



The Formation Mechanism of User Stickiness in Card-Unboxing Live Streaming Scenarios: A Perspective Based on Perceived Value and Flow Experience

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Abstract. With the development of live broadcast e-commerce, card splitting live broadcast has attracted widespread attention as an uncertain consumption mode characterized by random mechanism and instant interaction, but the formation mechanism of user stickiness still lacks systematic research. Based on the theoretical framework of stimulus-body-response (S-O-R), this paper takes the live broadcast scenario of card dismantling as the research object, constructs a model of user stickiness formation mechanism from the perspective of perceived value and flow experience, analyzes the action path of entertainment value, social value and information value on user stickiness, and tests the mediating effect and moderating effect of interaction of flow experience. The empirical analysis results based on questionnaire survey data show that all three dimensions of perceived value have a significant positive impact on user stickiness, and flow experience plays a key part of the mediating role between perceived value and user stickiness, and interactivity further strengthens the conversion effect of flow experience to user stickiness. The study finds that the user stickiness in the card opening live broadcast is not simply driven by the product result, but is shaped by immersive experience, emotional arousal and social interaction in the process of uncertain consumption. Based on these findings, this paper offers practical insights by highlighting the importance of optimizing content value and interaction mechanisms, as well as promoting rational consumption.

Keywords: Card-Unboxing Live Streaming, User Stickiness, Perceived Value, Flow Experience, Interactivity

1 Introduction

In recent years, with the continuous expansion of ACGN (animation, comics, games, novels) derivative culture, the "millet economy" with two-dimensional peripherals as the core has rapidly grown into an important part of the youth consumer market. Driven by short video and live broadcast technology, the consumption mode of two-dimensional goods is no longer limited to offline purchases or static e-commerce transactions, but has gradually evolved into an interactive consumption form with live broadcast as

the carrier. Among them, "card dismantling live broadcast", as an uncertain consumption model that highly relies on randomness and instant feedback, has quickly become popular on platforms such as Douyin. After consumers complete the order in the live broadcast room, the anchor will unpack it on the spot, and the product results will be presented in real time through the camera, transforming the originally personalized consumption decision into a public viewing process with group participation attributes.

The popularity of card unpacking live broadcasts does not only stem from the product itself, but also depends more on the emotional experience and psychological fluctuations stimulated by the unpacking process. Compared with traditional blind box consumption, card opening live broadcast combines random results with real-time interaction, significantly amplifying the emotional evocation effect. Yang shows that the motivation of young people in blind box consumption has shifted from simple material acquisition to multiple psychological needs such as novelty and curiosity, stress release and emotional sustenance [1]. In the context of card unpacking live broadcast, these motivations are highly concentrated in the "unpacking process", so that the consumption behavior itself gradually evolves into an emotional participation activity with experience as the core.

In reality, the live broadcast room presents the phenomenon of a large number of users staying for a long time, repeatedly choosing to enter and continue to interact, even if the order scheduling cycle is long and instant consumption may not occur, users still choose to stay in the live broadcast room to "accompany and watch"; This behavior shows that in the two-dimensional consumption scenario, consumers' focus has shifted from the final product result to the immersive experience and emotional satisfaction brought by the consumption process. Meng et al pointed out that the value perception of live content, especially emotional and entertainment content, is an important factor in promoting customer engagement and continuous engagement. This finding shows that process value is becoming the core driving force that cannot be ignored in live broadcast consumption [2].

However, the strong emotional stimuli and random mechanisms relied on by card dismantling live broadcasts have also raised social concerns about impulsive consumption and the weakening of rational decision-making. Li shows that visual stimulation and atmospheric rendering in live broadcast situations can induce consumers to enter a state of flow, thereby weakening rational judgment and increasing impulsive purchase intentions [3]. In the live broadcast scenario where young people and teenagers are highly concentrated, how to understand its attraction mechanism while identifying potential risks has become a practical problem that needs to be integrated.

Based on this, this study takes the card splitting users in the typical uncertain consumption scenario of card opening live broadcast as the research object, focuses on the formation mechanism of user stickiness, and explains the above phenomenon from the psychological mechanism level. This study introduces the classic Stimulus–Organism–Response (S-O-R) model proposed by Mehrabian and Russell as the overall analytical framework, regards the entertainment, social value and information value perceived by users in the card splitting live broadcast as external stimuli, and examines how it further affects users' continuous stay and repeated participation behavior through flow experience [4]. The concept of flow experience originates from flow theory proposed by

Csikszentmihalyi, which describes a state of deep immersion, intrinsic enjoyment, and focused attention during an activity [5]. At the same time, considering the situational characteristics of card splitting live broadcast that is highly dependent on real-time interaction, interactivity is further introduced as a moderating variable to test the role of interaction intensity in the process of conversion from flow experience to user stickiness.

2 Method

2.1 Research Basis and Research Hypotheses

The model construction and variable measurement of this study are based on mature academic theory. The variables used refer to the mature scales that have been validated in existing studies, and combined with the specific research situation of card dismantling live broadcast, appropriate terminology adjustments and contextual adaptation are carried out for the relevant questions. In terms of the measurement of perceived value, it mainly refers to the definition of the value dimension of virtual brand community by Jin and the empirical research results of Meng on the value perception of live broadcast content [6]. Combined with the entertainment, sociality and information transmission characteristics of card splitting live broadcast, this paper divides the perceived value into three dimensions: entertainment value, social value and information value, so as to comprehensively reflect the comprehensive evaluation of users' live broadcast content in the context of card splitting live broadcast. The measurement dimension of flow experience mainly refers to the flow experience scale proposed by Li in the context of e-commerce live broadcasting, combined with the empirical research framework constructed by Dong et al, focusing on the depth of immersion generated by users in the process of watching the live broadcast of card unpacking, focusing on the aspects of concentration, immersion, and changes in time perception [7]. The measurement of user stickiness draws on the empirical research in related fields and the mature scale design of the willingness to continue to use in the graduate dissertation, focusing on the user's willingness to stay and the tendency to repeat purchase in a specific card opening live broadcast room, so as to reflect their long-term participation behavior characteristics. The measurement of interactivity mainly refers to the live broadcast characteristic scale designed by Zhang Lianfeng et al based on the S-O-R theory, which is used to measure the quality of real-time interaction between the anchor and the audience and the audience during the live broadcast process, so as to reflect the situational role of interactive behavior in the user's psychological experience and behavior transformation [8].

Based on the stimulus-body-response (S-O-R) theoretical framework, the following research hypotheses are proposed: entertainment value, social value and information value all have a significant positive impact on user stickiness (H1–H3), Flow experience plays a significant mediating role between entertainment value and user stickiness (H4a), between social value and user stickiness (H4b), and between information value and user stickiness (H4c). Interactivity positively moderates the relationship between flow experience and user stickiness(H5).

2.2 Research Design and Model Construction

This study uses a quantitative research method. Using the Likert five-point scale, the questionnaire included four core scales: perceived value (independent variable), flow experience (mediating variable), user stickiness (dependent variable), and interaction (moderating variable). The research object focuses on the group with experience in card opening live consumption. The questionnaire is mainly distributed accurately and targetedly to the fan groups of social media platforms such as Xiaohongshu and Douyin. In order to ensure the authenticity of the data, screening questions and reverse logic check questions are set up in the questionnaire to eliminate invalid samples. A total of 361 valid questionnaires were collected in this study. The sample characteristics show that women account for 56.8%, the 26-30 age group is the core audience, and the vast majority of respondents have a college degree or above, and the overall education level is high, which is in line with the mixed decision-making characteristics of "rational + emotional" in live broadcast consumption.

Before the formal path analysis, the results of reliability and validity analysis showed that the Cronbach's α coefficient of each variable was higher than 0.85, and the overall scale α value was 0.931, indicating that the scale had a very high internal consistency. In terms of validity test, the KMO value was 0.928, and the Bartlett spherical test was significant ($p < 0.001$), indicating that the sample data were suitable for factor analysis. Further exploratory factor analysis extracted a total of 6 factors, which were completely consistent with the perceived value (entertainment, social, information), flow experience, interactivity and user stickiness variables set by the theory, and the cumulative variance explanation rate was 70.54%, indicating that there was a high consistency between the scale structure and the theoretical model, providing a reliable data basis for subsequent hypothesis testing

Based on the theoretical derivation and research design of S-O-R described above, a model of the stickiness behavior mechanism of users in card splitting live broadcast is constructed in Figure 1 below. The model intuitively demonstrates how perceived value, as an external stimulus (S), experiences the body's mediation (O) through flow, ultimately driving the behavioral response of user stickiness (R), and presents a regulatory path of interactivity.

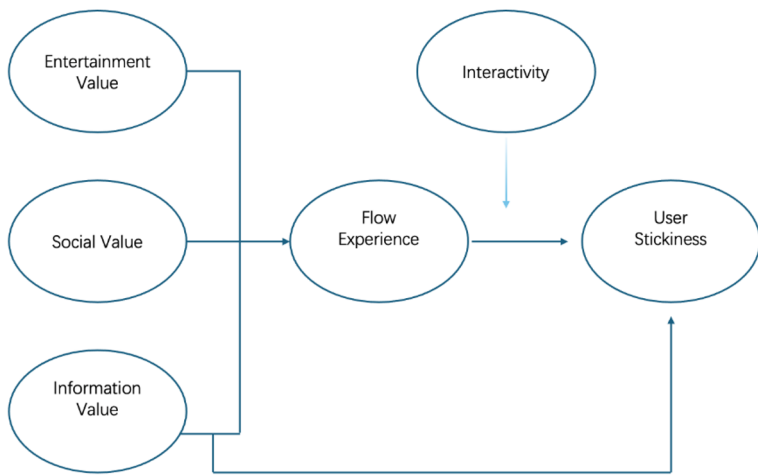


Fig. 1. Conceptual model of user stickiness based on the S-O-R framework (Picture credit: Original).

3 Results

3.1 Results of the Main Effect Test

In order to test the main effect of perceived value on user stickiness, this paper constructs a multiple linear regression model with user stickiness as the dependent variable and entertainment value, social value and information value as the independent variables. The regression results show that the overall significance of the model ($F(3,361)=57.748$, $p<0.001$) and the adjusted R^2 is 0.321, indicating that each dimension of perceived value can better explain the variation of user stickiness. The Durbin-Watson value is 2.175, and the VIF values for each variable are less than 5, indicating that there are no obvious autocorrelation and multicollinearity issues in the model. Further analysis shows that entertainment value ($\beta=0.232$, $t=4.697$, $p<0.001$), social value ($\beta=0.281$, $t=5.648$, $p<0.001$) and information value ($\beta=0.229$, $t=4.763$, $p<0.001$) all have a significant positive impact on user stickiness. Therefore, the main effect hypothesis is supported by both H1–H3.

3.2 Results of the Mediation Effect Test

In order to examine the mediating role of flow experiences in the relationship between perceived value and user engagement, this paper first conducts a preliminary analysis using Baron and Kenny's three-step regression method. The results indicate that in the three pathways involving entertainment value, social value, and informational value as independent variables, each variable is able to significantly predict user engagement and also significantly contribute positively to the flow experience (all $p<0.001$). Even

after simultaneously including both independent variables and the flow experience in the model, the flow experience continues to have a significant positive impact on user engagement. However, the regression coefficients of the independent variables on user engagement decrease compared to their direct effects, suggesting that the flow experience may indeed play a mediating role in this relationship, thus meeting the basic criteria for testing mediating effects.

Based on these findings, this paper further uses the Bootstrap method to conduct a robustness test of the mediating effect. The relevant results are presented in Table 1.

Table 1. Bootstrap results of mediation effects.

Mediation Path	Total Effect (c)	Indirect Effect (a × b)	95% CI	Direct Effect (c')	Mediation Type	Proportion Mediated
Entertainment Value → Flow Experience → User Stickiness	0.450***	0.119***	[0.076, 0.169]	0.331***	Partial Mediation	26.4%
Social Value → Flow Experience → User Stickiness	0.493***	0.125***	[0.077, 0.174]	0.369***	Partial Mediation	25.3%
Information Value → Flow Experience → User Stickiness	0.424***	0.133***	[0.083, 0.182]	0.291***	Partial Mediation	31.3%

The results show that the indirect effects of entertainment, social and information values on user engagement through flow experience are significant, and their 95% confidence intervals do not include 0. Among them, the mediating effect value of the entertainment value path is 0.119, the social value path is 0.125, and the information value path is 0.133. The corresponding direct effect c' is still significant, indicating that the flow experience plays a partial mediating role in the above three pathways.

In summary, flow experience plays a significant partial mediating role between perceived value (entertainment value, social value, and information value) and user stickiness, and the mediating effect hypotheses H4a, H4b, and H4c are all supported.

3.3 Results of the Adjustment Effect Test

Table 2. Results of moderation effect analysis.

Model	Variables	B	t	p	Adjusted R ²
Model1	Flow Experience	0.450	8.962	0.000	0.181
Model2	Flow Experience	0.273	5.012	0.000	0.268
	Interactivity	0.342	6.620	0.000	0.268
Model3	Flow Experience	0.233	4.390	0.000	0.320
	Interactivity	0.320	6.400	0.000	0.320
	Interactivity × Flow Experience	0.244	5.355	0.000	0.320

As shown in Table2, a moderating effect model was constructed by step-by-step regression method to test the moderating effect of interaction on the relationship between flow experience and user stickiness. The results show that after the introduction of the interaction term (interactivity × flow experience), the explanatory power of the model is significantly improved, and the regression coefficient of the interaction item is significantly positive ($B = 0.244$, $p < 0.001$). This shows that interactivity can significantly enhance the positive impact of flow experience on user stickiness, that is, at high interaction level, flow experience has a more significant promotion effect on user stickiness. Therefore, the study hypothesizes that H5 is supported.

4 Discussion

4.1 The Mediating Role of Flow Experience and the Mechanism of User Engagement Generation

In the context of live streaming card-opening, a consumption experience characterized by randomness and immediate feedback, this study finds that the state of flow plays a crucial mediating role between perceived value and user engagement. This result not only confirms previous findings regarding the impact of the flow state on consumer behavior but also indicates that, in highly uncertain situations, the flow state can motivate users to shift from brief participation to sustained engagement and emotional attachment. Unlike previous studies that focused on impulsive buying, this research links the flow state with long-term user behavior, revealing the underlying mechanisms by which immersive experiences influence consumption in scenarios where process value is a key factor. At the same time, the significant role of information value in enhancing user engagement suggests that users' behavior during live streaming card-opening does not rely entirely on emotional stimulation. By continuously obtaining information about card rarity and market conditions, users reduce the cognitive risks associated with uncertainty, enabling live streaming to function both as an emotional experience and as a source of rational support. This finding indicates that in uncertain consumer contexts, rational judgment and immersive experiences are not contradictory but rather work together to shape user engagement.

4.2 The Moderating Effect of Interactivity and the Amplification Mechanism of Social Presence

The results further show that interactivity plays a significant positive moderating role in the transformation of flow experience into user stickiness. This finding explains why there are still significant differences in user retention between live broadcast rooms when the card opening results are similar. Zhang et al pointed out that real-time interaction and synchronous feedback can enhance user trust, and this study shows that this interaction effect has a stronger amplification effect in uncertain consumption scenarios [9].

When high-quality interaction is formed between the anchor and the audience, the emotional experience during the unpacking process is no longer limited to the individual level, but is transformed into an immersive event shared by the collective. As noted by Sudirman and Patwayati, there is a mutually beneficial relationship between customer fit and satisfaction [10]. Frequent and responsive interactions enhance users' sense of social presence, allowing them to stay because of their sense of belonging and emotional resonance, even if they don't achieve the desired results.

From a mechanism point of view, the value of interactivity does not lie in directly increasing the conversion rate, but in its amplifying effect on psychological experience. By strengthening the entertainment value and social value, the interaction mechanism can transform the short-term flow experience into emotional identification and behavioral attachment to the live broadcast room, thereby promoting the continuous accumulation of user stickiness.

Through empirical analysis, this study finds that the live broadcast of card splitting effectively induces users' flow experience by strengthening identity in the highly similar circle field, and forms a strong immersive atmosphere in group interaction. This "group immersion" not only enhances user stickiness, but also brings potential governance risks. The research shows that social value and interaction mechanism jointly construct a high-trust consumption field based on similarity. From the perspective of socio-technical systems, similarity attraction based on common interests can significantly reduce transaction costs, but it may also weaken users' risk perception and rational judgment ability. Although a strong sense of social presence helps to enhance user fit, it can easily amplify group emotions, thereby inducing irrational consumption tendencies. Therefore, it is necessary for platforms to strengthen rational consumption guidance in highly layered live broadcast situations, and alleviate the risks caused by emotional amplification through a flexible reminder mechanism that fits the context of the circle. On this basis, the positive effect of information value on user stickiness further shows that professional content is the core source of healthy stickiness. Relevant research points out that content output with both knowledge depth and emotional temperature can meet the needs of users for higher level of respect and recognition, which enlightens the industry to promote the "gambling" logic of card opening live broadcast from relying solely on probabilistic stimulation to gradually shifting to a "cultural" orientation with IP history, artistic value and two-dimensional consumer culture as the core. By encouraging bloggers to output systematic and understandable professional content, and cooperating with the standardized and transparent design of random mechanisms,

user stickiness can shift from reliance on "unknown results" to recognition of "known cultural values", thereby hedging the negative social impact of uncertain consumption. In addition, the moderating effect of interactivity also shows that anchors have significant behavior guidance ability in the similarity marketing field. Users generally have a natural sense of closeness and trust in anchors, and anchors are not only the promoters of transactions, but also the maintainers of the circle ecosystem. Based on the logic of reciprocity of customer fit, it is necessary to introduce the concept of "responsible" similarity marketing to guide anchors to persuade and adjust as "like-minded seniors" when there is irrational competition or excessive consumption tendencies. This endogenous guidance mechanism based on circle trust is often more effective than external coercive intervention, helping to shape two-dimensional "millet" consumption as a sustainable cultural exchange practice and promote a healthier and long-term social media experience.

5 Conclusion

Based on the theoretical framework of S-O-R, this study systematically discusses the formation mechanism of user stickiness from the perspective of perceived value and flow experience. Through empirical analysis, the study reveals that entertainment, social and information value, as external stimuli, have an important impact on users' continuous stay and participation behavior, and flow experience plays a key psychological mediating role in it, so that users gradually transform from short-term viewing participation to stable emotional attachment and behavioral stickiness. At the same time, interactivity, as an important situational factor, can significantly enhance the conversion effect of flow experience to user stickiness, highlighting the amplifying role of live streaming interaction in uncertain consumption.

Overall, the user stickiness in the card dismantling live broadcast is not simply derived from product results or immediate benefits, but is shaped by immersive experience, emotional arousal and social interaction in the consumption process. This discovery deepens the understanding of uncertain consumption behavior from the mechanism level, and expands the application boundaries of S-O-R theory and flow theory in experiential e-commerce and vertical live broadcast scenarios. The results show that in the new consumption model with random mechanism as the core, "process value" has more lasting behavioral explanatory power than result value.

At the practical level, this study provides enlightenment for the operation and regulation of card splitting live broadcast and similar formats. The results suggest that the key to improving user engagement is not simply to strengthen probabilistic stimuli, but to build a sustainable immersive environment through content value, interactive experience and information support. At the same time, in view of the risk that high-intensity flow experience may be accompanied by emotional over-investment, it is necessary for relevant platforms and practitioners to introduce a more rational and transparent guidance mechanism without significantly weakening the sense of experience, so as to promote the development of uncertain consumption formats in a healthier and more sustainable direction.

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