Retraction

Retracted: The Impact of Self-Efficacy and Perceived Value on Customer Engagement under Live Streaming Commerce Environment

Security and Communication Networks

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] J. Cao, J. Li, Y. Wang, and M. Ai, "The Impact of Self-Efficacy and Perceived Value on Customer Engagement under Live Streaming Commerce Environment," *Security and Communication Networks*, vol. 2022, Article ID 2904447, 13 pages, 2022.

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Research Article

The Impact of Self-Efficacy and Perceived Value on Customer Engagement under Live Streaming Commerce Environment

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Live streaming commerce, which has led to the emergence of new forms of social commerce called live streaming, has already improved the performance of many social commerce streamers. Live streaming commerce is an emerging business model that has blended the functions of e-commerce and live webcasting. The total sales volume will increase when the streamers and the customers communicate in the real-time interaction platform. In live streaming commerce, customer engagement behavior has been beneficial for realizing the value of live streaming commerce, which scholars have studied and valued. However, internal and external factors often affect customer engagement behavior, and most of the existing research focuses on only one aspect. This article will analyze internal and external influencing factors (internal influencing factors are based on self-efficacy theory, and external influencing factors are based on value-based adoption models) and their interactions to get a broad conclusion. To understand customer engagement behavior in the live streaming commerce with comprehensive research, the article constructs a customer engagement model in the live streaming commerce environment and uses structural equations for empirical testing. In applying self-efficacy theory, it is committed to distinguishing the functional logic between general self-efficacy and special self-efficacy and understanding the mechanism of special self-efficacy, namely, the influence mechanism of live streaming self-efficacy on perceived value and customer engagement in specific situations. The research results show that general self-efficacy positively influences perceived usefulness, perceived entertainment, and live streaming commerce self-efficacy, while perceived usefulness, perceived entertainment, and live streaming commerce self-efficacy positively affect perceived value, live streaming commerce self-efficacy, and self-efficacy. Perceived value has a positive and significant impact on customer engagement behavior. This research explains the influencing factors and mechanism of customer engagement in the live streaming commerce environment from the internal and external perspectives, enriches the theoretical research on customer engagement, and provides practical guidance for customer engagement behavior in the live streaming commerce environment.

1. Introduction

In the era of e-commerce, products can only be explained through text and images provided by the seller. It is difficult to touch or try the product before making a purchase decision, and it is impossible to interact with the seller in real-time [1]. It may be a terrible experience to buy products in this way with high uncertainty as they risk buying defective products or even fake ones. With the booming of information technology, e-commerce and webcasting are integrated. Streamers show products to consumers by live video so that consumers can see the products intuitively.

Furthermore, consumers can even interact with streamers or other customers through pop-up screens. For real-time interaction, you can even experience the real user experience through the streamers' trial so that you can have a more objective and comprehensive understanding of the product. It shows a new form of business, namely, live e-commerce (also known as live commerce), which uses the e-commerce and live broadcast method to enhance the authenticity, visualization, and interaction of shopping.

By 2016, China's largest online shopping site Taobao started live streaming. Internet celebrity live streaming, live streaming delivery, live streaming e-commerce, and live

streaming business have gradually become hot topics on the Internet, and live streaming delivery has become a standard feature of all major social platforms. Depending on the huge user base and traffic advantages of the e-commerce platform, the live streaming commerce underwent explosive development [2] and became the outlet for economic development. According to the research report "live e-commerce toward a trillion billion market" released by KPMG and Ali Research Institute in October 2020, in the first half of 2020, the number of live streaming of China's e-commerce will exceed 10 million, and the number of active streamers will exceed 400,000. The number of people exceeded 50 billion, and the number of products on the shelves exceeded 20 million. It is predicted that the scale of China's live streaming business market will exceed 2 trillion yuan in 2021 [3]. According to the 47th "Statistical Report on China's Internet Development Status" released by NNIC, as of December 2020, the number of online shopping users in China has reached 792 million, the number of online live streaming users has reached 617 million, and the number of e-commerce live broadcast users has reached one million [4]. Live streaming commerce has become a generally accepted business model at this stage and has gradually attracted the attention of the academic and practical circles [5],

The live streaming commerce environment has changed the role of consumers and given customers special rights. Customers can shop on the live streaming platform and interact with the streamers or other customers through the live streaming platform. They are not only shoppers but also value deliverers who can influence the purchasing of customers [6]. Customer engagement is regarded as a well-known concept in information systems and marketing [5], and it is a key factor in the sustainable development of social commerce. For companies, customer engagement can better understand consumers to provide products and services that are more suitable for market needs, accelerate the speed of response to the market, and promote corporate innovation. For consumers, customer engagement can develop customer value through obtaining customized services and a better service experience [7]. At present, research on customer engagement in the environment of e-commerce and social commerce has accumulated specific results. It can be known from the existing literature that customer engagement is the key to the success of virtual environments and online brand communities, driven by both the internal characteristics of customers and the external environment [6]. However, there are a few research results on customer engagement behavior in the live streaming environment.

This article will consider internal and external factors to study customer engagement behavior in the live streaming commerce environment. The main contributions of the research are as follows: firstly, it validates the applicability of the value-based adoption model proposed by Kim (2007) in explaining the customer engagement in the live streaming commerce environment; secondly, it draws on the study of customer engagement in the e-commerce and social business environment achievements to correct the shortcomings of single perspective research, integrate the use of value-based adoption models and self-efficacy theories, and study

the influence mechanism of customer participation from both the internal characteristics of customers and the external environment; thirdly, it examines the nature of self-efficacy and divides it into two constructs, general self-efficacy and live streaming commerce self-efficacy, to study the impact of self-efficacy in different situations on perceived value and customer engagement behavior; fourthly, the theory of customer engagement is enriched in the live streaming commerce environment.

2. Literature Review

2.1. Live Streaming Commerce. Live streaming commerce refreshed the consumer's shopping context and promoted the consumer's shopping experience (Jiang and Cai, 2021) [8]. Conceptually, there are two typical definitions of live streaming commerce. The first definition of the view that the live streaming business is a new business model, integrated with webcast through an e-commerce platform that enables consumer multimedia interactive online shopping experience, is built based on segmentation on the scene of a small minority, long-tail community economic model (Cai et al., 2018; Cai and Wohn, 2019) [7, 9]. The second definition believes that live streaming commerce is a branch of e-commerce or social commerce (Cai et al., 2018; Cai and Wohn, 2019) [7, 9]. Live streaming commerce can achieve the goal of real-time social interaction, and it can enrich the consumers' shopping experience to boost sales. From a practical point of view, live streaming commerce evolved in two cases: one is developing the live sales, such as Taobao live streaming, which owns a complete original electronic business platform and supplying chain sources advantages; another category is live streaming on social platforms, such as Weibo, WeChat, Douyin, and self-media live streaming in Toutiao. This type of live streaming business takes advantage of the huge number of fans.

In terms of theory or practice, the live commerce platform is essentially an interactive platform of electronic (Cai and Wohn, 2019; Sun et al., 2019) [9, 10], which provides a cocreating value environment for enterprises and customers [7, 11]. Consumers, as value cocreators, gain practical value, entertainment value, and social value by watching live videos, interacting with streamers and other users, and forming an information pool by giving gifts and comments, providing more possibilities for customer engagement [12]. Compared with traditional e-commerce, live commerce provides in-depth, real-time, multimedia product display, bringing to users an intuitive and real-time shopping experience, and has the advantages of strong interactivity, professionalism, and high conversion rate.

The academics carried out researches on live streaming commerce, mainly focusing on two aspects: firstly, live streaming commerce models from a macroperspective are studied. The main descriptive and theoretical studies include components of live streaming commerce models, development status, problems faced, trends, and live streaming platform governance. Secondly, a microperspective is used to study the live business environment. The main empirical and theoretical analyses, including user behavior in a live

commerce environment, adopt the wishes of customer participation, theory, and empirical analysis and other factors to create value.

2.2. Value-Based Adoption Model. Value-based Adoption Model (VAM) theory is a user adoption model proposed by Kim et al. (2007) from the perspective of user-perceived value [13]. In the field of mobile commerce, the theoretical VAM has a reasonable degree of explanation for user adoption intention, customer engagement, and consumer purchase intention [14–16]. Unfortunately, the theoretical VAM only focuses on the customer perceived value from external technical characteristics and does not pay attention to the impact of internal factors on user adoption intention, customer engagement, and consumer purchase intention. Zhu et al. (2010) combined value theory and self-efficacy to construct a value acceptance SVAM and proposed that self-efficacy affected consumers' perceived value, which in turn affected consumers' intention [17]. Dash and Shaji (2012) conducted a study on the influence of users' mobile shopping adoption intention from self-efficacy and perceived value [18]. Liu and Tang (2015) confirmed the impact of perceived value on consumers' mobile shopping willingness based on VAM [19]; Li Baoku et al. (2017) proved that perceived value has a significant impact on the willingness to adopt personalized mobile recommendations based on the two dimensions of perceived benefit and perceived loss based on VAM. They also pointed out that perceived ease of use significantly impacts experience value and safety value. The impact is not significant; users are very concerned about the experience value brought by personalized mobile recommendations, that is, the sense of pleasure Therefore, based on the VAM, this article takes the two dimensions of user-perceived usefulness and perceived entertainment as external technical characteristics to examine their impact on perceived value, integrates self-efficacy theory, and then studies the impact mechanism of user participation in the live streaming commerce environment.

2.3. Perceived Value. Valarie (1988) believed that perceived value is the main factor that determines consumers' purchasing intention and purchasing decisions. Consumers usually weigh the gains and losses of a specific commodity under the constraints of consumption power, purchase cost, and knowledge reserves and then purchase the commodity with the greatest perceived value [20]. Perceived value is the standard used by users to measure the value of the product, and it is the subjective and personalized evaluation made by users on product quality or service emotionally (Hapsari et al., 2016) [21].

According to the existing literature, there are two typical views on the study of perceived value: the first view divides perceived value into two dimensions: perceived gain and perceived gains and losses. For example, the work of Sweeney and Soutar is based on gains and losses. A four-dimensional theoretical framework of perceived value was proposed at this level, including functional value, emotional value, social value, and perceived cost [22]. Kim et al. (2007)

confirmed the impact of perceived value on user adoption behavior from the two dimensions of benefit and sacrifice. Moreover, the second point of view emphasizes the role of perceived value and conducts research from different perspectives and scenarios; for instance, Turel et al. (2010) divided perceived value into functional value and non-functional value from the perspective of motivation [23]; Poyry et al. (2013) divided the perceived value into practical value and hedonic value from the perspective of utility [24]; Kim et al. (2011) divided user-perceived value into three dimensions: functional value, emotional value, and social value in the study of social network behavior [25]; Babin et al. (2012) divided perceived value into utilitarian value and hedonistic value [26]; Zhao Bingyan (2020) divided perceived value into functional value and emotional value when studying customer behavior intentions; Jin Liyin (2007) subdivided perceived value into financial value, social value, information value, image value, entertainment value, and social value [27]. This article adopts the second point of view, focusing on the mechanism of perceived value, and analyzes the impact of perceived value on customer engagement from two dimensions: perceived usefulness and perceived entertainment.

2.4. Self-Efficacy. Self-efficacy, also known as self-efficacy, is the core concept of social cognitive theory [28]. It is an individual's perception and belief in self-ability when completing specific tasks and achieving specific goals [29]. The formation of self-efficacy usually has four sources of information: direct experience, alternative experience, social persuasion, and psychological state [29]. Self-efficacy is a multilevel and multidimensional concept [22], which is divided into three aspects: first, self-efficacy reflects an individual's comprehensive judgment on whether they are capable of performing specific tasks; second, self-efficacy reflects that feelings will change as the individual obtains relevant information and experiences; third, self-efficacy is the individual's overall perception process, including motivational factors. Its application in different fields and environments can better explain behavioral intentions [27].

Schwarzer divided the self-efficacy into general self-efficacy and specific self-efficacy on the basis of Bandura. On this basis, Liu and LiFeng (2017) further proposed that general self-efficacy is a generalized self-cognition, which is the basis of an individual's cognition of a specific environment, while special self-efficacy is an individual's ability to complete a specific task in a specific environment and situations [30]. The logical sequence and influence of the two roles in specific situations are different. They also proposed that consumers' self-cognition in specific situations is a specific expansion of general self-cognition, which will affect consumers' acceptance behavior in specific situations [30]. The logical sequence and influence of the two roles in specific situations are different. Hsiang and Min (2004) proposed network self-efficacy and distinguished the different effects of general self-efficacy and network self-efficacy on the adoption of online electronic services [31]; in the field of information technology, different self-efficacy structures

have been developed for different research objects, such as computer self-efficacy, specific software self-efficacy, and Internet self-efficacy [32–34]. Khan (2014) proposed the social media self-efficacy construct and verified the impact on customer engagement [35]; Prentice et al. (2017) used information self-efficacy to interpret personal information capabilities in the Internet era [36]; Liu and LiFang (2017) took use of self-awareness of consumers driving social business models. Harmony was defined as self-efficacy in a socialized business environment and pointed out that general self-efficacy and self-efficacy in a socialized business context have different logic and effects on customers' willingness to accept [30]. This article intends to summarize the user's self-perception and judgment on the use of live commerce shopping mode in the live commerce environment as live commerce self-efficacy and use this construct to explore its impact on customer participation.

2.5. Customer Engagement. By summarizing the existing literature, scholars believe that customer engagement is included in any service. There are many definitions of customer engagement in academia. In summary, it mainly starts from the psychological and behavioral aspects. The first definition is that customer engagement is a psychological state resulting from the customer's pursuit of higher psychological needs in the transaction process and the pursuit contains emotions, such as being recognized, being respected, and self-realization. For example, Zhang (2017) defined *customer engagement* as a psychological process of building a brand relationship based on cognition and emotion. The second definition is that customer engagement is a behavior [6, 37], which is that customers determine their role in the service process by participating in the service, and the behavior that customers expect from service. Specifically, it is the behavior of customers engaged in the design of service content and methods. For instance, Brodie et al. (2011) defined customer engagement as a dynamic and interactive process in which customers and companies jointly create experiences under specific circumstances [5]. Similarly, Hsieh and Yen (2005) regard customer engagement as the extent to which customers provide resources in the process of service production and delivery [38]. Customer engagement in a live business environment is mainly manifested in real-time interaction among users, streamers through the barrage. Therefore, this article intends to treat customer engagement in a live business environment as a behavior, including transactional and nontransactional behaviors [39], which means that customer engagement can be a transactional behavior of purchasing a product or it can be a behavior of sharing shopping experience, participating in live interaction, and reviewing products [40].

Scholars have conducted empirical research on the influencing factors of customer participation behavior in the e-commerce and social business environment from different perspectives, showing that customer participation is a combination of internal and external factors. Inner driving factors mainly refer to the internal characteristics of customers, including cognition [5, 41], motivation [8, 39], trust

[39, 42], values [43], emotion [5, 41], self-efficacy [18], and flow experience [44]; external driving factors are mainly composed of technical features and environmental factors, including perceived control [44], perceived value [6, 42], relational establishment [37], technical characteristics [45], social support and community identification [46], relational bonds [1], and social interaction [44]. It can be known from the literature that scholars have begun to pay attention to customer engagement behavior in the live streaming commerce environment, confirming the influence of relationship bonding and emotional commitment [1], consumption motivation [7], and trust [42] on customer participation.

However, the existing research on customer engagement mainly makes use of the ternary interaction theory and the S-O-R model for the research, emphasizing the influence of external stimuli on the individual, and then the individual responds. Some scholars focused on the VAM, which emphasizes the role of perceived value. However, few paid attention to the combined effects of personality traits and perceived value at the same time, ignoring the role of internal factors. This research intends to comprehensively investigate the internal and external factors, adopting a comprehensive perspective to carry out research, and focus on the role of self-efficacy in special environments. Compared to existing research, it is more comprehensive and in-depth and pays more attention to the decisive role of customer's internal factors and inspects the perceived value of mediating role.

3. Research Model and Hypothesis

3.1. Research Model. Considering that the perceived ease of use in the VAM in this study did not play an important role, this variable was replaced with perceived entertainment. From the perspective of external technology characteristics, it examines the theoretical model with perceived value as the intermediary variable and customer engagement as the result variable. In addition, internal personal trait self-efficacy is added to the model, while self-efficacy is divided into general self-efficacy and live streaming commerce self-efficacy; thus, this article will investigate comprehensively customer engagement involved in the live commerce environment through the intermediary effect of perceived value. This article studies the initial theoretical model as follows (Figure 1).

3.2. Proposing a Hypothesis

3.2.1. Perceived Usefulness and Perceived Value. In TAM theory, perceived usefulness is a measurable indicator of expectations and extrinsic motivation. Perceived usefulness is used to evaluate the results of behaviors for individuals. The concept is similar to the usefulness of marketing about product quality, in which customer product is of superior type or the cognitive assessment is superior. Customers believe that the nature of the product indicates that it can perform some desired functions. Steenkamp (1990) proposed that the usefulness of a product is to meet the consumer's demand [14]. Researchers have confirmed that
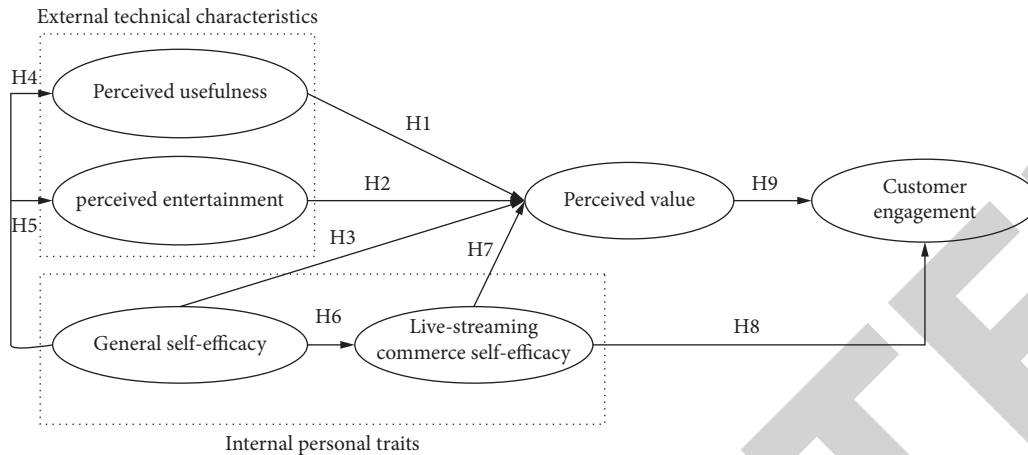
FIGURE 1: Theoretical model.

product quality positively impacts perceived value, and we expect users to affect perceived value in the same way. Consumers search for goods or services and easily complete mobile shopping with mobile shopping channels wherever they need information. They are the important manifestation of the usefulness of mobile shopping [47]. From the perspective of new technology adoption, the perceived usefulness of consumers about online shopping is an important factor that affects perceived value and adoption intentions. Perceived usefulness significantly influences perceived value [19]. Similar to the perceived usefulness in the TAM theory, the perceived usefulness described in the VAM theory refers to the perceived benefits, which are generated by the user's extrinsic motivation to meet their own needs, similar to the evaluation of product quality and merits.

H1: perceived usefulness will positively affect perceived value

3.2.2. Perceived Entertainment and Perceived Value. Perceived entertainment refers to the happiness and pleasure that consumers obtain in the process of using the service [48]. Childers et al. (2001) found that when consumers shop online, emotional pleasure factors have a greater impact than information technology factors, and emotional experience impacts consumers' perceived value and online shopping channel adoption attitudes. Keeney (1999) proposed that emotional entertainment experience is an important dimension that affects online shopping attitudes [49]. Therefore, the following hypothesis is proposed:

H2: perceived entertainment will positively affect perceived value

3.2.3. Self-Efficacy Theory and Perceived Value. Self-efficacy is the cognitive and emotional state formed by an individual in a specific situation. This research analyzes self-efficacy as an internal factor of perceived value and distinguishes between general self-efficacy and special self-efficacy in live streaming. With reference to the research results of ZhuGe

et al. (2010), we combined value theory and self-efficacy to construct a value acceptance model, emphasized the important influence of self-efficacy on the perception and evaluation of new technologies, and pointed out that self-efficacy will affect consumption, consumers perception of the value about the product or service, their attitude toward the product or service, and the intention to adopt it, especially when consumers lack basic experience, the impact of self-efficacy is more significant. Therefore, hypothesis 3 is proposed as follows:

H3: general self-efficacy has a positive effect on the perceived value

In the context of mobile shopping, users will feel that they can do mobile shopping, and mobile shopping is accessible and more useful. In addition, studies have shown that media tools can evoke pleasant memories of consumers and play a good role in consumers' perception of commodities. As a result, hypothesis 4 and hypothesis 5 are proposed as follows:

H4 general self-efficacy positively affects perceived usefulness

H5 general self-efficacy positively affects perceived entertainment

Existing studies have shown that the concept of a larger category of self-efficacy has a significant impact on a specific self-efficacy contained in it. From the perspective of the concept's scope and general self-efficacy, it has contributed to the formation of individual self-efficacy for specific tasks (Hsiang and Chiu, 2004). [31]. For instance, the general sense of efficacy significantly affects the self-efficacy of mobile auctions [17]; general computer efficacy positively affects a certain specific computer efficacy [50]; general network self-efficacy positively affects the self-efficacy of a certain network service [22]. Therefore, hypothesis 6 is proposed.

H6: general self-efficacy positively affects the self-efficacy of live streaming commerce

The live streaming commerce environment examines the user's ability to complete specific tasks, and the ability level is

a kind of self-efficacy for specific tasks [47]. Self-efficacy of live streaming commerce is the self-awareness of the capable level that users need to use the live broadcast platform. Bandura et al. (1997) pointed out that the judgment has the performance characteristics of a particular field but tends to be the perceived performance between two tasks in the same area of the transfer, depending on the skills of their qualitative features, and the two tasks required a degree of similarity [51]. For example, it will increase the individual's ability and confidence in using another electronic service when one is familiar with using one kind of electronic service; that is, some Internet performance may show a carry-over effect. When Zhu et al. (2010) studied the self-efficacy of mobile auctions, they proposed that the self-efficacy of mobile auctions will influence the perceived value [17]. Therefore, hypothesis 7 is proposed.

H7: the self-efficacy of the live streaming business affects perceived value

3.2.4. The Live Streaming Commerce Self-Efficacy and Customer Engagement.
Eastin and LaRose (2000) showed that the self-efficacy of a specific task is the acceptance process with a new variate [52]. ZhengChengde et al. (2012) regarded self-efficacy as a prerequisite variate for the user's intention to adopt mobile services [33]. Self-efficacy studies have shown that software-specific self-efficacy positively affects software use [35]. Khan (2020) proposed social media self-efficacy and clarified that social media self-efficacy is significantly related to Facebook brand page engagement, especially through brand page comments and sharing behaviors, which positively and significantly influences customer engagement. Therefore, hypothesis 8 is proposed.

H8: live streaming commerce self-efficacy positively affects customer engagement

3.2.5. Perceived Value and Customer Engagement.
Perceived value is a customer's overall assessment of the utility for a product or service based on benefits and contributions, and it is the key to a business's competitive advantage, while the customer perceived value directly influences consumers' attitudes. Scholars have demonstrated the positive impact of perceived value on customer behavior intentions from different perspectives [53]. Chen (2017) studied the use of WeChat and found that perceiving the value of a brand has a positive impact on user engagement behavior; WangYing and Huang Liyao (2019) proposed that consumers determine engagement behavior through perceived value, and users' engaged behavior is the evaluation result of perceived value. They also demonstrated that the perceived value of mobile short video could change consumers' attitudes toward short video-related companies' services and improve user participation in related applications. Gan and Wang (2017) proposed that perceived value significantly affects the satisfaction and purchase intention of social business customers [54]. In the live streaming commerce environment, perceived value is the subjective perception of the process and results of the interaction

between users and bloggers. To a certain extent, it affects customer engagement. Therefore, hypothesis 9 is proposed.

H9: perceived value positively affects customer participation

4. Research Approach

4.1. Sample and Data Collection.
The research mainly examines the influencing factors of user engagement behavior in the live streaming commerce environment. The object of the research is ordinary users who have watched live streaming to bring goods. Therefore, when we set the questionnaire items, the first question is used as the screening item. If the survey object has not watched the live broadcast, the questionnaire survey will be directly ended. This article uses the survey method of the online questionnaire. After the manual screening, if the user completed within 90 seconds (according to multiple tests, it takes at least 90 seconds to answer the questionnaire to be reasonable), all items with one answer belong to an invalid questionnaire. A total of 778 questionnaires were collected in this study. After excluding invalid questionnaires, 663 valid questionnaires were finally confirmed. Among them, there are 262 male users and 401 female users, accounting for 39.5% and 60.5%, respectively. Users under 20 years old, aged 21 to 30 years old, aged 31 to 40 years old, over 40 years old, and with high school education and below account for 30%, 56.5%, 8%, 5.5%, and 3.5%, respectively. Users with a college education, with a bachelor's degree, and with a graduate degree or above account for 24.3%, 55.5%, and 16.7%, respectively. In conclusion, this shows that the main body of the survey questionnaire is a group of young people who have received higher education. When it refers to time of watching, some users accounted for 57.8% within six months, 21.8% for six months to one year, 12.5% for one to two years, and 7.9% for over two years, indicating that the majority of new live streaming commerce users are increasing. The relatively small number of users also confirms that the live streaming business, as a new thing, is gradually recognized and accepted by people.

4.2. Research on Variable Measurement.
To ensure the validity and reliability of the questionnaire, we make the variable scale based on the measurement standards of mature scales at home and abroad, and on this basis, certain amendments have been made according to the live streaming commerce situation and context. To ensure the validity of the content, we adopt the "two-way translation" method for the scale items. First, three full-time business English teachers translate the scale into a first draft in Chinese and then summarize and discuss the appropriate Chinese expression according to the live business scene to form the first draft. Secondly, three graduate students translate the first draft into English, compare it with the original scale, and discuss and correct the translated sentences with significant differences to form the second draft; finally, some management professors check the second draft. After another revision, the final draft of the survey items of

the questionnaire is finally formed. Not only does it guarantee the scientific nature of the scale, but it also guarantees its applicability. Specifically, perceived value and perceived entertainment come from the translation of the scale in Kim et al. (2007), and perceived usefulness comes from the translation of the scale in Dash and Saji (2008). General self-efficacy is derived from the scale in the literature of Liu Xinmin et al. (2017), and the live streaming business self-efficacy is derived from the translation of the scale in the literature of Khan (2014), and the customer engagement is derived from the scale in the literature of Wongkitrungrueng and Assarut (2020). (See Table 1 for the measurement table of research variables.) Declarative sentences describe the design of the research variable items, and they are all measured by the Likert five-point scale. The answers are weak to strong, ranging from strongly disagree, disagree, uncertain, agree, and strongly agree.

4.3. Reliability and Validity Analysis. Using SPSS 25.0 software to test the internal reliability of the research variable scale, the results show that there are six latent variables in the model, namely, general self-efficacy, perceived usefulness, perceived entertainment, perceived value, live commerce self-efficacy, and customer engagement. Cronbach's α coefficients of all latent variables are greater than 0.7, indicating that the scale has high internal consistency and can be used to measure latent variables more reliably. When we performed the KMO test and the Bartlett sphere test, the results showed that the overall KMO value of the scale was 0.941, and the Bartlett sphere test result was significant, indicating that it is suitable for factor analysis. The maximum variance method was used for principal component analysis, and all observed variables were subjected to exploratory factor analysis (EFA). The results showed that six factors with eigenvalues greater than 1 were extracted, and the cumulative variance explanation rate was 68.598%. All the observed variables have higher loadings on the relevant factors, indicating that the scale of this study has good convergence validity.

To further test the reliability and validity of the scale, using Amos 26.0 software for confirmatory factor analysis, the test results show the following: (1) the standardized factor loading of each observation variable is above 0.627, which is higher than the minimum recommended value of 0.5 in general research; (2) R2 is between 0.462 and 0.801, which is greater than the recommended minimum value of 0.3. Through calculation, each factor's combined validity (CR) is higher than 0.8, indicating that each factor has good reliability. (3) The average variance extraction value (AVE) of the latent variable is higher than 0.5, indicating good convergence validity. (4) The square root of AVE arithmetic is higher than the correlation coefficient between the factors, indicating that there are obvious differences between the latent variables and the variables, and the factors have good discriminating validity. Therefore, the measurement model of this study has good validity (see Table 2 for variable reliability and validity test).

4.4. Test of Model Fitness. AMOS 26.0 software was used to analyze the structural model to test various absolute and value-added fitness indexes (see Table 3 for model fitness). The results show the following: (1) absolute fitness index: the chi-square degree of freedom ratio $\chi2/\mathrm{d}f$ is 4.127, which is within the acceptable recommended value (acceptable recommended value is 2–5). The asymptotic residual mean square and square root RMSEA value is 0.069, which meets the standard requirements; the residual square root RMR value is 0.032, which meets the standard requirements; the good fit index GFI value is 0.844, and the adjusted good fit index AGFI value is 0.817. Because these two indicators are highly dependent on the number of samples, Chen Xiaoping et al. (2012) suggested that the critical value of these two indicators is set to 0.80, so the two indicators also meet the standard requirements; (2) all indicators of value-added adaptation are all greater than 0.90. In summary, there is a good degree of fit between the model and the data in this study.

The model path coefficient and research hypothesis test were carried out, and the results showed the following: (1) the path coefficient of perceived usefulness and perceived value was 0.507 ($T = 7.991$, $P < 0.001$), and the research hypothesis H1 passed the statistical test; (2) the path coefficient of perceived entertainment and perceived value is 0.225 ($T = 4.440$, $P < 0.001$), and the research hypothesis H2 passes the statistical test; (3) general self-efficacy has no significant effect on perceived value, assuming that H3 fails the statistical test; (4) the path coefficient of general self-efficacy and perceived usefulness is 0.853 ($T = 7.115$, $P < 0.001$), and the research assumes H4 passes statistical test; (5) the path coefficient of general self-efficacy and perceived entertainment is 0.785 ($T = 7.289$, $P < 0.001$), and the research hypothesis H5 passes the statistical test; (6) the path of general self-efficacy and live business self-efficacy coefficient is 0.785 ($T = 7.032$, $P < 0.001$), and the research assumes that H6 passes the statistical test; (7) the path coefficient of live broadcast business self-efficacy and perceived value is 0.210 ($T = 3.922$, $P < 0.001$), and the research assumes H7 passes statistical test; (8) the path coefficient of live broadcast business self-efficacy and customer participation is 0.380 ($T = 6.817$, $P < 0.001$), and the research hypothesis H8 passes the statistical test; (9) the path coefficient of perceived value and customer participation is 0.511 ($T = 8.790$, $P < 0.001$), and the research hypothesis H9 passes the statistical test. (See Figure 2 for the path diagram of the live business customer participation model based on VAM and self-efficacy and Table 4 for model path coefficients and tests).

4.5. Mediating Effect Test. We made a test of the mediating role of perceived value in the model. The test results (see Table 5 for the mediating effect of perceived value) are shown as follows. (1) The coefficients of perceived usefulness, perceived entertainment, and live streaming commerce self-efficacy are significant for customer engagement (Table 5, Model 1) (2). Perceived usefulness, perceived entertainment, and live streaming commerce self-efficacy have significant

TABLE 1: Variable measurement table.

Latent variable	Dimension	Measurement item	Resources
Perceived usefulness	PU1	The live streaming platform with goods provides more useful information for my choice	Satyabhusan Dash and Saji (2008) [6]
	PU2	The live streaming platform with goods improved my ability to evaluate the product	
	PU3	The live streaming platform with goods improved the efficiency of shopping	
	PU4	It is more convenient to purchase products on the Internet than in stores	
	PU5	It relieves the pressure of shopping time through the living streaming platform with the goods.	
	PU6	It is very useful for me with the living streaming platform	
Perceived entertainment	PE1	It is funny to interact in the platform of living streaming with goods	Kim et al. (2007) [16]
	PE2	It makes me happy when I watch the live streaming platform with goods	
	PE3	I enjoy the process of watching the live streaming with goods	
General self-efficacy	SE1	I can deal with some difficult problems by efforts	Liu'xin'min (2017) [33]
	SE2	I can find the solutions when I face the difficulties	
	SE3	I have the ability to solve emergencies in my life	
	SE4	As long as I am willing, I can do what others can do with my hard work	
Live streaming commerce of self-efficacy	LSE1	I am confident that I can find the necessary information on a specific topic in the live streaming platform	Muhammad Laeeq-ur-Rehman Khan (2014) [4]
	LSE2	I am confident to participate in the interaction on the live streaming platform	
	LSE3	I have the ability to use the existing functions on the live streaming platform	
	LSE4	I am confident to seek help from friends on the live streaming platform	
	LSE5	I can handle the social relationship of the live streaming platform calmly	
Perceived value	PV1	Compared with other shopping methods, the cost of live shopping is more worthwhile	Kim et al. (2007) [16]
	PV2	Compared with other shopping methods, live shopping is more conducive to saving time	
	PV3	Compared with other shopping methods, the energy spent on live shopping is more valuable	
	PV4	All in all, live shopping is very valuable to me	
Customer engagement	CE1	I am willing to spend more time on the live streaming platform	Wongkitrungrueng and assarut (2020) [46]
	CE2	I am willing to be a fan of the live streaming platform	
	CE3	I am willing to try and track the activities of sellers	
	CE4	I am willing to watch the seller's live streaming in the near future	
	CE5	I would like to recommend the seller who carries the live streaming to my friends	
	CE6	I encourage relatives and friends to use live shopping	
	CE7	Recently, if necessary, I would buy from a live platform	
	CE8	When I shop, I prefer to choose sellers who use live streaming	

coefficients on perceived value (Table 5, Model 2). (3) Perceived value has significant coefficients on customer engagement (Table 5, Model 3). (4) When perceived usefulness, perceived entertainment, and live streaming self-efficacy are significant, respectively, to perceived value, when the relationship from perceived value to customer engagement is controlled, previous relationship from perceived usefulness, perceived entertainment, and live streaming self-efficacy to customer engagement is still conspicuous, but the path coefficient goes down. The relationship is still significant, but the path coefficient is reduced (Table 5, Model 4). In summary, perceived value plays a part of the intermediary role in the process from perceived usefulness to customer engagement (H10), from perceived entertainment to customer engagement (H11), and from live streaming commerce self-efficacy to customer engagement (H12). The research hypotheses are supported.

TABLE 2: Variable reliability and validity test.

Latent variable	Measurement items	Standardized factor loading	R^2	Cronbach's α	CR	AVE
Perceived usefulness	PU1	0.737	0.515	0.827	0.876	0.541
	PU2	0.729	0.504			
	PU3	0.709	0.527			
	PU4	0.661	0.462			
	PU5	0.751	0.580			
	PU6	0.816	0.647			
Perceived entertainment	PE1	0.777	0.634	0.806	0.887	0.725
	PE2	0.909	0.801			
	PE3	0.863	0.737			
General self-efficacy	SE1	0.766	0.563	0.709	0.824	0.542
	SE2	0.808	0.588			
	SE3	0.731	0.532			
	SE4	0.627	0.472			
Live streaming commerce self-efficacy	LSE1	0.703	0.487	0.811	0.869	0.570
	LSE2	0.764	0.593			
	LSE3	0.739	0.559			
	LSE4	0.812	0.645			
	LSE5	0.753	0.562			
Perceived value	PV1	0.774	0.591	0.808	0.875	0.637
	PV2	0.764	0.615			
	PV3	0.850	0.712			
	PV4	0.801	0.625			
Customer engagement	CE1	0.714	0.523	0.893	0.915	0.573
	CE2	0.789	0.627			
	CE3	0.793	0.633			
	CE4	0.790	0.622			
	CE5	0.774	0.500			
	CE6	0.774	0.590			
	CE7	0.768	0.580			
	CE8	0.714	0.507			

TABLE 3: Model fitness.

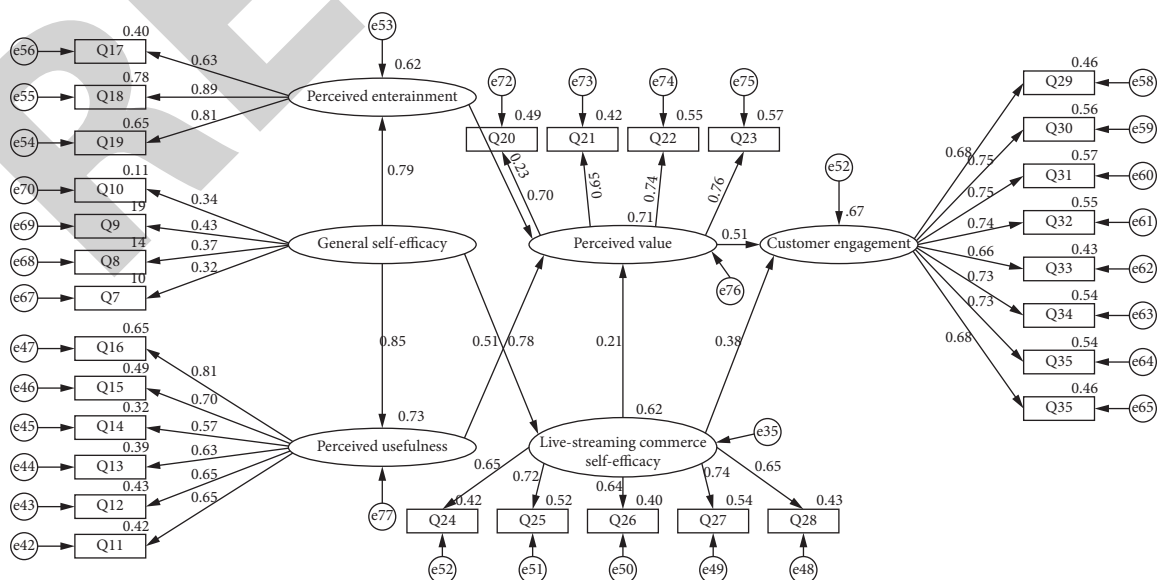| Fitting index	Absolute fitness index						Value-added fitness			
	χ^2/df	RMSEA	RMR	AGFI	GFI	NFI	IFI	RFI	CFI
Acceptable recommended index	2–5	<0.08	<0.05	>0.8	>0.8	>0.9	>0.9	>0.9	>0.9
Result of test	4.127	0.069	0.032	0.817	0.844	0.932	0.945	0.913	0.945

FIGURE 2: The path diagram of the model of live streaming commerce customer engagement based on VAM and self-efficacy.

Table 4: Model path coefficients and tests.

Path model	Standardized path coefficient	T	Hypothetical test
H1: perceived usefulness ⟶ perceived value	0.507	7.991	***
H: perceived entertainment ⟶ perceived value	0.225	4.400	***
H3: general self-efficacy ⟶ perceived value	＼	＼	＼
H4: general self-efficacy ⟶ perceived usefulness	0.853	7.115	***
H5: general self-efficacy ⟶ perceived entertainment	0.785	7.289	***
H6: general self-efficacy ⟶ live streaming commerce self-efficacy	0.785	7.032	***
H7: live streaming commerce self-efficacy ⟶ perceived value	0.210	3.922	***
H8: live streaming commerce self-efficacy ⟶ customer engagement	0.380	6.817	***
H9: perceived value ⟶ customer engagement	0.511	8.790	***

Note. ***$P < 0.001$; error variation index $T > 1.96$.

Table 5: Perceived value mediation.

Latent variable	Model 1 Customer engagement		Model 2 Perceived value		Model 3 Customer engagement		Model 4 Customer engagement	
	β	T	β	T	β	T	β	T
Perceived usefulness	0.712***	12.364	0.793***	12.729			0.331***	4.615
Perceived entertainment	0.691***	13.707	0.682***	13.536			0.355***	6.686
Live streaming commerce self-efficacy	0.729***	12.432	0.689***	11.662			0.419***	7.145
Perceived value					0.739***	13.079	0.281***	3.900

5. Research Discussion and Conclusion

5.1. Discussion. Based on reviewing and analyzing the current research results, this article establishes a theoretical model based on VAM and self-efficacy for customer engagement in live commerce. It examines the influence of external technical characteristics and internal personal characteristics on customer engagement in the live streaming commerce environment. Most of the hypotheses are supported by empirical evidence, indicating that the model has a reasonable degree of explanation for customer engagement behavior in the live commerce environment.

The research results show that both external technical characteristics and internal personal characteristics affect customers' perceived value to varying degrees. It reveals that both internal and external factors drive the customer's perceived value. Product or service quality, the shopping environment of the live streaming room, customer shopping experience, customer interaction with the streamer or other customers, and other factors are undoubtedly crucial for enhancing customer perceived value. However, the self-efficacy of live streaming commerce can also significantly influence the perceived value of customers, which cannot be ignored either. That is to say, in the live streaming commerce environment, attention should be paid to improving the customer's sense of self-efficacy in live streaming commerce.

In this study, the general self-efficacy has no significant effect on the perceived value in the live streaming commerce environment, while the special self-efficacy, namely, the live streaming commerce self-efficacy, has a significant effect on the perceived value in this context. It shows that in the live streaming commerce environment, customers' evaluation of their ability to solve general problems, that is, their perception of

general self-efficacy, is less concerned about their own ability to use the live streaming platform to solve the problems encountered in the shopping process.

We also found that perceived value significantly impacts customer engagement behavior. Live streaming commerce self-efficacy has both direct and indirect effects on customer engagement behavior. Customer perceived value plays a part in the mediating role of live streaming commerce self-efficacy in customer engagement. On the one hand, it shows that value driven self-efficacy is an important factor in customer engagement and verifies the effectiveness of the VAM in the live streaming environment. As an emerging business model, live streaming commerce, with the technical features of the live streaming platform, facilitates user operations, optimizes user experience, and better enhances customers' perceived value. It also highlights the importance of the shopping experience in live streaming commerce. On the other hand, self-efficacy in a specific environment is the self-efficacy of live streaming, which affects the perceived value in this environment and uses it as an intermediary to influence customer engagement in the environment.

5.2. Theoretical Innovation. The theoretical value and innovation of this research lie in the following: first of all, this article adopts the perspective of integration theory (that is, combining VAM theory and self-efficacy theory), comprehensively examines the external technical characteristics and internal personal characteristics from two dimensions, and analyzes the behavioral mechanism of live business customer engagement. They enriched the theoretical research on customer engagement behavior in live streaming commerce. Second, applying self-efficacy theory distinguished the role

of general and special self-efficacy, put forward the self-efficacy construct of live streaming commerce, enriched the self-efficacy theory, and pointed out the applicable context.

5.3. Revelation on Management. If we can effectively promote customer engagement, it is the key to developing live streaming commerce. In order to improve the development of live streaming commerce, such as live streaming e-commerce, live streaming platforms, and even live streaming self-media, comprehensively, there are some useful recommendations as follows.

Firstly, we can formulate strategies to enhance customer perceived value. In terms of perceived usefulness, the scene design of the live streaming room should start from the convenience of user operation, then optimize the process and simplify the operation, pay attention to the design of the shopping function, and optimize the user experience. The streamer should be concise and objective when introducing the product and pay more attention to the needs of the customers. In terms of perceiving entertainment, it is necessary to satisfy customers' entertainment psychology in an innovative and personalized way. The streamer should introduce products in humorous language, display products in trial shows, celebrity effects, etc., create topics, make good use of stalks, and establish a good relationship with customers. The communication mode creates a warm and pleasant shopping atmosphere and enhances customers' sense of pleasure.

Secondly, we can formulate strategies to improve customer self-efficacy. Live streaming platforms and live streaming e-commerce companies should devote themselves to cultivating users' skills and habits in using live shopping, pay attention to users' evaluations of live streaming services, and enhance the fit between streamers and customers. We can analyze user barrage information through big data technology, provide personalized services, enhance users' live shopping experience, improve confidence, enhance their sense of identity, and increase user participation.

5.4. Limitations and Future Prospects. Although this study has some implications for theory and practice, there are still some limitations. First of all, the subjects of the survey are not all consumer users who do live streaming shopping, but also users who watch the live video, and most of the users are primary users and stay in the live streaming room for a short period, and there are fewer in-depth users, which affects the survey to a specific result. Secondly, the survey did not refer to specific live e-commerce or live streaming platforms (Taobao Live, Toutiao, etc.). Different companies or live streaming platforms may have different user perceptions and self-efficacy, and customers' willingness to engage may differ. Thirdly, this article studies customer engagement behaviors in the environment of live streaming commerce engagement behavior, which may lead to the inaccuracy of the results of this study when the different engagement behaviors may have different influence factors. However, customer engagement behaviors are multitudinous, including transactional and nontransactional behaviors; that

is, transactional behaviors are direct purchases and non-transactional behaviors include broadcasting, comments, and forwarding. Finally, this research only focuses on the impact of perceived value and self-efficacy on customer engagement, without careful consideration from other perspectives such as companies, platforms, or streamers. Regarding the above limitations, due to the relationship between the length of the article and the research time, this article has not been able to discuss it further, and further research is needed in the future.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest to report regarding the present study.

Acknowledgments

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