaming shopping engagement

Guidance shopping affordance can provide customers with product service that meet their interests and needs (Dong and Wang, 2018; Xiao and Benbasat, 2011). In live streaming shopping, the guidance provided by streamers is based on customers' personalized needs. So customers will focus their attention on watching live streaming shopping, which helps them to create the sense of immersion (Yim et al., 2017). Meanwhile, guidance shopping affordance also helps customers to solve problems when they use live streaming shopping, which will increase the perceived utilitarian value (Dong and Wang, 2018). Immersion occurs when users experience a seamless process of addressing their innate utilitarian motivations and needs (Fang et al., 2018). Customers can directly seek purchasing help from streamers, and streamers can provide product information to customers based on their personalized needs. During this process, customers will perceive streamers as real persons, which helps them develop a sense of social presence and telepresence (Ou et al., 2014). Furthermore, guidance shopping affordance can improve the interaction between customers and streamers (Dong and Wang, 2018), and this enhanced interaction can help customers perceive telepresence (Lim and Ayyagari, 2018) and social presence (Zhang et al., 2014). Therefore, we hypothesize that:

H3a: In live streaming shopping, guidance shopping affordance is positively associated with immersion.

H3b: In live streaming shopping, guidance shopping affordance is positively associated with presence.

3.2. Live streaming shopping engagement and purchase intention

Customer engagement includes many dimensions. Caroux et al. (2015) found that perceived realism, presence, and immersion constituted engagement in HCI, typically in virtual environments. Perceived realism is the extent to which customers perceive that a virtual environment is realistic (Malliet, 2006). Perceived realism's major function is to help users identify the relationship between realistic and fictive events (Potter, 1988). As live streaming shopping environments are not fictional, perceived realism is not applicable to this context. Thus, live streaming shopping engagement in our study comprises immersion and presence.

In the live streaming shopping, the streamer interacts with customers, who can see the streamer's movements and hear their voice. Therefore, customers can perceive the person with whom they are communicating is a real person, which leads them to perceive social presence (Li, 2019). As a special type of media, live streaming can record and broadcast in real-time. Therefore, a significant feature of live streaming is that customers can form a sense of telepresence. In addition, live streaming shopping can induce fascination, which can lead to a sense of immersion (Shin, 2017).

3.2.1. Immersion and purchase intention

Perceived immersion could help users to identify the values and benefits they can obtain from an activity (Fang et al., 2018). It is easier for customers to make purchase decisions when they perceive greater value and benefits (Sun et al., 2016). In addition, in a virtual shopping environment, customers can more easily experience a state of pleasure when they are in immersed (Yim et al., 2017), and customers' pleasure will directly influence their purchase behavior (Chen et al., 2017). Finally, as customers experience a pleasant mental state when engaging in live streaming shopping, they will more actively participate in shopping activities and have a more positive attitude toward the products presented by streamers. Therefore, we hypothesize that:

H4: In live streaming shopping, immersion is positively associated with customer purchase intention.

3.2.2. Presence and purchase intention

The real-time interactions between customers and streamers in live streaming shopping will bring a strong sense of telepresence to customers. The sense of telepresence in an online shopping environment can make customers feel comfortable (Gao et al., 2018). The positive feeling makes it easier for customers to make purchase decisions. Customers with a higher sense of telepresence will obtain more product information, thus reducing product uncertainty (Kang et al., 2014) and increasing customers' confidence to make purchase decisions (Gao et al., 2018). Consequently, their purchase intention will be stronger.

Websites with social presence can deliver more information to customers, which enhances their perceived transparency (Lu et al., 2016). The more transparent the shopping environment, the greater the security perceived by customers when making purchase decisions (Lee and Park, 2014). Relatedly, perceived social presence can shorten the psychological distance between customers and streamers (Darke et al., 2016; Lu et al., 2016), thus helping to establish closer relationships between them. This means that perceived social presence can enhance the sense of intimacy between customers and streamers (Gao et al., 2018) and increase customers' perceived pleasure from shopping experience (Choi, 2016). Both effects can directly and/or indirectly increase customers' trust in streamers and reduce product uncertainty, thereby strengthening customer purchase intention (Li, 2019; Lv et al., 2018; Ou et al., 2014). Because the presence dimensions of telepresence and social presence can both strengthen customer purchase intention, we hypothesize that:

H5: In live streaming shopping, presence is positively associated with customer purchase intention.

Our research model is shown in Fig. 1.

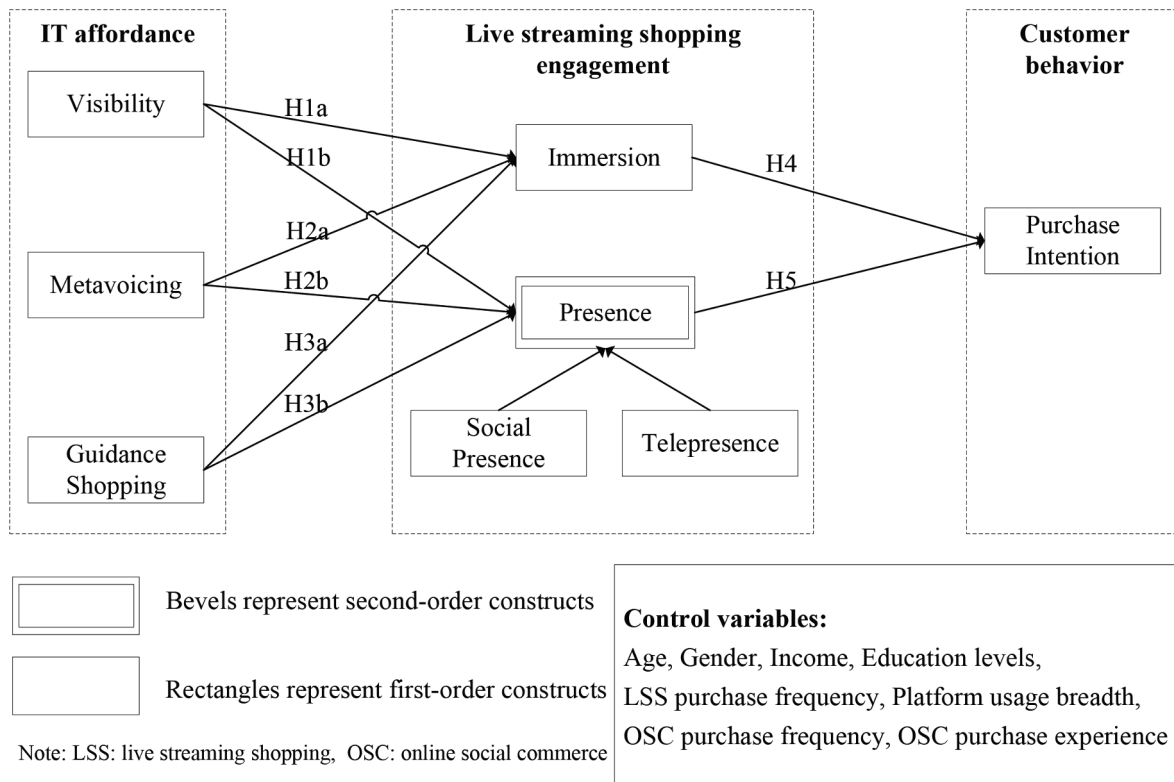


Fig. 1. Conceptual model.

4. Data and methodology

This research concentrates on social commerce platforms and social media platforms that have live streaming shopping. It specifically considers Taobao.com, JD.com, Mogujie.com and Sina Microblog. Taobao.com and JD.com, which are the two largest e-commerce platforms in China, have added “live streaming shopping” functions to their websites. Mogujie.com has always been the leading operator of live streaming shopping. Sina Microblog, which is among the largest social medium platforms in China, also has a “live streaming” function on its website, enabling sellers to carry out live streaming shopping activities. There are two reasons for our decision to include more than one platform in our study. First, these social commerce platforms offer similar live streaming shopping functions, including product visualization, allowing customers to post comments, and enabling streamers to offer shopping guidance. In addition, there is a crossover between Sina Microblog and Taobao.com: sellers offer live streaming product demonstrations on Sina Microblog but give customers links to their online stores on Taobao.com, as Sina Microblog does not host online shops. Second, it is difficult to confirm that customer responses concerning a specific platform are not affected by their experiences on other platforms. Therefore, our study examines how live streaming shopping in general can affect customer purchase intention.

Our study adopts the survey method. Our questionnaire includes 27 self-report items, eight respondent information items, and one item as a marker variable. Our questionnaire includes seven variables, including social presence and telepresence that combine to form presence (a second-order formative variable). In addition, we take “emotional stability of personality” as a marker variable (Hsieh and Tseng, 2018) because it is unrelated to other variables in our model. We use a 7-point Likert scale to measure each item (1 = *strongly disagree*, 7 = *strongly agree*). We designed all items following previous studies, with minor changes for each item to fit our research context. Because the items were originally devised in English, we used the forward-backward translation method to design the questionnaire for our study’s Chinese

context. First, we translated all items from English to Chinese. Second, we invited 10 consumers with more than two years’ experience of live streaming shopping to check whether the translated measurement items are easy to understand. Third, two researchers with relevant research experience translated the items from Chinese back to English to determine the accuracy of the translation. Finally, four researchers were invited to compare the items in Chinese with their counterparts in English. Their evaluation feedback confirmed that there are no significant differences between the two versions.

We distribute the questionnaire on the Wenjuanxing website (<https://www.wjx.cn/>), which is among the largest professional data collection websites in China, with over one million respondents answering questionnaires every day. We choose the sample service offered by Wenjuanxing, which is a professional data collection service for research purposes. Wenjuanxing helped us to randomly select live streaming shopping users and to remove invalid questionnaire responses. To ensure the suitability of potential respondents, we included pre-screening questions asking customers if they had experience of live streaming shopping and which platform(s) they had purchased from. Only those who reported having live streaming shopping experience were given access to the questionnaire. These customers were then instructed to answer questions based on their previous live streaming shopping experiences. We also included two questions to identify invalid responses: both were similarly worded to two genuine items in the questionnaire but had opposite meanings. If respondents gave the same answers to these two questions as their answers to the two genuine items, their questionnaire was classified as invalid. In total, 504 valid questionnaires were received from August 15, 2018 to September 10, 2018.

The items of visibility affordance (VI), metavoicing affordance (ME), and guidance shopping affordance (GS) are adapted from Dong and Wang (2018). The items of immersion (IM) are adapted from Yim et al. (2017). The items of social presence (SP) and of telepresence (TE) are adapted from Ou et al. (2014), and the items of purchase intention (PUI) are adapted from Chen et al. (2017). Appendix A details all the

Table 2
Demographics of Respondents (N = 510).

Items		Frequency	Percentage
LSS purchase frequency (times per month)	1–3	345	68.45%
	4–6	111	22.02%
	7–9	34	6.75%
	More than 9	14	2.78%
Gender	Male	196	38.89%
	Female	308	61.11%
Age	Under 20	0	0.00%
	20–24	113	22.42%
	25–29	154	30.55%
	30–39	197	39.09%
	40–49	34	6.75%
	50 or older	6	1.19%
Education level	Secondary school or below	20	3.97%
	Junior college	95	18.85%
	Bachelor	351	69.64%
	Master's	35	6.94%
	PhD	3	0.60%
OSC purchase experience	Less than 6 months	24	4.76%
	6 months–1 year	26	5.16%
	1–1.5 years	27	5.36%
	1.5–2 years	30	5.95%
	More than 2 years	397	78.77%
Monthly income (RMB)	Less than 1500	30	5.95%
	1500–2999	28	5.56%
	3000–4999	96	19.05%
	5000–5999	85	16.86%
	6000–6999	62	12.30%
	7000–7999	70	13.89%
	Above 8000	133	26.39%
Live streaming platform types	TaoBao	478	94.84%
	JingDong	278	55.16%
	MoGuJie	232	46.03%
	Sina Microblog	201	39.88%
Platform usage breadth	1 type	87	17.26%
	2 types	208	41.27%
	3 types	150	29.76%
	4 types	59	11.71%
OSC purchase frequency	1–3	147	29.17%
	4–6	174	34.52%
	7–9	95	18.85%
	More than 9	88	17.46%

Note: LSS: Live streaming shopping; OSC: Online social commerce.

measurement items of our research. Following some scholars' method of using the number of pages as the product search breadth (Zheng et al., 2013), we take the number of platforms used as the platform usage breadth. Control variables in our model include live streaming shopping purchase frequency (LSS purchase frequency), gender, age, education level, monthly income, online social commerce purchase experience (OSC purchase experience), platform usage breadth, and online social commerce purchase frequency (OSC purchase frequency).

Table 2 presents the demographic information of the study's respondents. Of all the respondents, 61.11% are women (n = 308) and

38.89% are men (n = 196). Most of the respondents are aged either 25–29 (n = 154, 30.55%) or 30–39 (n = 197, 39.09%), and most have a bachelor's degree (n = 351, 69.64%). In terms of user experience, most respondents buy products 1–3 times a month through live streaming shopping (n = 345, 68.45%), and most purchase online 4–6 times a month through social commerce platforms (n = 174, 34.52%).

5. Data analysis and results

We used SPSS19.0 and SmartPLS3.0 for our data analysis. SPSS19.0 is only used to test common method bias. Since our model contains a second-order formative variable, we use partial least squares (PLS) to calculate first-order variables and test second-order formative variables (Gefen et al., 2000). SmartPLS is commonly used for structural equation modeling. It can process small-sample data, non-normal data, and models with second-order formative variables. PLS has been widely adopted in recent research (Algharabat et al., 2017; Chen et al., 2017; Ko, 2018). Furthermore, we use SmartPLS to analyze the measurement model and the structural model because presence is a second-order formative variable (Ringle et al., 2012), comprising social presence and telepresence.

We estimate the parameters of presence by using a repeated indicator approach and two-stage approach in PLS (Ringle et al., 2012; Wetzels et al., 2009). For the repeated indicator approach, presence as a higher-order latent variable is formed by social presence and telepresence, which are two lower-order latent variables in our model (Becker et al., 2012). For the two-stage approach, we use the repeated indicator approach to get the latent variable scores of social presence and telepresence, before then taking the scores of social presence and telepresence from the first stage as manifest variables in the presence measurement model.

5.1. Measurement model

We use Cronbach's alpha and Composite Reliability (CR) to test the model's reliability. Table 3 shows that Cronbach's alpha values ranged from 0.75 to 0.85, and CR values ranged from 0.84 to 0.90. Both metrics thus exceed the required value of 0.7 (Fornell and Larcker, 1981), which satisfies the reliability requirement. We use the average variance extracted (AVE) and item loading to test for convergent validity. The AVE values of all constructs range from 0.54 to 0.71, thus exceeding the accepted level of 0.5 (Chin, 1998), and all the item loadings exceed the required value 0.7. The results thus show that convergent validity is also satisfied.

We follow Ko (2018) by using three methods to assess discriminant validity. For the first method, we adopt the Fornell–Larcker criterion. Table 3 shows that the AVE square roots exceed the correlation coefficients of each latent variable, which confirms discriminant validity (Fornell and Larcker, 1981). For the second method, we adopt cross-loadings. Table 4 shows that all indicator loadings exceed the cross-loadings, which confirms discriminant validity (Chin, 1998). For the

Table 3
Cronbach's Alpha, Composite Reliability, AVE, and Correlations.

Constructs	Cronbach's Alpha	Composite Reliability	AVE	GS	IM	ME	PI	SP	TE	VI
GS	0.75	0.84	0.57	0.76						
IM	0.79	0.88	0.71	0.46	0.84					
ME	0.79	0.85	0.54	0.50	0.44	0.74				
PUI	0.79	0.88	0.70	0.49	0.56	0.41	0.84			
SP	0.84	0.90	0.68	0.56	0.51	0.41	0.56	0.83		
TE	0.85	0.90	0.69	0.49	0.65	0.43	0.58	0.60	0.83	
VI	0.80	0.87	0.62	0.50	0.43	0.53	0.50	0.45	0.44	0.79

Note: GS: guidance shopping affordance; IM: immersion; ME: metavoicing affordance; PUI: purchase intention; SP: social presence; TE: telepresence; VI: visibility affordance.

Diagonal elements represent the square root of AVE.

Table 4
Weightings, Loadings and Cross-loadings.

Constructs	Items	VIF	Weights ^a	Loadings and Cross-loadings						
				GS	IM	ME	PI	SP	TE	VI
PRESENCE	SP	1.55	0.57							
	TE	1.55	0.55							
GS	GS1	1.39		0.72	0.29	0.41	0.36	0.37	0.32	0.37
	GS2	1.43		0.77	0.36	0.34	0.35	0.45	0.41	0.37
	GS3	1.49		0.79	0.37	0.38	0.41	0.49	0.40	0.39
	GS4	1.43		0.75	0.36	0.40	0.37	0.36	0.34	0.41
IM	IM1	2.26		0.35	0.87	0.40	0.44	0.44	0.59	0.38
	IM2	1.33		0.41	0.78	0.37	0.48	0.43	0.51	0.39
	IM3	2.29		0.38	0.87	0.32	0.47	0.42	0.54	0.31
ME	ME1	1.58		0.35	0.25	0.71	0.24	0.23	0.25	0.42
	ME2	1.57		0.34	0.32	0.72	0.30	0.29	0.28	0.46
	ME4	1.55		0.37	0.29	0.75	0.29	0.30	0.26	0.40
	ME5	1.41		0.34	0.37	0.73	0.32	0.31	0.37	0.31
PUI	ME6	1.49		0.43	0.34	0.76	0.35	0.35	0.40	0.40
	PUI1	1.54		0.39	0.48	0.30	0.83	0.51	0.53	0.38
	PUI2	1.93		0.44	0.50	0.38	0.88	0.46	0.51	0.46
SP	PUI3	1.70		0.40	0.40	0.36	0.81	0.43	0.42	0.42
	SP1	1.73		0.43	0.48	0.34	0.44	0.77	0.52	0.39
	SP2	2.14		0.46	0.35	0.36	0.47	0.85	0.45	0.37
	SP3	2.21		0.47	0.40	0.27	0.44	0.85	0.51	0.34
TE	SP4	2.02		0.47	0.46	0.38	0.48	0.83	0.49	0.40
	TE1	2.19		0.37	0.57	0.36	0.51	0.48	0.86	0.34
	TE2	2.05		0.40	0.59	0.42	0.48	0.49	0.83	0.39
	TE3	1.83		0.45	0.51	0.38	0.48	0.50	0.80	0.40
VI	TE4	2.02		0.41	0.50	0.29	0.46	0.50	0.83	0.32
	VI1	1.85		0.41	0.38	0.49	0.43	0.35	0.35	0.84
	VI2	1.56		0.38	0.30	0.39	0.42	0.37	0.35	0.77
	VI3	1.57		0.38	0.29	0.42	0.37	0.29	0.23	0.74
	VI4	1.51		0.41	0.38	0.38	0.35	0.40	0.42	0.79

Note: GS: guidance shopping; IM: immersion; ME: metavoicing; PUI: purchase intention; SP: social presence; TE: telepresence; VI: visibility.

^a Presence is a formative variable, this column lists the factor weights (bold value) of SP and TE to Presence; for loadings and cross-loadings part, the bold values are the indicator loading values corresponding to the constructs and others are cross-loading values. All factor weights and indicator loadings are significant ($p < 0.001$).

Table 5
Heterotrait-Monotrait (HTMT) Ratio.

	GS	IM	ME	PI	SP	TE	VI
GS							
IM	0.59						
ME	0.65	0.54					
PI	0.64	0.70	0.52				
SP	0.69	0.63	0.49	0.68			
TE	0.61	0.79	0.52	0.71	0.70		
VI	0.65	0.54	0.68	0.64	0.55	0.52	

Note: GS: guidance shopping; IM: immersion; ME: metavoicing; PUI: purchase intention; SP: social presence; TE: telepresence; VI: visibility.

third method, we adopt the Heterotrait–Monotrait (HTMT) ratio to test for discriminant validity (Henseler et al., 2015). Table 5 shows that the HTMT values ranged from 0.49 to 0.79; as they are all below 0.85, discriminant validity is again confirmed (Voorhees et al., 2016). After testing using these three methods, we find that our model has satisfactory discriminant validity.

For second-order formative variables, we report the indicator weights and their significance (Becker et al., 2012). Table 4 shows that the weights of social presence and telepresence are 0.57 and 0.55, and both are significant. These results meet the requirements for both reliability and convergent validity. We also report the multicollinearity of indicators. All the variable inflation factor (VIF) values are below 3.33 (Cenfetelli and Basselier, 2009), which indicates that there are no major multicollinearity problems.

5.2. Common method bias

Because we collected data by questionnaire, common method bias (CMB) may be a potential concern. We use Harman's single-factor method and a marker variable assessment technique to assess CMB (Lindell and Whitney, 2001). The unrotated principal components factor analysis (omitted for brevity) indicates that there is 36.342% total variance in Harman's single-factor test, which suggests there is no CMB (Ou et al., 2014). In addition, we use SmartPLS3.0 to test the marker variable, which we find to have no impact on our model, again suggesting that there is no CMB (Rönkkö and Ylitalo, 2011). Based on the results from these two methods, we can confirm that CMB does not exist in our study.

5.3. Structural model

To obtain a stable result, we bootstrap 5000 times when using SmartPLS to calculate T-values and path coefficients. We also acquire R-square values from SmartPLS. Fig. 2 and Table 6 shows the structural model test results. We first test the impacts of IT affordance on live streaming shopping engagement. The results show that visibility affordance is positively associated with immersion ($\beta = 0.20$, $p < 0.001$) and presence ($\beta = 0.21$, $p < 0.001$); metavoicing affordance is also positively associated with immersion ($\beta = 0.20$, $p < 0.001$) and presence ($\beta = 0.16$, $p < 0.01$); and so is guidance shopping affordance (immersion: $\beta = 0.26$, $p < 0.001$; presence: $\beta = 0.40$, $p < 0.001$). These results show that H1a–H3b are all supported. Therefore, our results show that visibility affordance, metavoicing affordance, and guidance shopping affordance – the three IT affordances considered in this study – each positively impact on

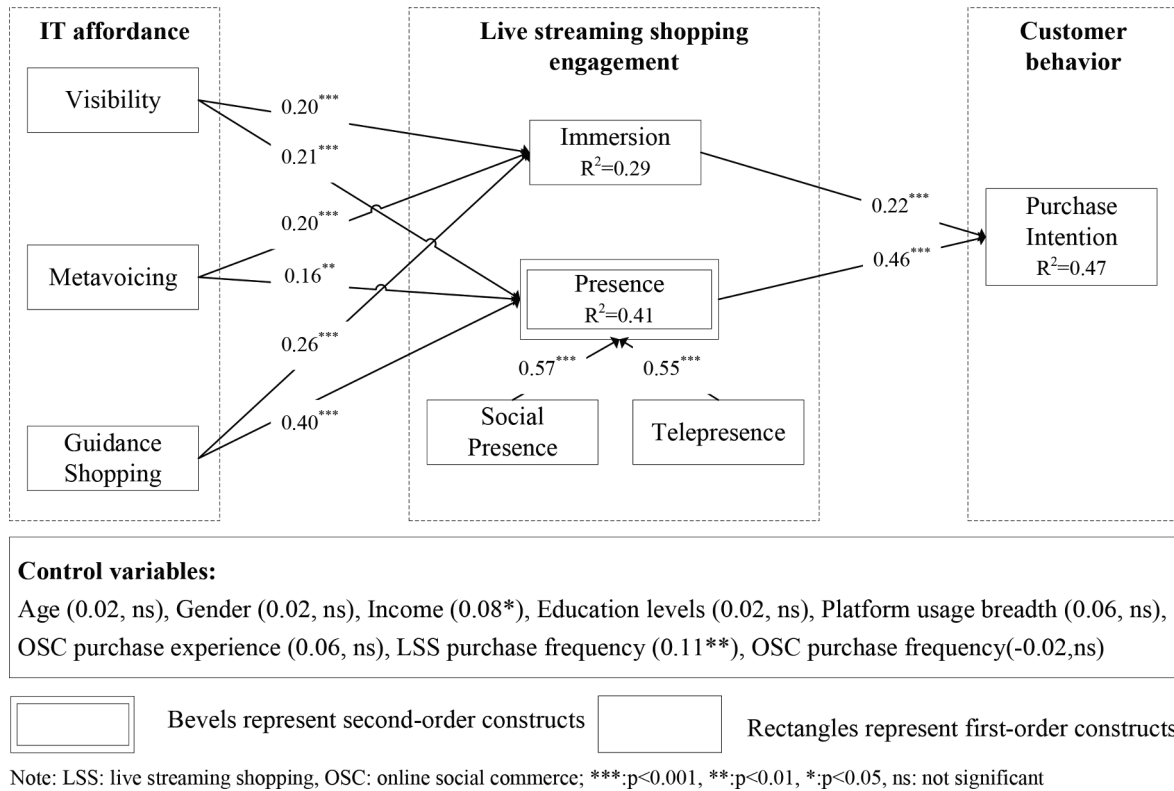


Fig. 2. Model testing results.

customer engagement in live streaming shopping.

Furthermore, immersion is positively associated with purchase intention ($\beta = 0.22$, $p < 0.001$), as is presence ($\beta = 0.46$, $p < 0.001$): these findings respectively support H4 and H5. Therefore, the results show that live streaming shopping engagement is positively associated with customer purchase intention. Table 6 shows the results of all hypothesis tests. The R-square of purchase intention is 0.47, indicating that about 47% of purchase intention is explained by presence and immersion. This empirical result clearly shows that engagement can affect customer purchase intention in live streaming shopping. Similarly, the R-square of presence is 0.41, which indicates that visibility affordance, metavoicing affordance, and guidance shopping affordance have good explanatory power for presence. The R-square of immersion is 0.29, indicating that in addition to IT affordance there may be other factors influencing customers' perceived immersion in live streaming shopping, such as interactivity and vividness (Yim et al., 2017). In addition, income ($\beta = 0.08$, $p < 0.05$) and live streaming shopping purchase frequency ($\beta = 0.11$, $p < 0.01$) have positive impacts on purchase intention.

5.4. Post hoc assessment of mediating effects

To verify whether each IT affordance impacts customer purchase intention through live streaming shopping engagement, we examine the mediating effects of engagement using the bootstrapping procedures of SmartPLS. Because we do not hypothesize the impact of IT affordances on purchase intention, it is sufficient to assess the indirect path (Zhao et al., 2010). Table 7 shows the results of the mediating effects assessment test. They show that immersion mediates the impacts of visibility affordance ($\beta = 0.04$, $p < 0.01$), metavoicing affordance ($\beta = 0.05$, $p < 0.01$), and guidance shopping affordance ($\beta = 0.06$, $p < 0.001$) on purchase intention, and that presence mediates the impacts of visibility affordance ($\beta = 0.10$, $p < 0.001$), metavoicing affordance ($\beta = 0.07$, $p < 0.01$), and guidance shopping affordance ($\beta = 0.18$, $p < 0.001$) on purchase intention. Therefore, our results demonstrate that IT affordances influence purchase intention through live streaming shopping engagement.

Table 6
Hypotheses Testing Results.

Hypothesis	Path	Path coefficients	Standard Deviation	T-values	P-Values	Supported?
H1a	VI → IM	0.20	0.04	4.42	0.0000	Yes
H1b	VI → PRESENCE	0.21	0.05	4.42	0.0000	Yes
H2a	ME → IM	0.20	0.05	4.05	0.0001	Yes
H2b	ME → PRESENCE	0.16	0.05	3.04	0.0023	Yes
H3a	GS → IM	0.26	0.05	5.21	0.0000	Yes
H3b	GS → PRESENCE	0.40	0.05	8.59	0.0000	Yes
H4	IM → PUI	0.22	0.05	4.42	0.0000	Yes
H5	PRESENCE → PUI	0.46	0.05	9.50	0.0000	Yes

Note: VI: visibility; ME: metavoicing; GS: guidance shopping; IM: immersion; PUI: purchase intention; SP: social presence; TE: telepresence.

Table 7
Results from Testing the Mediating Effects of Live Streaming Shopping Engagement.

Constructs			Indirect effect (IV-M-DV)		Mediating Effect
IV	M	DV	Path coefficients	P-Values	
GS	IM	PUI	0.06	0.0008	Significant
ME	IM	PUI	0.05	0.0038	Significant
VI	IM	PUI	0.04	0.0034	Significant
GS	PRESENCE	PUI	0.18	0.0000	Significant
ME	PRESENCE	PUI	0.07	0.0044	Significant
VI	PRESENCE	PUI	0.10	0.0000	Significant

Note: GS: guidance shopping affordance; IM: immersion; ME: metavoicing affordance; PUI: purchase intention; SP: social presence; TE: telepresence; VI: visibility affordance.

6. Conclusions and implications

Our study's main purpose is to investigate how live streaming shopping influences customer purchase intention on social commerce platforms. For this purpose, we built a research model that emphasizes IT affordance and customer engagement. Because engagement differs across contexts, we define live streaming shopping engagement in our model and use it as the mediating variable. We also examine if customer engagement can impact on customer purchase intention in the context of live streaming shopping. Our findings show that IT affordances (including visibility affordance, metavoicing affordance, and guidance shopping affordance) have significant impacts on live streaming shopping engagement (including immersion and presence), which is positively associated with customer purchase intention. The theoretical and practical implications of our study are as follows.

6.1. Theoretical implications

Our research contributes to the literature by offering three important insights into live streaming shopping. First, our study explains why live streaming influences customer purchase intention from the affordance and customer engagement perspective. Live streaming has changed many aspects of traditional social commerce, but previous studies have not investigated the impacts of these changes (Wongkitrungrueng and Assarut, 2018). After reviewing previous studies, we jointly examined technical features and customers' perceptions thereof from the IT affordance perspective. We also define live streaming shopping engagement as the mechanism for live streaming affordance to influence customer purchase intention. Our results show that live streaming shopping affordances (including visibility affordance, metavoicing affordance, and guidance shopping affordance) can influence customer purchase intention through live streaming shopping engagement. Thus, our study provides a theoretical basis for future studies of live streaming shopping.

Second, our study primarily adopts the affordance lens, which is a new research perspective for live streaming shopping. Previous studies of social commerce and live streaming shopping have separately examined social commerce features and how customers perceive them (Hajli, 2015; Renata and Zhang, 2013; Wongkitrungrueng and Assarut, 2018). However, because live streaming shopping is a high HCI level social commerce form, it is necessary to consider features and customers' perception as one unit. The concept of affordance can help researchers to consider both features and how customers perceive them (Leonardi et al., 2013; Parchoma, 2014; Treem and Leonardi, 2013). Therefore, there are some deficiencies in previous social commerce research that our study has somewhat addressed. Although some recent social commerce studies have adopted the affordance lens (Dong and Wang, 2018; Lin et al., 2019), this perspective has not previously been used to study live streaming shopping. Thus, our study contributes to

the extant literature on affordance in social commerce.

Third, we define customer engagement in live streaming shopping and verify that it provides a mechanism for affordance to influence customer purchase intention. Because live streaming shopping is a form of social commerce with significant HCI, our definition of customer engagement in this context includes both immersion and presence (a second-order formative variable comprising social presence and telepresence) (Caroux et al., 2015; Ou et al., 2014). Although some studies have shown that live streaming can build customer engagement in social commerce (Wongkitrungrueng and Assarut, 2018), whether customer engagement can lead to customer purchases is still unknown. Research on live streaming has shown that customer engagement positively influences viewers' consumption of virtual gifts (Yu et al., 2018). However, unlike virtual gifts, live streaming shopping usually entails physical products. Therefore, our study's definition of live streaming shopping engagement offers a new perspective for future customer engagement research.

6.2. Practical implications

Introducing visibility affordance, metavoicing affordance, and guidance shopping affordance as IT affordances of live streaming shopping, our study demonstrates that these affordances each influence customer purchase intention through live streaming shopping engagement. These results yield several practical suggestions for live streaming designers and social commerce sellers.

First, our results show that the IT affordances of live streaming shopping can indeed positively influence customers' purchasing decisions through engagement, which includes immersion and presence. Therefore, social commerce operators who have not yet adopted live streaming shopping should consider doing so to improve their sales performance. For example, they can leverage live streaming shopping to demonstrate products to customers and to communicate with and guide them, creating an environment that is conducive to customers perceiving immersion and presence. Sellers that have already adopted live streaming shopping should maximize the advantages of its visual and metavoicing features. For example, sellers can show more details of their products and respond rapidly to customers' questions to enhance customers' perceived immersion and presence. In addition, some streamers could improve their skills in guiding shoppers. For example, streamers should ensure they have thorough product knowledge before offering guidance to customers. When streamers show their products to customers through live streaming and proactively help them to solve problems, customers are more likely to purchase their products.

Second, live streaming shopping designers should endeavor to improve visibility and metavoicing. For example, they could improve the clarity of live streaming videos to strengthen the authenticity of products presented to customers. With a higher level of visibility, customers can view more realistic product videos that provide more detailed product information. Designers could also increase the functionality for streamer–customer interactions. If customers can fully express their needs and obtain responses from streamers, they will be able to obtain more accurate information. In addition, designers could endeavor to optimize live streaming shopping to more efficiently induce perceived immersion and presence in customers. Access to more information can reduce customers' uncertainty, giving customers a better shopping experience and, in turn, improving sellers' sales performance.

6.3. Limitations and future research

Our study has several limitations. First, we collected data on customer purchase intention. Although purchase intention can be used as an indicator of purchase behavior (Lee and Lee, 2015; Venkatesh and Davis, 2000), actual purchase data are more accurate in measuring such behavior. If conditions permit, future studies should use transactional data to study customers' purchase behavior in live streaming shopping.

Second, our research includes four live streaming shopping platforms. Although we control for platform usage breadth and give the reasons why we research four platforms in our paper, each platform has some unique characteristics which have an important impact on researches from other research perspective. For example, Mogujie.com mainly sells products for women. Future research should consider the impact of each platform's unique characteristics on customers' purchase intention in live streaming shopping. Third, as a general study of live streaming shopping, we did not consider product-related factors as main influencing factors. Future research should study the influence of different product-related factors on customer buying behavior in the context of live streaming shopping. Fourth, using the survey method, it was not practicable for us to measure purchase intention based on a specific experience. However, measuring customer purchase intention based on a specific shopping experience is useful for understanding customers' purchase behavior under certain circumstances. Therefore, future

studies of live streaming shopping should use experimental methods to examine customer purchase intention based on specific shopping experiences.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

Construct	Question	References
Visibility (VI)	VI1: Live streaming shopping provides me with detailed pictures and videos of the products VI2: Live streaming shopping makes the product attributes visible to me VI3: Live streaming shopping makes information about how to use products visible to me VI4: Live streaming shopping helps me to visualize products like in the real world	Dong and Wang (2018)
Metavoicing (ME)	ME1: Live streaming shopping allows me to comment on products ME2: Live streaming shopping allows me to react to streamers' feedback on products ME3: Live streaming shopping allows me to share in streamers' opinion about products ME4: Live streaming shopping allows me to join in streamers' communal discussions on products ME5: Live streaming shopping allows me to share shopping experiences with streamers	Dong and Wang (2018)
Guidance Shopping (GS)	GS1: Streamers on live streaming shopping can provide me with information on all alternative products I intend to buy GS2: Streamers on live streaming shopping can help me establish my product needs without any restrictions GS3: Streamers on live streaming shopping can help me identify which product attributes best fit my needs GS4: Streamers on live streaming shopping can provide me with personal product customization based on my requirements	Dong and Wang (2018)
Immersion (IM)	IM1: Not deeply engrossed–Deeply engrossed IM2: Not absorbed–Absorbed IM3: My attention was not focused–My attention was focused	Yim et al. (2017)
Social Presence (SP)	SP1: There is a sense of human contact in live streaming shopping SP2: There is a sense of personalness in live streaming shopping SP3: There is human warmth in live streaming shopping SP4: There is a sense of human sensitivity in live streaming shopping	Ou et al. (2014)
Telepresence (TE)	TE1: When watching live streaming shopping, my body was in the room, but I felt my mind was inside the world created by this Streamers TE2: When watching Live streaming shopping, I felt that I was immersed in the world this Streamers had created TE3: This live streaming shopping-generated world seemed to me to be “somewhere I visited” rather than “something I saw” TE4: I felt I was more in the “real world” than the “computer world” when I was watching live streaming shopping	Ou et al. (2014)
Purchase Intention (PUI)	PUI1: I will consider live streaming shopping as my first shopping choice. PUI2: I intend to purchase products or services through live streaming shopping. PUI3: I expect that I will purchase products or services through live streaming shopping	Chen et al. (2017)

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