What Encourages Purchase of Virtual Gifts in Live Streaming: Cognitive Absorption, Social Experience and Technological Environment

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Abstract

Live streaming has become extraordinarily popular worldwide. As a new form of social media, live streaming enables two levels of real-time interactions (i.e., between viewers and the streamer, and among viewers) and is monetized in a new way-viewers' purchase of virtual gifts. The new monetization model has achieved a great success, yet there is a lack of understanding about what encourages viewers to purchase virtual gifts in live streaming. To explain such purchase behavior, this study develops a model which investigates the roles of viewers' holistic experience with the system (i.e., cognitive absorption) and their social experiences (i.e., para-social interaction and virtual crowd experience), as well as how these experiences are developed within the technological environment of live streaming (i.e., interactivity, deep profiling and design aesthetics). The model was validated by using survey data collected from China. We also discuss implications for research and practice emerging out of this study.

Keywords: Purchase of Virtual Gifts, Live Streaming, Cognitive Absorption, Para-Social Interaction, Virtual Crowd Experience

Introduction

Live streaming is one of the fastest growing e-business models today. In the United States, 48% of Internet users watched live streaming at least once a week and 23% of them watched it at least once a day in 2017 (Kats, 2017). In China, more than half of the 772 million Internet users had experience using live streaming apps in 2018 (CNNIC 2018). Nowadays, users spend more time watching live streaming than watching

television (Zhao et al. 2018). Users live broadcast various types of activities ranging from singing, playing games to eating and sleeping, which is authentic and not post-edited. Several features of live streaming platforms distinguish live streaming from online video sharing. One of the key features of live streaming is that the videos are broadcast and viewed in real time. Second, live streaming platforms facilitate interactions through various functions such as chat messenger and "dan mu" (bullet subtitle). Third, during a live stream, viewers can get instant replies from the streamer, participate in and potentially influence the broadcasting content, and have a live chat with the streamer and with other viewers in the same live stream.

Unlike online video websites such as YouTube where the monetization models are mainly based on advertising and premium services, live streaming's main source of revenue is derived from viewers' purchase of virtual gifts (Xiang 2017). Virtual gifts are pictographs offered in live streaming platforms such as flowers, hearts and rockets with the price ranging from USD 0.01 to over USD 1000. They can be purchased by viewers to appreciate the streamer during the broadcasting. The revenue is split between the platform and the streamer. The business model of virtual gifts has turned out to be a huge success and become the predominant monetization approach of live streaming in the East Asia (Chen 2017; The Economist 2017). For example, the sales of virtual gifts contributed to the vast majority of the live streaming revenue in China which was estimated to be USD 4.4 billion in 2018 (Deloitte 2017; Xiang 2017). Western platforms which still depend on advertisements and commission fees of subscriptions as their main revenue sources have also started to catch on and to explore the approach of virtual gifts (Chen 2017). The purchase of virtual gifts in live streaming can be different from the purchase behavior in online shopping. In online shopping, the consumption follows transaction obligation. When buyers purchase something online, the sellers are obliged to deliver things back as promised. However, in live streaming context, purchase of virtual gifts is perceived to be a voluntary action rather than a transactional behavior. The streamer has no obligation to deliver anything back in return when viewers send virtual gifts.

The emerging phenomenon of live streaming has attracted great research interests. Recent studies about live streaming have examined issues on use or continuance intentions (Chen and Lin 2018; Zhao et al. 2018). Although understanding users' intention to use live streaming is an important topic, it is the purchase of virtual gifts which can generate revenues to live streaming platforms. Despite virtual gifts being the number one source of revenues for live streaming platforms, most viewers are not purchasing virtual gifts to streamers (Tu et al. 2018). Also, there is sparse research on understanding users' purchase behavior of virtual gifts. Hence, understanding the purchase behavior of virtual gifts in live streaming requires research efforts. Please find the summary of live streaming literature in Appendix A in the hyperlink.

This study attempts to address what can lead viewers to purchase virtual gifts in the live streaming environment. The Information Systems (IS) literature has highlighted the salient role of Cognitive Absorption (CA) in explaining behavioral intentions in information systems (Chandra et al. 2012; Lowry et al. 2013). CA captures one's holistic experience with the system and plays an important role in affecting customers' purchase decisions in e-commerce (Agarwal and Karahanna 2000; Shang et al. 2005). Based on it, we first propose CA to be a key driver for viewers' purchase behavior in live streaming. Moreover, the recent literature on live streaming has stressed people's desires for socializing as a critical motivator for live streaming participation (Chen and Lin 2018). This study thus makes an attempt to explore the roles of viewers' social experiences in the purchase behavior. The design of live streaming enables two levels of social contact: one emphasizes the interaction between the streamer and viewers; the other depicts the viewer's participation in the viewer crowd. Considering this, Para-Social Interaction (PSI) and virtual crowd experience are posited to respectively reflect a viewer's social experiences with the streamer and with peers in a live stream.

In live streaming, the technological environment plays a key role in shaping user experience since the system is the medium through which viewers watch the live content and engage with others (Li et al. 2018). Prior literature suggests that the technological artifacts of the virtual environment can influence users' perceptions and experience and subsequently affect their behavior (Ma and Agarwal 2007; Parboteeah et al. 2009). Thus, the roles of various IT-related factors in live streaming are also examined to comprehend how the technological environment of live streaming can shape viewer experience and ultimately affect viewer behavior. Given the unique design of live streaming, we delineate the influences of IT-related factors in live streaming from three aspects: the streamer, the viewer and the platform. Specifically, we investigate how the viewer perceived interactivity (i.e., viewer-streamer interactivity and viewer-viewer interactivity), deep profiling (i.e., streamer-level deep profiling and viewer-level deep profiling) and design aesthetics of

the platform affect viewer experience and subsequently influence the purchase of virtual gifts in live streaming. Our theoretical model was validated using survey data collected from China, the largest market of live streaming in the world (Deloitte 2017).

This study represents one of the first attempts to investigate the purchase of virtual gifts in live streaming. First, our research highlights the salience of CA in affecting the viewer's purchase behavior in live streaming. It further extends the understanding on CA by theoretically linking CA with PSI and virtual crowd experience respectively. It thus provides valuable insights into the relationship between people's social experience and their immersive enjoyable experience in a system. Second, this study contributes to the Theory of PSI by exploring the IT-related antecedents and the outcome of PSI in live streaming. This research also provides a theoretical rationale for studying viewer purchase behavior as a consequence of viewer experience resulting from the exposure to IT-related factors. It thus yields important implications for the design of the supporting IT infrastructure in live streaming.

Theoretical Background

Cognitive Absorption

CA refers to a person's psychological state that the person is deeply involved in using information systems (Agarwal and Karahanna 2000). It can be reflected by five dimensions, namely temporal dissociation, focused immersion, heighted enjoyment, control and curiosity (Agarwal and Karahanna 2000). Temporal dissociation refers to the situation when an individual is too concentrated on the matter at hand so that she or he is unaware of the time going by. Focused immersion emphasizes the concentration of one's attention, representing the extent to which one is absorbed in the object. Heighted enjoyment refers to the one's experienced joy and fun. Control refers to the extent to which one has active control over the experience of an activity. Curiosity means the state of curiosity and is closely associated with one's explorative behaviors.

CA has been widely applied to advance the understanding of utilitarian system usage especially in the working context (Chandra et al. 2012). As CA can be seen as a state stemming from intrinsic motivations (Agarwal and Karahanna 2000; Shang et al. 2005), the research interests are shifting towards the role of CA in the usage of hedonic systems such as gaming (Lowry et al. 2013). However, studies on the consequences of CA in both utilitarian and hedonic systems have mainly concerned the system usage. Although CA has been extended to the online shopping context and proven to be influential on customers' shopping process, limited attention has been paid to its impacts on purchase behaviors in hedonic systems (Shang et al. 2005). Moreover, with regard to how such state is formed, prior research has paid little attention to the antecedents of CA (Agarwal and Karahanna 2000). Hence, the consequences and antecedents of CA in hedonic systems like live streaming need further investigation.

In live streaming, the rich content and social interactions may make viewers feel entertained and induce them to explore what will happen next. They are likely to immerse themselves in the environment and forget about time (Lin and Lu 2017). Therefore, we expect the viewer's holistic experience with the live streaming system can be captured by CA. This study applies CA as a key concept to explain the viewer's purchase of virtual gifts and explores how CA can be developed in live streaming.

Theory of Para-Social Interaction

PSI refers to the illusionary experience of being involved in a real relationship with a media character such as a TV performer (Rubin and McHugh 1987). Though such relationship is one-sided, people who have PSI still feel that they are in a mutual relationship and tend to treat the media character as their real friend (Labrecque 2014). PSI can meet one' needs for interpersonal relationship development (Wang et al. 2008). The Theory of PSI has been extensively used to illuminate the behavior of television and radio audience (Grant et al. 1991). For example, in TV shopping context, audience are more likely to make purchases when they have PSI with hosts (Park and Lennon 2004).

The recent research is extending the theory to the online environment. Although social media like SNSs allows two-way communication, users may still have PSI because there is no obligation for others to respond (Kim and Song 2016). PSI is found to be influential on online users' attitudes (Thorson and Rodgers 2006) and consumer-brand relationships (Labrecque 2014; Yuan et al. 2016). Prior research also provides support that PSI can lead to impulse buying intentions in social commerce (Xiang et al. 2016). Still, research

attention paid to the effects of PSI on the purchase behavior in the online context is limited, particularly in the non-shopping environment. Besides, PSI highlights the presence of a specific medium whereas the existing literature lacks empirical research about the role played by system factors in developing the PSI experience. Thus, it becomes imperative to identify the effects of various IT-related factors on PSI.

In live streaming, although the streamer can interact with viewers, they can hardly know every single viewer and establish friendship with each of them. Therefore, the relationship between a viewer and the streamer is rarely mutual. Even so, viewers still tend to participate actively despite receiving the streamer's response or not. The literature suggests that social media can facilitate the development of the user's illusionary friendship with a celebrity (Kim and Song 2016). Hence, in this study, PSI is introduced to reflect viewers' social experience with the streamer to explain their psychological states and subsequent behaviors in live streaming. How IT-related factors in live streaming can contribute to the viewer's experience of PSI with the streamer is also be explored to further enrich the theory.

Hypothesis Development

Cognitive Absorption and Purchase of Virtual Gifts

CA is found to be an important factor explaining people's purchase behavior in e-commerce (Shang et al. 2005). It is suggested that consumers who experience intrinsic enjoyment during the process of browsing online stores are more likely to make purchases (Siekpe 2005). In the live streaming context, CA is also expected to influence the viewer's purchase behavior. CA can first generate viewers' positive attitudes and then make them willing to invest more in the activity (Chandra et al. 2012). The heightened enjoyment experienced may motivate viewers to reciprocate the streamer with virtual gifts (Li et al. 2018). Moreover, viewers who experience CA are highly immersed in the environment. They tend to screen out irrelevant thoughts as their entire attentional resources are focused on the live streaming activity (Novak et al. 2000). In that case, viewers can easily notice the virtual gifts displayed in the live stream and are less likely to rationally evaluate the value of these items, leading to the increased possibilities of purchase. Furthermore, the curiosity evoked encourages viewers to engage in exploratory behaviors (Ghani and Deshpande 1994). While exploring available possibilities in the stream session, viewers may try the function of virtual gifts in order to find out what will happen. Thus, it is proposed that:

H1: Cognitive absorption is positively associated with the viewer's purchase of virtual gifts.

Para-Social Interaction and Purchase of Virtual Gifts

PSI has been applied in the shopping context to explain consumer behavior, in both offline and online. It is found that audience who have intensive PSI with the hosts on television shopping programs are more likely to make purchases (Grant et al. 1991; Park and Lennon 2006; Stephens et al. 1996). Prior studies on social media show that PSI can positively affect the user's brand evaluation (Yuan et al. 2016), and increase purchase intentions (Xiang et al. 2016). Based on it, we believe in live streaming the viewer's PSI with the streamer may also influence the purchase of virtual gifts.

PSI mimics real interpersonal friendship (Rubin et al. 1985; Stephens et al. 1996). When feeling a sense of friendship with the streamer, viewers tend to care about the interests of the streamer and have a strong willingness to make the streamer feel supported (Stephens et al. 1996). They can be motivated to spend money on virtual gifts since such behavior shows their appreciation and support towards the streamer. Besides, viewers with a high level of PSI are inclined to purchase virtual gifts as a way to improve interaction experience with the streamer and maintain the illusionary friendship (Grant et al. 1991). Furthermore, PSI can increase the persuasiveness of the media character (Labrecque 2014). When a streamer expresses interests in virtual gifts, the viewers who have strong PSI with the streamer are more likely to be persuaded to send virtual gifts so as to meet the expectation of the streamer. Therefore, PSI can increase the likelihood of purchasing virtual gifts. It is proposed that:

H2: Para-social interaction is positively associated with the viewer's purchase of virtual gifts.

Virtual Crowd Experience and Purchase of Virtual Gifts

Virtual crowd experience captures one's experience of participation in online group activities (Koh et al. 2003). In a live stream, viewers form an ad-hoc group. Viewer experience with the virtual crowd is expected to influence the purchase of virtual gifts in live streaming. Participating in crowd activities can develop a strong sense of involvement. Previous work shows that involvement can contribute to the purchase of digital items on virtual community website (Kim et al. 2012). Although the virtual gifts in live streaming are purchased for the streamer while the digital items in virtual community are purchased for oneself, both of them are bought to present, express and communicate in an online social environment. Therefore, the involvement stimulated from virtual crowd experience may also contribute to the purchase of virtual gifts in live streaming. In addition, a viewer crowd may consider giving virtual gifts as a social norm. In this sense, the experience of participating in virtual crowd activities also tends to encourage the viewer to buy virtual gifts for the streamer (Etzioni 2000). Therefore, it is hypothesized that:

H3: Virtual crowd experience is positively associated with the viewer's purchase of virtual gifts.

Para-Social Interaction and Cognitive Absorption

The positive attitude from PSI with a media character is likely to make an individual more willing to involve in the media environment. In the context of live streaming, those viewers with PSI to the streamer are more likely to concentrate their attention on the streamer since they perceive the streamer as their friend. In that case, the viewer tends to enjoy herself or himself by responding to the imaginary friend and helping that imaginary friend warm up the atmosphere. Based on that, it can be argued that PSI can provide viewers with joy of social contact and relationship development. The companionship from the illusionary relationship can make a viewer's experience more enjoyable (Wang et al. 2008). In addition, the one-sided friendship also boosts the viewers' desire to know more about the streamer. This may strengthen one's curiosity of the streamer and her or his activities, which further leads to immersion in the live stream (Lowry et al. 2013). Hence, it can be expected that PSI may lead to the state of CA. It is proposed that:

H4: Para-social interaction is positively associated with cognitive absorption.

Virtual Crowd Experience and Cognitive Absorption

The experience of active virtual crowd participation is likely to lead to the viewer's state of CA in two ways. On one hand, the social interaction with the group can be fun and enjoyable for viewers. It has been noted that participation in the joint leisure activity can effectively bring people with the 'group fun' (Hills et al. 2000). Live streaming by nature is an online joint leisure activity which is generally enjoyed by a group of viewers. Active participation in a live stream includes constantly involving in the group chat and cheering up with the group to heat the atmosphere. The experience of virtual crowd can strengthen one's joy thanks to the companionship from other viewers and the group entertainment. On the other hand, intense virtual crowd experience indicates that viewers are kept busy with group engagement, which leads to immersive experience. Apart from the enjoyment received, the busy activities make viewers actively focus on the matters at hand. Consequently, viewers are likely to get their attention absorbed in the live stream. Thus, it is expected that virtual crowd experience may lead to CA. It is proposed that:

H5: Virtual crowd experience is positively associated with cognitive absorption.

Viewer-Streamer Interactivity

Interactivity has been defined in prior literature as the extent to which the form and content of a mediated environment can be modified by users in real time through their participation (Steuer 1992). As technology evolves, there is a tendency for online service providers to enhance the interactive capabilities of their products or services. In live streaming, a viewer can interact with the streamer and with other viewers in the same live stream. Thus, interactivity in this study is conceptualized from the interpersonal interaction perspective to examine the mediated interactions between users. Specifically, interactivity here refers to viewers' subjective perceptions on the quality of technology-mediated interaction with the streamer and other viewers in live streaming (Ou et al. 2014). The perceived interactivity composes of three dimensions: active control, two-way communication and synchronicity (Liu 2003). Active control refers to the degree to

which one can voluntarily participate in and influence a communication; two-way communication indicates the two-way flow of information; and synchronicity refers to the speed of interaction. Interactivity is seen as a key element in the online environment (Tajvidi et al. 2017). In e-marketplace, interactivity helps achieve high-quality communication, enhancing the relationships between buyers and sellers (Cyr et al. 2009; Ou et al. 2014). Prior research also shows that interactivity is closely associated with buyers' positive attitudes such as trust and satisfaction (Bao et al. 2016; Cyr et al. 2009).

In live streaming, we expect that the viewer-streamer interactivity (i.e., viewers' perceived interactivity with the streamer) can be associated with the viewer's PSI with the streamer. Prior research finds that in a television show, a character directly addressing the audience and adjusting to supposed responses contributes to the audience's PSI with the character (Hartmann and Goldhoorn 2011). The experience of PSI is also shown to be positively associated with the audience's tendency to interact with the television host (Park and Lennon 2004). In live streaming, the real-time interaction makes viewers feel that the streamer is approachable. Viewers can frequently send comments to the streamer, while the streamer can actively and simultaneously respond to viewers. The highly efficient interactive process gives the viewer an impression that the streamer recognizes her or him and she or he is engaged in a reciprocal relationship (Labrecque 2014). When the viewer gets more involved in the interaction with the streamer, she or he is more likely to feel personally connected to the streamer (Kim and Song 2016). When the streamer is not broadcasting, the viewer may feel lost and miss the streamer. Thus, we propose that:

H6a: Viewer-streamer interactivity is positively associated with a viewer's para-social interaction with the streamer.

Prior research has found that the communication attribute of a product is associated with users' experience of pleasure (Lee et al. 2011). It is also shown that social interactions in online environments contribute to users' high level of concentration, making them absorbed in the environment (Chang 2013). In live streaming, the frequent communication with the streamer keeps the viewer busy and focused. Furthermore, facilitated by the real-time interaction, the streamer can provide customized content matching the viewer's tastes, which increases enjoyment. In addition, when a viewer interacts with the streamer by sharing thoughts, she or he tends to wonder the streamer's following actions, which arouses curiosity. Therefore, a high level of viewer-streamer interactivity is likely to reinforce the viewer's engagement in live streaming and to enhance the experienced enjoyment, leading to CA. We hypothesize that:

H6b: Viewer-streamer interactivity is positively associated with a viewer's cognitive absorption.

Interactivity in social media can satisfy one's need to avoid loneliness (Zolkepli and Kamarulzaman 2015). The active interaction in an online community contributes to one's positive feelings towards the group (Zolkepli and Kamarulzaman 2015). In live streaming, viewers are temporarily gathered revolving around the streamer. They can interact with the streamer synchronously and such interaction is visible to other viewers. In order to create a warm and festive atmosphere, the streamer has the tendency to ask for viewer opinions and feedback frequently. Viewers are likely to support the streamer by responding to the streamer accordingly. Thus, the message from the streamer is always followed by the group action of viewers. A viewer posting own comments can also see how others respond to the streamer. Hence, through interacting with the streamer, a viewer is inclined to experience a feeling of being together with other viewers and fitting into the environment. It leads to a viewer's perception of being connected to the viewer group as she or he shares the same goal and is doing the same thing synchronously with other viewers. It thus enhances the viewer's bonding with the viewer group, which improves the experience with the crowd. It further makes the viewer willing to take an active role in the crowd. Hence, we propose that:

H6c: Viewer-streamer interactivity is positively associated with a viewer's virtual crowd experience.

Viewer-Viewer Interactivity

Viewers can interact with other viewers in the ad-hoc group. Viewer-viewer interactivity in this study refers to the extent to which a user has the ability to control information exchange and to bond interpersonal interactions with other viewers (Hu et al. 2016). It may influence the viewer's state of CA. Previous studies have found that interactivity in the online community can shape user experiences. Interacting with peers in the online community can stimulate concentration and make the user forget about the passing-by of time (Wu and Chang 2005). Similarly, in live streaming, a high level of interactivity among viewers can also lead

viewers to focus on the crowd, to immerse in the interaction, and to forget about time, leading to a high level of CA. Therefore, it is hypothesized that:

H7a: Viewer-viewer interactivity is positively associated with a viewer's cognitive absorption.

In the online community, users are likely to meet and to interact with those who share the same values (Schau et al. 2009). In live streaming, viewers who watch the same live stream are inclined to have some values and interests in common and to develop strong positive feelings towards the group (Quan-Haase et al. 2002; Zolkepli and Kamarulzaman 2015). This makes viewers motivated to participate in group activities, including responding to each other and participating in discussion together. The synchronous and two-way communication over which a viewer has control tends to improve the viewer's participation experience. With a high level of interactivity, the viewer is likely to engage in the virtual crowd and to hold favorable attitudes towards the engagement. Therefore, it is proposed that:

H7b: Viewer-viewer interactivity is positively associated with a viewer's virtual crowd experience.

Streamer-Level Deep Profiling

Deep profiling refers to a user's subjective perception on the extent to which identity information is organized and made available in the system to construct a mental representation of users (Ma and Agarwal 2007). For example, in online communities, a user's expertise, interests, achievements and credits are always shown in her or his profile. Connections with other members can also be made accessible. Facilitated by the function of deep profiling, new comers can quickly learn about the identities of others in the virtual environment (Ma and Agarwal 2007). Prior research indicates that deep profiling promotes interpersonal recognition and leads to the establishment of interpersonal relationships (Ma and Agarwal 2007; Song and Phang 2016). In live streaming, the artifact for deep profiling enables viewers to easily find out the identity information of both the streamer and other viewers. Given the different roles of the streamer and the viewer in live streaming, the influence of deep profiling is also investigated at both streamer level and viewer level.

The streamer-level deep profiling helps the viewer quickly obtain an understanding of the personalities and preferences of the streamer. Prior study suggests that when a TV character reveals personal information, the audience are likely to gain a high level of certainty and familiarity (Tsay-Vogel and Oliver 2014). By accessing the streamer's social and identity information in live streaming, a viewer may feel that she or he has gained inside information about the streamer, which fosters perceived intimacy (Labrecque 2014; Perse and Rubin 1989; Stephens et al. 1996). The study of Savage and Spence (2014) finds that the self-disclosure by a radio host tends to affect the listeners' PSI with the host. The research of Kim and Song (2016) also provides evidence that there are positive connections between the celebrity's share of self-information on Twitter and the fan's PSI. In live streaming, the streamer-level deep profiling promotes the viewer's feeling that she or he understands the streamer at a much personal level, which fosters the viewer's illusion of the mutual relationship with the streamer. Therefore, we believe the deep profiling at streamer level can lead to the viewer's experience of PSI. It is proposed that:

H8a: Streamer-level deep profiling is positively associated with a viewer's para-social interaction with the streamer.

Audience always have the demands to learn about the information of a character from the character herself or himself (Tsay-Vogel and Oliver 2014). In live streaming, a viewer may be interested in who the streamer is, what the interest and overall reputation of the streamer are. The streamer-level deep profiling provides a means through which the streamer makes herself or himself known to viewers. It thus reduces the viewer's perceived cognitive burden that may otherwise be expended in exploring the information about the streamer from external sources (Chandra et al. 2012). It is shown that one's disclosure of personal information is closely associated with the information recipient's positive emotional and cognitive responses such as liking and satisfaction (Sprecher et al. 2012). In live streaming, obtaining the streamer's identity-related information reduces the viewer's uncertainties and generates positive feelings. As a result, the viewer is likely to experience a deeper engagement with the streamer, thereby increasing their involvement in the environment. Receiving other's identity information is also related to one's enjoyment experience of interaction (Sprecher et al. 2012). The study of Tsay-Vogel and Oliver (2014) provides support by showing that a character's disclosure of self-related information can lead to the audience's immersion in the entertainment media and ultimately enhance overall pleasure. Based on that, it is proposed that:

H8b: Streamer-level deep profiling is positively associated with a viewer's cognitive absorption.

Viewer-Level Deep Profiling

In this study, viewer-level deep profiling refers to a viewer's perception on the extent to which self-identity information is organized and made available to others. Viewer-level deep profiling may affect the viewer's CA. It may reflect the viewer's perceived sociability of live streaming. Moreover, as viewer-level deep profiling indicates how a viewer perceives others to value her or his profile, it can be relevant to the viewer's level of self-esteem. Previous studies suggest that both perceived sociability and level of self-esteem can influence the amount of time spent and the level of immersion in social media (Kwak et al. 2014). Therefore, in the context of live streaming, when a viewer's identity information is made available to all, the viewer may perceive live streaming to be highly sociable and feel a high level of self-esteem, resulting in immersion and enjoyment in the live streaming activities (Wu and Chang 2005). Therefore, it is hypothesized that:

H9a: Viewer-level deep profiling is positively associated with the viewer's cognitive absorption.

Viewer-level deep profiling may also influence the viewer's virtual crowd experience. People who prefer to make their profiles available to others may value the social interaction experience in social media since profile information is the foundation of online social relationship (Kane et al. 2014; Shin 2016). Therefore, in live streaming viewers who value their profiles are likely to participate in and dedicate to social activities, including the activities with the viewer crowd. In addition, the high level of self-esteem perceived by the viewer who shows the identity information to others may drive the viewer to contribute to the viewer group and to help other viewers (Kwak et al. 2014). Therefore, viewer-level deep profiling can enhance the experience of participating in viewer crowd activities. We thus propose that:

H9b: Viewer-level deep profiling is positively associated with the viewer's virtual crowd experience.

Design Aesthetics

Design aesthetics represents how professional and appropriate the user interface is designed (Lowry et al. 2015). It is often perceived as an important environmental cue that influences user experience (Lowry et al. 2015). According to prior literature, design aesthetics appears to be an important factor affecting user experience in web environment and hedonic systems (Cyr et al. 2006; Lowry et al. 2015; Wang et al. 2011). For instance, Lowry et al. (2015) have pointed out that design aesthetics can be a key factor affecting users' perceptions on the information system which may subsequently shape users' behavioral intention. Thus, we believe design aesthetics can be a potential key factor to explain users' enjoyment experience and subsequent behaviors in the context of a hedonic system like live streaming.

Design aesthetics may affect the experience of PSI in live streaming in two ways. First, the visual appeal of the design can shape viewers' impression about the professionalism of the online environment and their attitudes towards people within that environment (Cyr et al. 2006; Parboteeah et al. 2009). The streamer who holds a live stream in a platform with an attractive user interface is likely to develop a positive image in viewers' minds as she or he tends to be considered as a professional talent in a decent platform offering appropriate services. Second, an appropriate and professional design of the user interface is needed to enable basic functions in order to support users' actions carried out in the system (Cyr et al. 2006; Jiuchang et al. 2017). Those features can provide viewers with more possible actions to deliver one-way expression towards the streamer, leading to the experience of PSI. Thus, it is proposed that:

H10a: Design aesthetics is positively associated with viewers' para-social interaction.

Visually appealing designs can effectively attract people's attention and bring aesthetic pleasure (Lee et al. 2011; Parboteeah et al. 2009). Apart from visual appeal, design aesthetics also stresses the importance of mechanic interaction. In user interface design, buttons and graphics should be meaningful, functional and comfortable to play (Cyr et al. 2006; Lowry et al. 2015). The design of the interface in live streaming can play an essential role in shaping viewer's experience. If the user interface design is unattractive and confusing, viewer participation may be discouraged by the poor using experience. Visual appealing and meaningful design can encourage people to concentrate and to engage with the system. It is proposed that:

H10b: Design aesthetics is positively associated with viewers' cognitive absorption.

As mentioned above, design aesthetics can shape users' image of the system and willingness to use it (Cyr et al. 2006; Parboteeah et al. 2009). The social media platform provides users with the environment of virtual crowd activities, and the quality of the design is fundamental to the quality of crowd experience (Huang 2012). Thus, it can be expected that in live streaming design aesthetics is positively associated with virtual crowd experience. It is proposed that:

H10c: Design aesthetics is positively associated with viewers' virtual crowd experience.
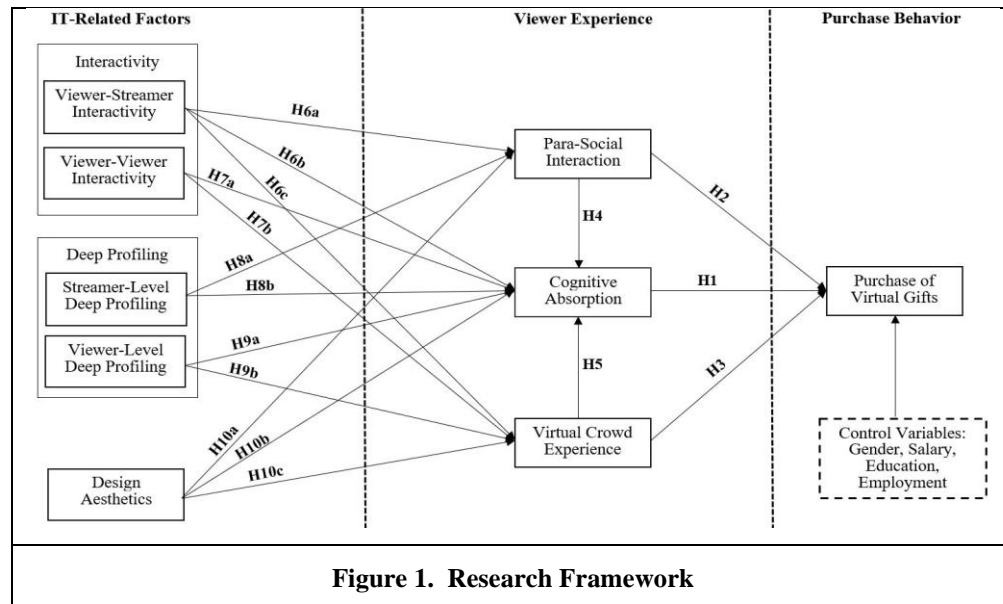
The research framework is illustrated in Figure 1 below.

Figure 1. Research Framework

Methodology

Measurement Development and Data Collection

A questionnaire survey was conducted to collect data. The measurements of each variable are developed from previous research. Specifically, the measurements of purchase of virtual gift were adopted and adapted from Pavlou (2003) and Guo and Barnes (2011), viewer-streamer and viewer-viewer interactivity are from Ou et al., (2014) and Liu (2003), streamer-level and viewer-level deep profiling from Ma and Agarwal (2007), design aesthetics from Lowry et al. (2015), PSI from Rubin et al. (1985), virtual crowd experience from Koh and Kim (2004), and CA from Lowry et al. (2013) (Please find the measurement items in Appendix B via this embedded hyperlink). Each item was measured in 7-point Likert scale where 1 represents strongly disagree and 7 represents strongly agree. Gender, education, salary and employment status of the viewer were included as the control variables of purchase of virtual gifts (Pavlou 2003).

As the study was conducted in China, we followed the back-translation method: the English questionnaire was first translated into Chinese by three researchers and then the Chinese version was translated back to English by different researchers. The two English versions were compared to ensure a high degree of correspondence. To further improve clarity, we asked eight experienced live streaming viewers to review the questionnaire. The finalized questionnaire was distributed by a market research company. Respondents were instructed to complete the questionnaire only if they had prior experience of viewing live streaming. After excluding invalid ones (i.e., those with the same answer to all questions and those with missing responses), we received 481 valid responses in total. The demographics information is shown in Table 1.

Table 1. Demographics of Respondents							
Gender		**Education**		**Salary (RMB)**		**Employment**	
Female	57.4%	Doctoral degree	0.7%	<3,000	12.3%	Full time	85.2%

Male	42.6%	Master's degree	9.6%	3,000-5,000	15.0%	Part time	4.0%
Age		Bachelor's degree	76.7%	5,000-7,000	28.7%	Unemployed	10.0%
18-30	60.9%	Diploma	9.6%	7,000-9,000	20.6%	Not in labor market	0.8%
31-40	34.1%	High school	3.1%	9,000-11,000	13.3%		
>41	5.0%	≤Middle school	0.3%	> 11,000	10.2%		

Table 1. Demographics of Respondents

Assessment of Measurement Model

To test the measurement model, the reliability and validity of constructs were assessed. As shown in Table 2, the values of Cronbach's Alpha of all first-order constructs range from 0.701 to 0.895, and the values of composite reliability (CR) range from 0.823 to 0.927. All of them exceed the required 0.70, confirming the reliability of data (Bland and Altman 1997; Nunnally and Bernstein 1994). The Average Variance Extracted (AVE) of all first-order constructs range from 0.524 to 0.761, exceeding the required value of 0.5. Therefore, the convergent validity is confirmed. For each first-order construct, its correlations with all other constructs are smaller than the square root of the construct's AVE. Therefore, the Fornell-Larcker's criteria is met, confirming the discriminant validity (Fornell and Larcker 1981) (Please find Fornell-Larcker's Criteria in Appendix C via this embedded hyperlink). For the viewer-streamer interactivity and viewer-viewer interactivity, considering that they are second-order formative constructs, correlations between formative indicators were further examined with the variance inflation factors (VIF). VIF values are all smaller than 3, which meets the requirement and indicates that the collinearity is not a significant issue. It further confirms the validity of the formative model (Hair et al. 2016).

Table 2. Cronbach's Alpha, CR and AVE			
	Cronbach's Alpha	**CR**	**AVE**
Purchase of Virtual Gifts	0.895	0.927	0.761
CA_Curiosity	0.701	0.834	0.627
CA_Focused Immersion	0.888	0.918	0.691
CA_Heightened Enjoyment	0.779	0.858	0.602
CA_Temporal Dissociation	0.775	0.846	0.524
Design Aesthetics	0.759	0.861	0.673
PSI	0.781	0.859	0.604
Virtual Crowd Experience	0.863	0.897	0.593
Viewer-Viewer Interactivity_Active Control	0.716	0.825	0.541
Viewer-Viewer Interactivity_Two-Way Communication	0.783	0.874	0.698
Viewer-Viewer Interactivity_Synchronicity	0.811	0.888	0.725
Viewer-Streamer Interactivity _Active Control	0.711	0.823	0.539
Viewer-Streamer Interactivity_Two-Way Communication	0.816	0.891	0.731
Viewer-Streamer Interactivity_Synchronicity	0.800	0.882	0.714
Viewer-Level Deep Profiling	0.708	0.837	0.632
Streamer-Level Deep Profiling	0.706	0.836	0.629

Table 2. Cronbach's Alpha, CR and AVE

Common method bias was checked with procedural remedies and statistical tests (Podsakoff et al. 2003). By organizing and balancing the sequences of measurement items, the questionnaire was designed to reduce respondents' evaluation apprehension to avoid the potential bias. All questionnaire items were adopted from existing well-established studies. Respondents were clearly instructed to choose the answers that best suit their situations as there was no right or wrong answer. The questionnaire was answered anonymously, and such anonymity was also made clear to all respondents. Statistically, the common method variance was tested using Harman's single-factor test (Chin et al. 2012). The result showed that multiple factors emerged from the unrotated solution. The variance explained by the first factor was less than 50% of the total variance, showing that common method bias was not a significant issue in the data.

Assessment of Structural Model

Partial Least Square Structural Equation Modeling (PLS-SEM) was used to examine the research hypotheses with SmartPLS 3.0. Viewer-streamer interactivity and viewer-viewer interactivity are reflective-formative second-order constructs. They were formatively measured by first order constructs namely active control, two-way communication and synchronicity. CA is a reflective-reflective second-order construct. It was reflectively measured by first order constructs including focused immersion, heightened enjoyment, temporal dissociation and curiosity. These constructs were incorporated to reflectively measure CA considering their relevance towards the live streaming context. For these higher order constructs, the latent variable scores of the first-order constructs were first obtained using repeated indicator approach and then adopted as the indicators to form the second-order constructs (Hair et al. 2016). The results of hypotheses testing are shown in Figure 2 and the results of second-order factors are reported in Figure 3.
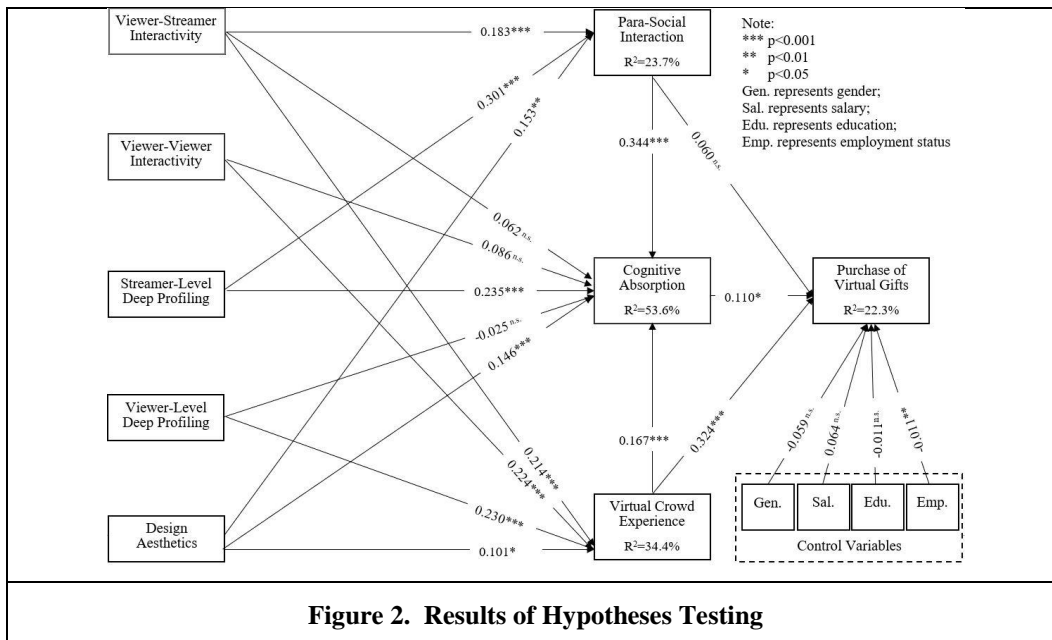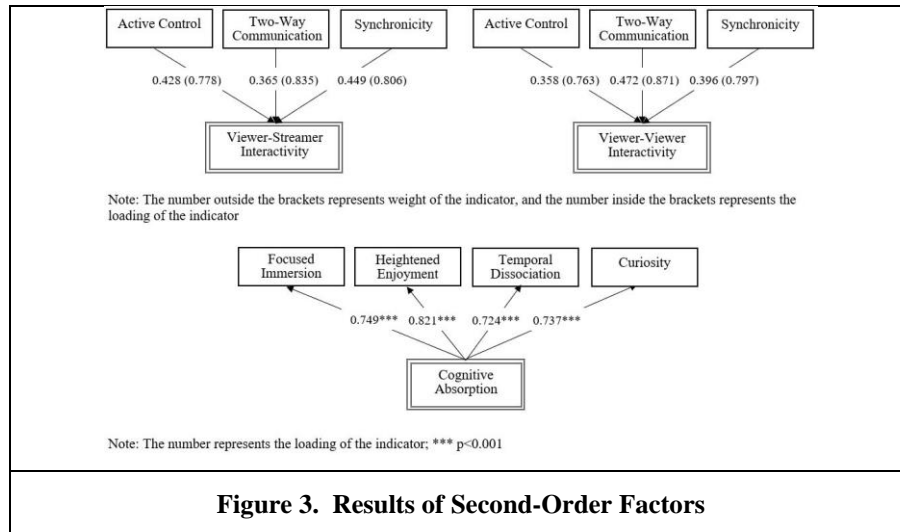

Figure 2. Results of Hypotheses Testing

Figure 3. Results of Second-Order Factors

The results show that CA has positive influences on purchase of virtual gifts (β = 0.110, p < 0.05), supporting H1. Virtual crowd experience is also found to positively affect purchase of virtual gifts (β = 0.324, p < 0.001), supporting H3. However, PSI is not significantly associated with purchase of virtual gifts. H2 is thus not supported. In addition, PSI and virtual crowd experience are positively associated with CA (β = 0.344, p < 0.001; β = 0.167, p < 0.001), supporting H4 and H5. The results also reveal that viewer-streamer interactivity has positive influence on PSI (β = 0.183, p < 0.001) and viewer's virtual crowd experience (β = 0.214, p < 0.001), supporting H6a and H6c. However, the relationship between viewer-streamer interactivity and CA is not significant. Thus, H6b is not supported. Viewer-viewer interactivity is found to significantly influence virtual crowd experience (β = 0.224, p < 0.001), supporting H7b. Nonetheless, it has no significant effect on CA, failing to support H7a. Streamer-level deep profiling is positively associated with PSI (β = 0.301, p < 0.001) and CA (β = 0.235, p < 0.001). Therefore, H8a and H8b are supported. Viewer-level deep profiling significantly influences virtual crowd experience (β = 0.230, p < 0.001), supporting H9b. However, its relationship with CA is not significant, failing to support H9a. Design aesthetics is found to positively associated with PSI (β = 0.153, p < 0.01), CA (β = 0.146, p < 0.001) and virtual crowd experience (β = 0.101, p < 0.05), supporting H10a, H10b and H10c.

Discussion

There are several important findings obtained from our study. Our study first confirms the importance of CA in affecting the viewer's purchase of virtual gifts. In live streaming, a viewer with a high level of CA is more likely to spend money in purchasing virtual gifts to the streamer. The finding is in line with the research of Lowry et al. (2013) which suggests that CA is the representation of intrinsic motivation shaping people's behavior. In addition, our findings suggest that virtual crowd experience in live streaming can lead to the state of CA and encourage the purchase of virtual gifts. This is consistent with the study of Koh et al. (2003) suggesting the links between users' experience in the virtual community and their immersion state. The result is also aligned with the study of Kim et al. (2012) supporting the association between virtual community involvement and digital item purchase intention.

Moreover, our results support the influence of PSI on CA. This is consistent with prior research about the positive influence of PSI on perceived enjoyment in a mediated context (Hartmann and Goldhoorn 2011). Interestingly, there is no evidence supporting the effect of PSI on purchase behavior in the live streaming context, which is different from the findings in the shopping contexts (e.g., TV shopping) (Park and Lennon 2004; Xiang et al. 2016). One plausible explanation can be that within the shopping context, there are explicit buy-and-sell relationships. If users treat the seller as their friend, they are likely to support the seller through buying products promoted by her or him (Grant et al. 1991; Park and Lennon 2004; Xiang et al. 2016). Nevertheless, in live streaming, the relationship between viewers and the streamer is not buy-and-sell. There are various ways in which viewers can support the streamer, such as subscription, "likes" or active interaction. Thus, viewers' imaginary friendship with the streamer may only motivate them to further engage in the streamer's live stream session but not to spend money on virtual gifts.

In terms of the IT-related factors, interactivity is confirmed to influence viewers' experience with the streamer and the viewer crowd. Viewer-streamer interactivity can encourage a viewer to develop the illusionary relationship (i.e., PSI) with the streamer and to participate in the viewer group activities. Viewer-viewer interactivity helps create a lively and vivid atmosphere for the viewer crowd, which enhances viewers' virtual crowd experience. The findings are consistent with prior studies supporting the effects of interactivity on people's perceptions towards others and their online community engagement (Thorson and Rodgers 2006). Although interactivity was expected to contribute to the development of CA according to prior studies (Huang 2012; Nah et al. 2011; Wu and Chang 2005), surprisingly the results show no evidence in support of the association between CA and either viewer-streamer interactivity or viewer-viewer interactivity in live streaming. This indicates that the interactivity may not contribute to the state of CA directly. Instead, interactivity may lead to CA indirectly through its positive influence on PSI and virtual crowd experience. The mediating tests were thus conducted (Please find the detailed results in Appendix D via the embedded hyperlink). The results support the mediating effects of PSI and virtual crowd experience on the relationship between interactivity and CA.

Furthermore, we find the positive influence of deep profiling on viewers' experience in live streaming. As hypothesized, the results demonstrate that viewers who pay more attention to streamer-level deep profiling are more likely to treat the streamer as their friend, consistent with the findings of Kim and Song (2016). The results also indicate that viewer-level deep profiling reflects a viewer's 'readiness' to interact with the viewer crowd, which is aligned with the study of Ma and Agarwal (2007). In addition, we find differences between streamer-level and viewer-level deep profiling in terms of their effects on CA. Streamer-level deep profiling is found to positively affect CA. It indicates that when viewers get a better understanding of the streamer by accessing her or his identity information, they are likely to experience more pleasure. In contrast, the direct influence of viewer-level deep profiling on CA is not supported. One possible explanation can be that a viewer's profile disclosure serves as a foundation for the social interaction with peer viewers (Kane et al. 2014) and leads to CA indirectly through encouraging viewers to actively participate in viewer crowd activities. Mediating effects were tested, and the results support the mediating effects of virtual crowd experience on the relationship between viewer-level deep profiling and CA (Please find the detailed results in Appendix D via the embedded hyperlink.

Design aesthetics is found to be a critical antecedent of PSI, CA and virtual crowd experience in live streaming. It is consistent with findings of prior studies stating that aesthetics can play an essential role in affecting people's experience and attitudes in the online environment (Cyr et al. 2006; Wang et al. 2011).

Conclusion and Future Research

Implications for Theory

The viewer's purchase of virtual gifts is an important source of revenue for the live streaming industry, whereas there is a lack of understanding about what factors can lead to such purchase behavior. This study elaborates what motivates the viewer's purchase of virtual gifts in live streaming, which provides an enlightened understanding of the behavior. This study has the potential to add to the IS body of knowledge in the following ways.

First, CA serves as the key concept for our explanation of the purchase behavior in live streaming. Little research has concerned how the state of CA is developed in the digital environment. This study provides theoretical and empirical support for the influences of both a viewer's experience with others (i.e., PSI and virtual crowd experience) and the IT-related factors (i.e., streamer-level deep profiling and design aesthetics) on the state of CA. We thus contribute to the concept of CA by identifying its key determinants in live streaming as comprising both experiential and technological factors. It also theoretically integrates the concept of CA with the Theory of PSI and validates CA as a novel outcome of PSI.

Second, it examines PSI as the viewer's experience of the illusion in a reciprocal relationship with a streamer in live streaming. Prior research on the factors underlying PSI largely focuses on personal characteristics such as perceived homophily and attraction (Rubin and McHugh 1987; Turner 1993). This research contributes to the Theory of PSI by validating IT-related factors (i.e., streamer-level interactivity, streamer-level deep profiling and platform design aesthetics) as salient antecedents of PSI.

In addition, prior research has mainly focused on purchase behavior in e-commerce. We enrich the literature by focusing on the new purchase behavior of virtual gifts in live streaming. Considering the dynamics of the live streaming environment, this study shows the mechanism of how technological features in the environment lead to purchase of virtual gifts. Specifically, it investigates and validates the effects of interactivity (i.e., viewer-streamer and viewer-viewer interactivity), deep profiling (i.e., streamer-level and viewer-level deep profiling) and design aesthetics as key technological features of the live streaming environment on viewer experience.

Implications for Practice

From a managerial perspective, this study yields pragmatic guidelines for live streaming platforms to fine tune strategies and to expand the sales of virtual gifts. We first suggest that live streaming platforms should strengthen interactive features to support both viewer-streamer and viewer-viewer interactions. For example, platforms can offer opportunities for viewers to have a one-to-one live video chat with the streamer. Platforms can also allow viewers to 'like' the comments from others. In addition, platforms can consider introducing a 'battle' mode for viewers, allowing viewers to compete with each other.

Second, functions should be designed to make the user's identity information easily visible and accessible. Platforms can generate both the streamer's and the viewer's personal information automatically based on their past activities, which can enrich their profile. They can also consider allowing the streamer and the viewer to submit a short video in their profile page to introduce themselves. Moreover, the streamer's and the viewer's accounts in other social media platforms can also be displayed in the profile page or live stream sessions, which further enriches personal information and facilitates interpersonal connection.

Third, live streaming platforms should keep improving the visual appearance of the interface and create an aesthetic platform. They can constantly update the elements such as colors, graphics, images and layout of items and make efforts to yield an impression of beauty and attractiveness.

Future Research

This study can possibly be extended in several ways. First, the roles of personal predispositions are not considered in this research. Thus, an interesting avenue for future research would be to explore the possibility of an interaction between system features and the viewer's personal predispositions. Moreover, with the emergence of live streaming, there is a trend to integrate live streaming with e-commerce. The framework developed in this study can be applied to e-commerce live streaming to investigate consumer behavior. Third, additional work is needed to address other antecedents that may determine viewer reaction. For instance, apart from socializing and entertainment, people's participation in social media can also be affected by the desires to seek information and social status (Park et al. 2009). Furthermore, streamer characteristics may also be influential on viewer behaviors. For future research, it would be interesting to examine the roles of streamer characteristics such as streamer popularity and attractiveness.

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