

Research Article

Understanding Virtual Gifting in Live Streaming by the Theory of Planned Behavior

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Based on the theory of planned behavior (TPB), the current study developed a model to understand motivations and predictors of viewers' virtual gifting behaviors in online live streaming. The model was tested with data from 392 live streaming viewers with previous virtual gifting experiences. The results showed that perceived pleasure, interaction with streamers, group interactions, and support for streamers can predict individual attitudes toward virtual gifting. Subjective norms learned from family and friends as well as streamers and viewers in live streaming could significantly affect virtual gifting intention. Quality of streams, the attractiveness of the streamers, and viewers' monetary resources influenced perceived ease of virtual gifting. Overall, the proposed model predicted virtual gifting behavior well. Findings were discussed in terms of the links between online and offline subjective norms along with the relationship of perceived behavior control, virtual gifting intention, and virtual gifting behavior. We suggest that the adjusted TPB model with subjective norms both offline and online can fit the online interaction contexts well and explain online norms development. Furthermore, our model reflects how social incentive contributes to virtual gifting. These findings offer insights into the motivations of virtual gifting behavior and provide implications for virtual gifting experience design.

1. Introduction

Live streaming platforms are rapidly gaining popularity. The world-famous live streaming platform Twitch acquired by Amazon has two million active streamers [1]. The growth of live streaming in China outstrips other countries that its user base has reached 660 million in 2020 [2]. Watching live streaming has become a new form of popular mainstream entertainment [3]. Streamers can perform live-streaming shows (直播, *zhibo*) in their personal channels on these digital live streaming platforms such as *Douyu*. On live streaming platforms, streamers provide a wide selection of content (e.g., games, sports, news, performances, celebrity gossip, and life shows such as make-up, social eating, creative projects, and miscellaneous topics). Viewers could interact with streamers in live streaming channels by commenting and virtual gifting [4]. However, there are significant differences between Chinese and Western live streaming platforms,

especially the virtual gifting features [5]. American streamers rely more on ads, endorsements, and subscription fees, while Chinese streamers' revenue mainly comes from virtual gifting [6].

Specifically, the virtual gifting mechanism of Chinese live streaming platforms brings about a distinctive model of content monetization. In live streaming, viewers first exchange money to in-app/platform currency, then purchase different value virtual gifts with the currency, and send virtual gifts to streamers in live streaming channels. Different from acquiring virtual goods in online games for players' own sake, buying virtual goods in live streaming is for streamers. Upon receiving the virtual gifts, streamers and live streaming platforms split and cash out the proceeds [7]. Therefore, virtual gifting generates revenue for live streaming platforms, provides income for streamers, and supports the industry's rapid development. For example, *Douyu*, one of the most popular live streaming platforms in China, received over 2

billion RMB (approximately 341 million USD) in the second quarter of 2021 [8].

Virtual gifting in live streaming is a way of social interaction and exchange. Sending high-value gifts can create eye-catching visual or audio effects such as flashing on the screen (Z. [9]). The gifting practices create opportunities for viewers to interact with streamers such as content cocreation and attract attention from other viewers with the onscreen animation effects (Z. [10]). For example, virtual gifts could represent different kinds of emotions such as “rose,” “candy,” and “thumb up.” Viewers could also display their status by sending virtual gifts such as “sports car” and “rocket” [11, 12]. When streamers receive virtual gifts from viewers, they would acknowledge and celebrate these viewers by directly responding verbally or textual messages (i.e., chats), which further encourages virtual gifting behavior in the community and build a two-way communicative environment [13]. Indeed, such exchange provides extra values in the experience which is different from channel donations and subscriptions.

Many existing studies examined affordances of live streaming platforms from an infrastructural point of view. For example, scholars contended that the practices and infrastructures of Twitch introduce new dimensions of flexibility, convenience, and user-control [14]. Other researchers contextualized live streaming platforms in the increasingly platformized Chinese society and criticized the profit-oriented platform infrastructure, corporatized streamer guilds, and commodified virtual relations [12].

Social and revenue affordance in live streaming also caught much attention. Through 100 observations of the most popular streamers on Twitch, researchers highlighted the importance of social interaction in live streaming [13]. Meisner and Ledbetter [15] suggest that the affordances of live streaming platforms create the participatory branding that personal branding practices are belabored by both streamers and audiences. A feature, *danmaku*, the live comments on the screen, as a contextual cue indicates the social density of a streaming channel can moderate the motivation of virtual gifting behavior [16]. From the perspective of streamers, existing literature explored the impact of trust, norms of reciprocity, and networks on their social capital formation [17]. Streamers can make use of a variety of monetization techniques to improve viewers’ engagement as well as induce their virtual gifting behaviors, such as gambling [1], sexual innuendo [18, 19], interactivity play [17], and displaying happiness [20].

Nevertheless, very limited research has tapped into virtual gifting behavior from viewers’ perspectives. Even though live streaming platforms and streamers can nudge viewers’ virtual gifting behaviors, viewers have their own agency and autonomy when making virtual gifting decisions. Therefore, it is important to understand how viewers’ psychological factors exert influence on their virtual gifting intention and behaviors. Recent studies on live streaming viewer behavior provided some evidence. Hilvert-Bruce and colleagues [21] investigated Twitch live streaming viewer engagement through surveys and found that social interaction and sense of community are associated with

financial supporting for streamers through subscription and donation. A study examining Chinese live streaming viewer behaviors suggested that virtual gifting is motivated by social networking [22]. Virtual gifting is not directly related with viewing frequency. Instead, viewers’ involvement weighs more, and those who chatted more are more likely to pay.

To provide a theoretical understanding of virtual gifting behaviors from the individual psychological perspective, the present study applied the theory of planned behavior (TPB, [23]) with users who have sent virtual gifts in live streaming. As we are more interested in the underlying psychological factors, choosing users with previous experiences could provide a more explicit understanding of decision-making and avoid attritions due to unfamiliarity with the usage of virtual gifting. We chose the TPB model as it delivers more specific information in explaining why people make their choices [24]. TPB considers social influences with norms variables to capture unique variance in intention. Moreover, the efficacy of TPB in predicting intentions and behaviors has also been supported [25]. Cheng [26] confirmed that TPB shows better performance in explaining behavior involving social interaction. Considering the importance of social interaction in live streaming, TPB fits well in this regard.

Moreover, whether there is a virtual gifting norm is an empirical question. Using data crawled from *Douyu*, a study examined the distributions of gifts and senders in live streaming. The results suggested that the probability of sending gift is correlated with the length of time seeing others sending gifts (Z.-H. [27]). This finding is consistent with the evidence of peer influenced purchase on social media. Users are more likely to purchase products if other familiar people have purchased before (Z.-G. [28]). Nevertheless, most of the viewers believed that it is not necessary to send virtual gifts in live streaming [29]. According to *Douyu*, one of China’s biggest live streaming platforms, only 4% of its monthly active viewers have sent paid virtual gifts before [30]. Also, on this platform, the distributions of virtual gifts and paid viewers are strongly skewed that the 2.7% high-value paid viewers contributed to 80.2% of the total virtual gift value (Z.-H. [27]). However, other literature also reveals that larger audiences can yield higher average tip per viewer (S. [31]). Therefore, these results indicate that peer influence and social norms in live streaming channels could induce virtual gifting; yet, most live streaming viewers have not adopted this virtual gifting behavior. Indeed, it is intriguing to understand viewers’ behavior pattern in terms of virtual gifting frequency and amount.

Accordingly, we would like to explore whether normative beliefs affect virtual gifting behaviors. Specifically, whether normative beliefs embedded in offline relations online communities could together affect virtual gifting behaviors. As subjective norms reflect the perceived opinions of referent others, most empirical studies refer to significant others in physical life. We suggest that others in the online community should also be paid attention to. As more social interaction is carried in online environments, scholars call for research to understand how online visual spaces contribute to normative structures [32]. Meanwhile, online

spaces are linked to offline everyday life in many ways; so, social pressure offline and online could jointly affect individuals' behaviors [33]. For example, in the context of online social gaming, Eklund [34] found that players prefer to form online group membership with others who share characteristics with themselves in physical life (e.g., cultural background), and this similarity could facilitate the creation of norms and sociability in the game.

Therefore, this study could contribute to the existing body of knowledge in three ways. First, we identify the factors that influence virtual gifting behaviors in live streaming. Despite the popularity of live streaming virtual gifting, little psychological research has been conducted to investigate the underlying factors at the individual level. Second, given the importance of social interaction in virtual gifting, we emphasize the effect of both offline and online social influence. This can not only shed light on how online norm is constructed but also bridge the divide of social influence in online and offline contexts. Last, the proposed adoption model can list a concrete set of factors that can influence virtual gifting by applying the TPB framework, which can offer practical implications for both live streaming platforms and streamers.

1.1. Eliciting Beliefs about Virtual Gifting in Live Streaming. According to TPB [35], an individual's behavior is determined by intention. Intention is determined by attitude (evaluation or appraisal of the behavior), subjective norms (social pressure of adopting the behavior), and perceived behavioral control (PBC, perception of the ease or difficulty of enacting behavior). PBC, as a combination of perception of control and self-efficacy, can directly influence both intention and behaviors. There are three types of beliefs in the TPB that affect three perceptual constructs: behavioral beliefs that influence attitude, normative beliefs that affect subjective norms, and control beliefs that shape perceived behavioral control [35]. We first identified the salient beliefs and then laid out the hypotheses within the research model.

We followed Ajzen's [36] procedures and designed an open-ended questionnaire. 28 participants were recruited online (14 females, mean age = 30 years old) through referral, who all lived in China and considered themselves as active viewers of live streaming. They have used different Chinese live streaming platforms such as *Douyu*, *YY*, *Bilibili*, *Momo*, and *Huya*. These participants have sent virtual gifts from 2 to 8 times and spent from 10 to more than 500 Yuan during last month. The survey was conducted online and lasted approximately 10 to 30 minutes. All the participants provided their informed consent and were paid 10 Yuan after completing the survey. The study was reviewed and approved by Internal Review Board, and the ethical research protocol was followed throughout the study. The participation in the study was based completely on an anonymous and voluntary basis, and these participants were informed that the data were only used for research.

Participants were required to respond to six questions by providing three answers to each: (1) advantages of virtual gifting in live streaming, (2) disadvantages of virtual gifting in live streaming, (3) individuals or groups who would

approve or support your virtual gifting, (4) individuals or groups who would disapprove or not support your virtual gifting, (5) any factors or circumstances that would make it easy or enable you to send virtual gifts, and (6) any factors or circumstances that would make it difficult or prevent you from virtual gifting. The responses were sorted based on the frequency mentioned.

The resulting set of beliefs included a wide range of characteristics, among which we chose those mentioned by more than 20% of participants, as prescribed by Ajzen and Fishbein [37] (Table 1). For behavioral beliefs, these were *group interaction* (28.6%), *interaction with streamers* (25.0%), *perceived pleasure* (21.4%), and *support for streamers* (21.4%). For normative beliefs, there were *family or friends* (42.9%), *streamers* (35.7%), and *viewers* (28.6%). For control beliefs, there were *performance quality* (50.0%), *streamers' attractiveness* (32.1%), and *monetary resources* (21.4%).

1.2. Research Model. Next, we propose our research model based on these derived beliefs to predict virtual gifting behaviors in live streaming. We decompose the derived beliefs following DTPB [38] to provide a better understanding of this behavior.

1.2.1. Attitude. In this study, attitude refers to the overall appraisal of virtual gifting behavior in live streaming. Previous studies have shown that favorable attitude can positively influence intention. For instance, favorable attitude is associated with higher intention to make Internet purchases [39] and to participate in social network sites [40].

So, we hypothesize the following:

H1: attitude towards virtual gifting in live streaming is positively associated with virtual gifting intention

Evidence suggests that entertainment and social networking motivate people to use live streaming and are positively associated with use frequency and virtual gifting behavior [22, 29]. Experienced enjoyment in live streaming as the flow can drive consumption of virtual gifts (B. [41]). Lim and colleagues [42] found that wishful identification and engagement with other viewers and streamers could develop into parasocial relationship. This parasocial relationship may also encourage viewers to support streamers through virtual gifting. Given virtual gifting can generate income for streamers, viewers who want to support streamers are more likely to have a positive view of virtual gifting.

Therefore, we predict the following:

H2: perceived pleasure is positively associated with attitude toward virtual gifting in live streaming

H3: interactions with streamers are positively associated with attitude toward virtual gifting in live streaming

H4: group interactions are positively associated with attitude toward virtual gifting in live streaming

H5: support for streamers is positively associated with attitude toward virtual gifting in live streaming

1.2.2. Subjective Norm. Subjective norm refers to whether the virtual gifting behaviors are accepted, encouraged, and implemented by the individual's circle of influence. Previous

TABLE 1: Elicited beliefs and percentage of participants mentioned each belief (as frequency).

Behavioral beliefs	Frequency (%)	Normative beliefs	Frequency (%)	Control beliefs	Frequency (%)
Group interaction	8 (28.6%)	Family or friends	12 (42.9%)	Performance quality	14 (50.0%)
Interaction with streams	7 (25.0%)	Streamers	10 (35.7%)	Streamers' appearance	9 (32.1%)
Perceived pleasure	6 (21.4%)	Audiences	8 (28.6%)	Monetary resources	6 (21.4%)
Supporting streams	6 (21.4%)				

studies have found a positive association between normative beliefs and intention to purchase virtual gifts [43, 44]. Existing literature has proved the differences between online and offline norms because some digital platforms still allow for anonymity and nicknames [45]. Different reference groups can form different social norms [46]. For example, Wang and colleagues [47] manipulated subjective norms as perceived peer support and parental monitoring, which had significantly different influences on the intention to play online games. They argue that the different beliefs of “important others” should not be neglected. Therefore, we separate subjective norms based on the different social environments, namely, offline as in physical life and online as in live streaming channels:

H6: subjective norm offline, based on beliefs of family or friends, is positively associated with virtual gifting intention

H7: subjective norm online, based on the beliefs of streamers and viewer members, is positively associated with virtual gifting intention

1.2.3. Perceived Behavioral Control (PBC). PBC refers to users' perceived ease or difficulty of the planned behavior [36]. Similar to other forms of interpersonal behavior, attractiveness of streamers' physical appearance and personality could influence viewers' virtual gifting behaviors. For example, female streamers' gender performativity is linked to their revenue [18, 19]. Streamers' personality and their affective labor could also help them make a better living [48]. Besides, the performance quality could affect viewers' willingness to send virtual gifts. Many studies have shown the importance of the quality of virtual goods [49, 50] in online consumption. In eSports live streams, viewers' spending is related with streamers' talents and performance in eSports games [4]. Moreover, we speculate that income can be a constraint. In sum, we propose the following:

H8: PBC of virtual gifting in live streaming is positively associated with virtual gifting intention

H9: PBC of virtual gifting in live streaming is positively associated with virtual gifting behavior

H10: streamers' attractiveness is positively associated with perceived ease of virtual gifting in live streaming

H11: performance quality is positively associated with perceived ease of virtual gifting in live streaming

H12: monetary resources are positively associated with perceived ease of virtual gifting in live streaming

1.2.4. Intention. According to TPB, individuals' actual behavior is determined by their intent to perform that behavior. A meta-analysis showed an average correlation of

0.53 between the actual behavior and the intention [51]. Thus, we suggest the following:

H13: intention is positively associated with virtual gifting behavior

1.2.5. Habit. Habit is the repeated performance of a behavior, and it has been shown to influence behavioral intention [52]. Therefore, habit is controlled due to its impact on virtual gifting behavior in live streaming. Figure 1 displays the research model with all hypotheses.

2. Methods

2.1. Participants. We conducted an online survey via a Chinese survey platform (<https://www.wjx.com>). These participants were recruited national wide and rewarded by the platform with credits. 639 participants took part in our survey. All the participants provided their informed consent before completing the survey, and the surveys were conducted with the approval of Internal Review Board. Only 415 participants who have sent virtual gifts in live streaming within the last month were invited to complete the survey. 23 participants were excluded as they did not complete all the questions, leaving a final sample of 392 participants for analysis. 48.5% of the participants were female. 58.4% of them were 20-30 years old, and 35.2% were 30-40 years old.

Additionally, we compared the living cities of our participants with an industry report [53], and the distribution of participants is comparable to the representative of general live streaming users' profiles in China. In our study, 52% participants were from first-tier cities (46% in report), 19% from second-tier cities (21.2%), 19.5% from third-tier cities (21.8%), and 9.4% from other rural areas (11.8%).

2.2. Measures

2.2.1. Virtual Gifting Behaviors. Participants were asked about their total virtual gifting amount and how many times they sent virtual gifts during the last month. Habit was measured with the question “Tipping by sending virtual gifts to streamers in live streaming has become my habit” using a 7-point scale (from 1 = “strongly disagree” to 7 = “strongly agree”).

2.2.2. Principal TPB Perceptions. Principal TPB perceptions including attitude (two items), subjective norm (four items), and perceived behavioral control (two items), and intention (one item) were measured with a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree) (see Table 2). Subjective norm is separated as offline and online (two items each), which online here is defined as

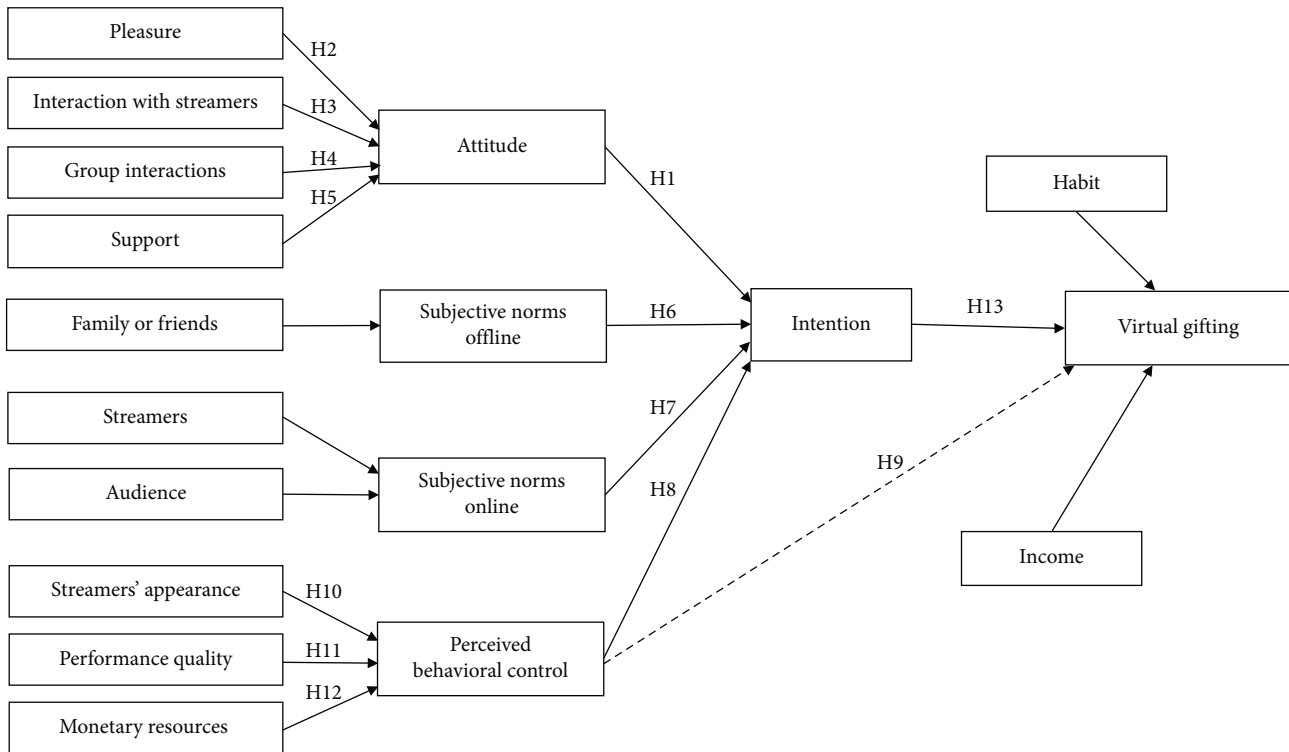


FIGURE 1: The research model and hypotheses of all variables.

TABLE 2: Items of principal TPB perceptions.

Construct	Measure
Intention	I intend to send virtual gifts to streamers in the next month.
Attitude (ATT)	For me, sending virtual gifts to streamers in the next month is a good idea.
	For me, sending virtual gifts to streamers in the next month is a pleasant idea.
Subjective norms offline (SN)	Most people who are important to me in real life (e.g., family members or friends) think it is good to send virtual gifts to streamers.
	Most people who are important to me in real life (e.g., family members or friends) would send virtual gifts to streamers.
Subjective norms online (SN)	Other people in the live streaming channel (e.g., the streamer or other viewer members) think it is good to send virtual gifts to streamers.
	Other people in the live streaming channel (e.g., the streamer or other viewer members) think it is reasonable to send virtual gifts to streamers.
Perceived behavioral control (PBC)	I am confident that I can send virtual gifts to streamers.
	The decision of sending virtual gifts to streamers is up to me.

in live streaming channels. The measurement was adapted from previous studies [36, 54].

2.2.3. *External Beliefs.* We developed the items of external beliefs grounded in the results of our pilot study, and all items were measured by a seven-point Likert scale (see Table 3). In accordance with Ajzen and Fishbein’s [37] expectancy-value formulation, belief-based measures were obtained by multiplying belief strength and power. Hence, higher multiplied scores refer to greater importance and influence on virtual gifting behaviors. Attitudinal beliefs were measured as the product of behavioral belief strength

(b) (1 = extremely unlikely, 7 = extremely likely) and outcome evaluation (e) (1 = very bad, 7 = very good). Normative beliefs were measured as the product of injunctive normative beliefs (n) (1 = strongly disagree, 7 = strongly agree) and motivation to conform (m) (1 = strongly disagree, 7 = strongly agree). Control beliefs were measured as the product of control belief strength (c) (1 = strongly unexpected, 7 = strongly expected) and control belief power (p) (1 = more difficult, 7 = much easier). Internal consistencies of all external beliefs, including attitude beliefs ($\alpha = .86$), subjective norm ($\alpha = .72$), and perceived behavioral control ($\alpha = .71$), are considered acceptable.

TABLE 3: Measurement items of external beliefs.

Construct	Item	Measure
Attitude	(b) Perceived pleasure	Sending virtual gifts to streamers would bring me entertainment.
	(e) Perceived pleasure	Entertaining is good for me.
	(b) Interaction with streamers	Sending virtual gifts to streamers could lead to interactions with streamers.
	(e) Interaction with streamers	Interacting with streamers is good for me.
	(b) Group interactions	Sending virtual gifts to streamers could promote group interaction in the live chat room.
	(e) Group interactions	Group interaction in the live chat room is good for me.
SN-offline	(b) Support for streamers	Sending virtual gifts to streamers could support my favorite streamers.
	(e) Support for streamers	Supporting my favorite streamers is good for me.
	(n) Family or friends	My family or friends would send virtual gifts to streamers.
	(m) Family or friends	I would send virtual gifts to streamers, as my family or friends do.
SN-online	(n) Viewer	Other viewer members think that I should send virtual gifts to streamers.
	(m) Viewer	I would send virtual gifts to streamers, as other viewer members also do (or intend).
	(n) Streamers	The streamers think I should send virtual gifts to them.
	(m) Streamers	I would send virtual gifts to streamers, as the streamers' appreciate/desire/request.
PBC	(c) Streamers' attractiveness	I expect attractive streamers while watching live streaming and sending virtual gifts to streamers.
	(p) Streamers' attractiveness	Attractive streamers would make me more likely to send virtual gifts to them.
	(c) Monetary resources	I expect more disposable monetary resources while watching live streaming; so, I can send virtual gifts to streamers.
	(p) Monetary resources	Having more monetary resources would make it easier for me to send virtual gifts to streamers.
	(c) Performance quality	I expect high performance quality while watching live streaming and sending virtual gifts to streamers.
	(p) Performance quality	High performance quality would make me more likely to send virtual gifts to streamers.

3. Results

3.1. Descriptive Results. In this study, 48.5% of the participants were male, 64.0% of the participants were married, 77.8% were between 26 and 40 years old, and 97.2% had a bachelor's degree or above. As for income, 69.6% of participants' monthly income was above 5k RMB (approximately 734 USD). During the last month, the average virtual gifting amount was 309.1 Yuan (approximately 48 USD), and on average, participants sent virtual gifts 5.2 times. Means and standard deviations of all TPB variables are shown in Table 4.

A correlational analysis of principal TPB perceptions and virtual gifting behaviors is shown in Table 5. Virtual gifting amount was positively associated with intention ($r = .29, p < .01$), attitude ($r = .28, p < .01$), and subjective norms offline ($r = .22, p < .01$). Virtual gifting frequency was positively associated with intention ($r = .31, p < .01$), attitude ($r = .20, p < .01$), subjective norms online ($r = .14, p < .01$), and perceived behavioral control ($r = .13, p < .01$).

3.2. The Structural Model. We drew on a partial least squares (PLS) approach, a structural equation modeling technique [55, 56], to analyze our data through the dedicated software SmartPLS. PLS employs a component-based approach for estimation purposes (e.g., [57]) and can accommodate the

presence of formative factors and a large number of constructs (e.g., [58]). Contrary to covariance-based structural equation model (CB-SEM)'s objective of reproducing the theoretical covariance matrix, PLS-SEM aims at maximizing the explained variance of the dependent latent constructs. Accordingly, PLS-SEM is suitable for exploratory research and theory development [59]. In this study, observed variables (e.g., group interaction and perceived pleasure) served as predictors of conceptual variables (e.g., attitude, intention and subject norms). We used weighted sums of observed variables to represent conceptual variables. Building such a weighted composite of these observed variables naturally fits the formative logic of measurement (e.g., [60, 61]). Therefore, we chose PLS-SEM path modeling, given that it is especially suitable for composite-based modeling [62]. All control variables and demographic variables were initially included in the model, and then insignificant ones, including *age*, *gender*, *educational level*, and *marriage*, were dropped. As a result, *habit* and *income* remained in the final model.

The path coefficients and R^2 value are measured for structural model evaluation [63]. The path coefficients are shown in Figure 2, and the relationship between the dependent and independent variable was explained and strengthened by correlations results. R^2 refers to the representative part of the dependent variable explained by the independent variable, and R^2 values of more than 20% are considered

TABLE 4: Descriptive statistics of all TBP variables.

	Mean	SD
Virtual gifting behaviors		
Virtual gifting amount	309.08	236.74
Virtual gifting frequency	5.15	2.69
Habit (1-7 scale)	4.68	1.47
Principal perception scale: 1-7		
Intention	5.34	1.17
Attitude	5.54	0.83
Subjective norms	4.79	1.00
Perceived behavioral control	5.66	0.98
External belief scale: 1-49 (7 × 7)		
ATT: perceived pleasure	32.73	10.05
ATT: interactions with streamers	34.04	10.25
ATT: Group interactions	33.86	10.34
ATT: support for streamers	34.91	10.86
SN-offline: family or friends	22.45	12.51
SN-online: streamers	24.25	10.99
SN-online: viewers	24.07	10.10
PBC: streamers' attractiveness	33.56	11.19
PBC: performance quality	38.58	10.85
PBC: monetary resources	28.83	11.93

Note: ATT: attitude; SN: subjective norms; PBC: perceived behavioral control.

high [59]. All external beliefs could significantly predict attitude ($R^2 = .26$), subjective norm offline ($R^2 = .68$), subjective norm online ($R^2 = .20$), and perceived behavioral control ($R^2 = .29$). These principal TPB perceptions were all significant predictors of the intention to send virtual gifts in live streaming ($R^2 = .52$). PBC positively influenced virtual gifting intention ($b = .25, p < .001$), but PBC had a negative effect on virtual gifting behaviors ($b = -.15, p < .01$), suggesting a negative influence (H9). Finally, virtual gifting intention significantly predicted virtual gifting behaviors ($R^2 = .24$) together with *habit* and *income*. Therefore, all the other hypotheses were supported except H9.

We further investigated effects on virtual gifting behavior with two models, in which virtual gifting behavior is measured separately by virtual gifting amount and frequency. In the model of virtual gifting amount, PBC showed a negative effect ($b = -.16, p < .01$). Compared with the full model, intention had slightly smaller effect ($b = .15, p < .01$), while *habit* ($b = .34, p < .001$) and *income* ($b = .18, p < .001$) had a larger effect on virtual gifting amount. However, in the model of virtual gifting frequency, PBC showed no significant effect on virtual gifting behavior ($b = -.05, ns$). Intention predicted virtual gifting frequency similarly as the full model ($b = .26, p < .001$), while *habit* ($b = .12, p < .01$) and *income* ($b = .08, ns$) showed smaller effect.

To examine the predictive power of the proposed model, we compared it to the other three models in terms of adjusted R^2 : (1) a direct model (ATT, SN, and PBC omitted as mediators), (2) a model without SN, and (3) a model

without control variables (*habit* and *income* omitted), using Cohen's formula for calculating effect size (f^2) (the degree to which the phenomenon is present in the population) [55]:

$$f^2 = (R^2_{\text{included}} - R^2_{\text{excluded}}) / (1 - R^2_{\text{included}}). \quad (1)$$

The direct model explains $R^2 = .44$ ($f^2 = .17$) of the variances in intention. The second model dropping SN (both offline and online) explains $R^2 = .45$ ($f^2 = .15$) of the variances in intention. Specifically, the model dropping SN offline explains only $R^2 = .48$ ($f^2 = .08$), and another model dropping SN online explains only $R^2 = .49$ ($f^2 = .06$). The third model dropping *habit* and *income* predicts $R^2 = .14$ of the variances in virtual gifting behaviors ($f^2 = .13$). In sum, the original model has higher predictive validity compared to the other three models and explicates most accessible factors that underlie virtual gifting behaviors in live streaming.

4. Discussion

The study is aimed at shed lighting on virtual gifting behavior in live streaming among Chinese viewers. Grounded in the TPB framework, the findings provided an adjusted model with specific factors that explain and predict virtual gifting intention and behavior. Attitude toward virtual gifting was composed by perceived pleasure, interaction with streamers, group interaction, and support for streamers. Subjective norm offline was based on family and friends, while subjective norm online was based on other viewers and streamers. Perceived behavior control included streamer's attractiveness, performance quality, and monetary resources. All these four factors can significantly predict virtual gifting intention and behavior.

Although previous evidence showed that subjective norms had the weakest effect on individuals' intention among all the TPB components [64], our model suggested subjective norms offline and online both exerted a strong influence on virtual gifting intention (H6 and H7). Subjective norms offline and online together explained total 23% variances of intention, which is more than attitude (16%) and PBC (13%). The weakness of subjective norms might relate to its insufficient measurement that could not fully explain the role of social influence [46]. The contexts of social interaction should not be neglected. Many studies have argued that the interface is a mediated environment that channels users' actions towards certain directions and develops social behavioral norms [65]. The streaming affordances in live streaming channels could facilitate the formation of new norms [12]. For example, streamers are in the focal area of the virtual stage and could deliver their vocalization through microphones. Viewers can interact with both other viewers and streamers in the live streaming channels by sending texts and high-value virtual gifts with animation. All these audiovisual features offer a two-way communicative environment that establishes and enforces social norms. In addition, there is a reciprocal relationship between social influences of online and offline. For example, offline norms

TABLE 5: Correlation analysis among the principal TPB perceptions and virtual gifting behavior.

	Amount	Frequency	Intention	Attitude	SN-offline	SN-online
Frequency	.32**					
Intention	.29**	.31**				
Attitude	.28**	.20**	.61**			
SN-offline	.22**	.09	.44**	.38**		
SN-online	.08	.14**	.52**	.46**	.28**	
PBC	.03	.13**	.55**	.47**	.26**	.53**

Note: SN: subjective norms; PBC: perceived behavioral control; * $p < .05$, ** $p < .01$, *** $p < .001$.

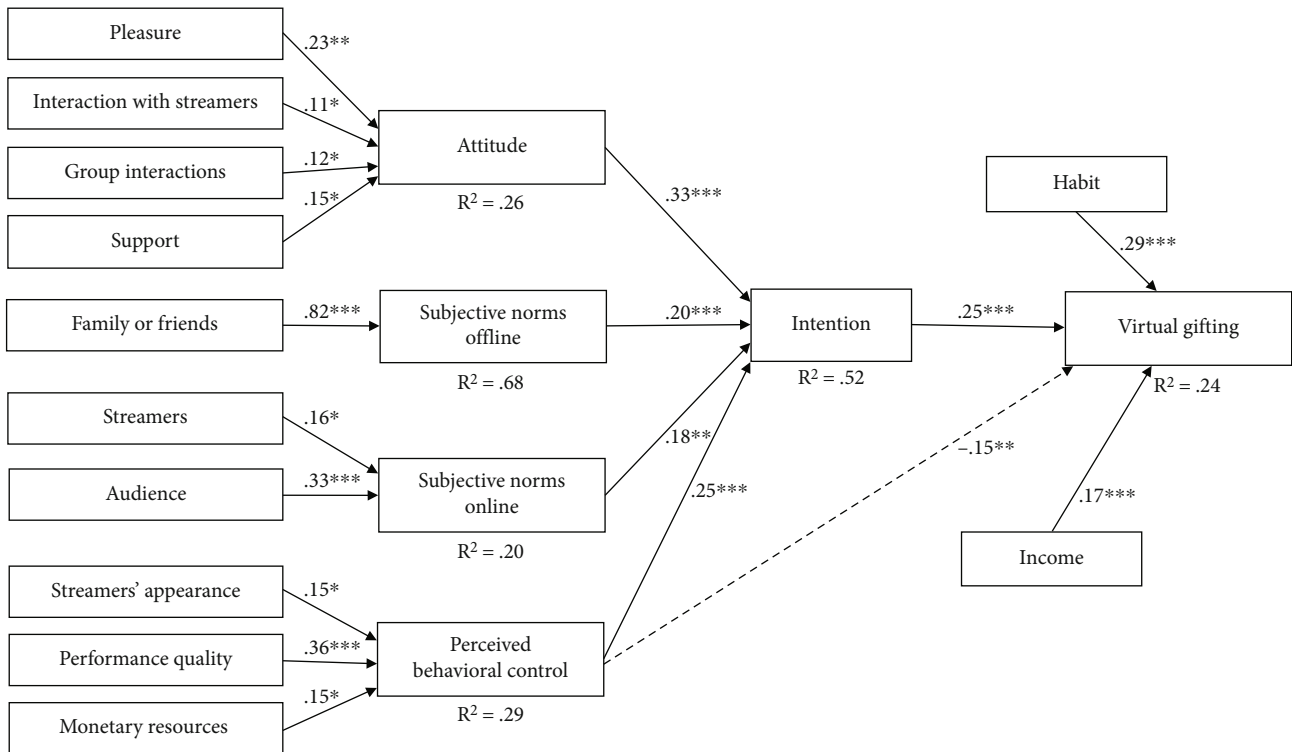


FIGURE 2: The structural model and PLS-SEM results. Note: numbers show path coefficients, * $p < .05$, ** $p < .01$, *** $p < .001$.

of politeness expectations can affect users' behavior patterns in the online game [66]. This reciprocal relationship helps understand the construction of norms in live streaming channels. Moreover, virtual gifting can increase social interactions in live streaming channels, enriching the content of streams and increasing the flow experience (B. [41]). Therefore, virtual gifting behavior is encouraged in the context of live streaming.

Our findings suggested that social incentive contributes to virtual gifting. Interactions with streamers, group interactions, and support for streamers predicted attitudes toward virtual gifting (H3, H4, and H5). Sothenen [67] stated that voluntary payments schemes operationalize reciprocity, allowing participants to send tangible gifts to the givers who provide information in the Internet's gift economy. Some researchers have shown that introduction of monetary incentives could reduce the intrinsic motivations, known as the crowding-out effect ([68, 69]), whereas Raban [70] found

in Google Answers Web site where researchers were paid to answer questions and tips were followed by comments and ratings as intangible incentives. The evidence showed that social incentives and economic gains can be connected. Social gratification is essential in the two-way communicative live streaming environment. Virtual gifting is voluntary that is motivated by gratitude, which represents not only a tangible incentive but also an intangible social incentive. Virtual gifting behaviors catalyze further interaction between viewer members in live streaming channels. In that case, our study supported the coexistence of tangible and intangible incentives in social media. Virtual gifting does not crowd out intrinsic motivations but facilitates social incentives, generating a lively exchange environment.

It is notable that the perceived behavioral control showed a negative association with the virtual gifting behavior (H9). Our analyses further indicated PBC has a negative effect on the virtual gifting amount but not on the virtual

gifting frequency. It seems that the virtual gifting amount is more difficult to decide. The resistance to actual behaviors could be attributed to mental transaction costs [71]. Viewers are likely to be involved in an informal profit-loss analysis. They need to evaluate the benefits with factors such as quality of performance and attractiveness of streamers. Meanwhile, they might calculate the cost, including financial cost of virtual gifts and time cost to purchase in-app currencies, which could require several payment procedures. This process could be cognitively complex. In addition, the value of virtual gifts is set by live streaming platforms, which may limit the choices of viewers. For example, on *Douyu* platform, there are five categories of virtual gifts that are priced at 0.1RMB, 0.2 RMB, 6 RMB, 100 RMB, and 500 RMB. The price gap could cause trouble for viewers who want to send virtual gifts with a value in between. People who have strong perceived behavior control may like to make their virtual gifting decisions based on judgment and analysis. Bargaining with every virtual gift could result in cognitively overwhelming, which inhibits the actual virtual gifting behavior.

4.1. Implications and Limitations. The results of this study provided several important implications. First, the findings provided empirical support for the TPB application to virtual gifting behaviors in live streaming. We adjusted TPB with both offline and online subjective norms to account for the social influence effect, thereby increasing its predictive power in the live streaming context. TPB with the capture of norm variables can be applied to examine behaviors related to online social interaction, while TAM may be more appropriate for studying personal adoption and use of technology [72]. As more offline social interaction moves into digital worlds, attention must be given to understanding of online behavior with social influence. Second, we suggest that the strength of the relationship between subjective norms and intention can be improved with both “important others” offline and online in TPB. This also sheds light on how virtual gifting norms develop. Future research is needed to understand how the social influences in different contexts interact with each other to shape behaviors. The development and maintenance of online norms could be an emergent aspect of understanding future social interaction online. Meanwhile, given the interaction between online and offline norms, it is also possible that online norms could exert influence on offline behaviors. This may be another direction for future research.

Third, from a managerial perspective, the present study offers meaningful insights into virtual gifting behavior in live streaming. In this study, we constructed specific models that decomposed the principal perceptions of TPB. This offers a concrete set of factors that practitioners could focus their attention on. We found the attitude toward virtual gifting is positively associated with interactions in live streaming channels. As we mentioned, virtual gifting behaviors generate extra social interactions. This effect can be improved by integrating more interactive features in live streaming platforms’ social affordances, such as the design of virtual gifts. Virtual gifts can be designed as a menu relating to content development where viewer can pick their preference to

enrich the content in live streaming channels, similar to “chose your own story-line” in the movie *Black Mirror*. Instead of showing the monetary value with the rocket and sports car, virtual gifts can signify different social cues through embodiment and symbolism. For example, virtual gifts can trigger animations that enable symbolized virtual physical contact. Virtual physical contact could enhance social connectedness. Interaction between viewers could also contribute to a friendly atmosphere in live streaming channels. Platforms could design functions to notify viewers who behave (chat/sending gifts) similarly. This may prime the feeling of mimicry behaviors in physical life, with which people feel they are more “alike” with each other. These designs could facilitate virtual gifting and enrich the live streaming experience.

This study focused on the virtual gifting behavior in Chinese live streaming. We noticed that infrastructures of Chinese platforms could differ with those in other countries. For example, researchers listed several monetization methods employed by streamers on Twitch: subscribing, donating, advertising, sponsorships, competitions, unpredictable rewards, and channel games [73]. Moreover, the cultural background may also influence viewer behaviors. A cross-cultural study examining viewers on Twitch found that Western and Eastern viewers differed in linguistic and psychological dimensions of emotional expression [74]. The generalization of current findings could be limited. Another limitation concerns the sample that comprised those participants who had virtual gifting experiences before. Existing literature proved that external factors would exert different effects in pre-adoption and post-adoption stages [75]. For example, concerning social influence, and the compliance process would play a less influential role after gaining first-hand experience [76]. Future studies can find out what factors would nudge viewers into the first virtual gifting. Last, our results might be limited by using a cross-sectional design and self-reported data. Future research could improve our research model with longitudinal design and objective data retrieved from live streaming platforms. For example, using crawled data from the platform to measure actual virtual gifting behaviors can be more persuasive [27].

5. Conclusion

This study contributed to the empirical evidence of virtual gifting behavior by applying the TPB framework. We examined the virtual gifting behavior in Chinese live streaming where the economic size of virtual gifting has been substantial. Viewers’ attitudes toward virtual gifting are significantly associated with the social interaction experience in live streaming channels and positively predict virtual gifting intention. The perceptions of others in social networks both online and offline can significantly influence virtual gifting intention. The proposed model that adapted subjective norms to offline and online can better fit in the online social contexts, which could be useful in understanding the development of online norms.

Data Availability

The data that support the findings of this study are available on request from the corresponding author, Yi Xu. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Authors' Contributions

The authors confirm contribution to the paper as follows: Yi Xu was responsible for idea generation, data analysis, and draft manuscript preparation. Yixin Ye was responsible for data collection, experiment performing, and data analysis. Yixuan Liu was responsible for interpretation of results and draft manuscript preparation. All authors contributed to the article and approved the submitted version.

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