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Can They Keep You Hooked? Impact of Streamers' Social Capital on User Stickiness in E-Commerce Live Streaming

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Abstract

Amid the rapid growth of social media and live streaming platforms, streamers, who serve as a crucial link between products and users, have garnered significant attention from both academia and industry. This study explores the impact of the streamer's social capital (S) on user stickiness (R), as well as the mediating roles of perceived value and flow experience (O) in light of the Stimuli-Organism-Response (SOR) framework and social capital theory. A total of 322 valid samples were analyzed through Structural Equation Modeling (SEM) and Fuzzy-set Qualitative Comparative Analysis (fsQCA). The results from the SEM indicate that the structural capital, cognitive capital, and relational capital of streamers in e-commerce live streaming significantly influence users' perceived value, while structural capital and relational capital substantially impact users' flow experience. Furthermore, both perceived value and flow experience are found to have a significant effect on user stickiness, with chained mediating effects observed between perceived value and flow experience. The fsQCA results further identify three configurational paths influencing user stickiness: the perceived value-oriented path, the flow experience-oriented path, and a hybrid path. This study offers valuable insights and practical implications for e-commerce merchants and companies involved in live streaming activities.

Keywords: social capital; perceived value; flow experience; user stickiness



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1. Introduction

The advancements in AI-generated content (AIGC), real-time audio and video transmission technology, intelligent recommendation algorithms, and data analysis techniques have catalyzed the growth of the live streaming sector in the e-commerce sector. According to the 55th Statistical Report on China's Internet Development Status, by December 2024, China's live streaming user base had reached 833 million, accounting for 75.2% of the country's total internet users. The e-commerce livestreaming user base stood at 597 million, representing 54.7% of all internet users [1]. Short videos and livestreaming content have emerged as a prevalent daily occurrence among Chinese users [2]. E-commerce streamers are crucial for live streaming platforms. They are key to carrying content and connecting teams and fans, which makes them vital for keeping users engaged. Their strong social capital is essential for enhancing user stickiness [3].

However, since 2024, streamers have frequently encountered trust crises, and the traffic anxiety associated with e-commerce live streaming has intensified. The homogenization of content formats has led to user fatigue, thereby affecting viewing duration and

purchasing intent. The e-commerce live streaming industry has transitioned from a period of significant growth, often referred to as a “traffic boom period,” to a phase characterized by intense competition among existing users, often termed a “competition for existing users period [4]”. It is evident that enhancing the social capital of live-streaming streamers constitutes a pivotal strategic initiative for the e-commerce live streaming industry. This initiative is imperative to address the novel challenge of transitioning from a “traffic-driven” to a “value-driven” growth model. It is essential to ensure the sustainable strengthening of user stickiness. What is more, there are significant disparities in the social capital of different streamers, such as income levels [5,6], necessitating further research to comprehensively grasp the impact of streamers’ social capital on user stickiness.

Research has been conducted on factors influencing user stickiness [7]. The rapid growth of e-commerce live streaming has led to a surge in studies examining user stickiness, with a primary focus on factors such as streamers, products, and environmental suitability [8]. However, the existing literature has not adequately addressed how streamers’ characteristics and behaviors affect user stickiness. Most studies have focused on attractiveness, similarity, expertise, and credibility. This research investigates how three types of social capital influence user stickiness.

This study applies the Stimuli-Organism-Response (SOR) framework, which says that environmental stimuli evoke behavioral responses through individual reactions [9]. In e-commerce live streaming scenarios, users are part of an online shopping environment characterized by the virtual presence of others, where various environmental stimuli can provoke a series of responses. The social capital of streamers can be considered an environmental stimulus (S) that triggers users’ cognitive and emotional reactions [10]. Therefore, this study will explore the pathways and extent to which the streamer’s social capital influences users’ perceived value of products and services, as well as their sense of control, focus, and pleasure. While many studies have employed perceived value and flow experience to explain consumer reactions to external stimuli, they typically take them as separate mediating variables, investigating their effects on user behaviors in isolation. Few studies have simultaneously examined the mediating mechanisms and interaction between perceived value and flow experience. In fact, research on such interaction under different scenarios has yielded conflicting perspectives: some studies suggest that users’ flow experience influences perceived value, while others find that perceived value impacts flow experience [11]. This study captures users’ cognitive and emotional reactions (O) to the streamer, further investigates the chained mediating effect between the two, specifically how perceived value influences the process mechanism of flow experience. This study aims to uncover the process mechanisms underlying the behavioral responses (R) of user stickiness triggered by these factors.

This study addresses the following questions: (1) How does a streamer’s structural, cognitive, and relational capital impact perceived value and flow experience? (2) How do perceived value and flow experience impact user stickiness? (3) In what ways does a streamer’s social capital impact user stickiness through the intermediation of perceived value and flow experience? However, given that the influence of a streamer’s social capital on user stickiness may follow multiple equally effective pathways, traditional quantitative methods, though effective in identifying causal relationships between variables, often have difficulty accounting for alternative explanatory antecedents. This can lead to overly restrictive research logic. To address this issue, this study adopts a mixed-methods approach that combines SEM with fsQCA. First, SEM is used to test the hypotheses and answer RQ1–RQ3. Subsequently, fsQCA is applied to identify the configurational conditions that contribute to high user stickiness, thereby overcoming the limitations of SEM in excluding other potential explanatory antecedents. This approach provides clearer and more accurate

conclusions and offers valuable insights for e-commerce merchants and companies engaged in live streaming activities.

2. Literature Review

2.1. E-Commerce Live Streaming and Social Capital

E-commerce live streaming, a novel addition to the e-commerce landscape, establishes a direct line of communication between users and the sales of merchandise. In this context, streamers serve as the carriers of both content and format, and their social capital and influence are crucial to enhancing user stickiness [12]. Social capital encapsulates the total resources, encompassing both actual and potential, available within an individual's relational network [13]. Streamers attract users who share common interests and goals by showcasing specific characteristics, recommending products and services, and connecting with users; this is the primary source of the streamer's social capital [5,14]. Different types of streamers possess varying levels of social capital; for instance, celebrities, star entrepreneurs, and government officials can quickly attract a large user base due to their distinct charisma and social influence. The three-dimensional framework of social capital is used to investigate how the structural, cognitive, and relational aspects of capital influence user behaviors and intentions within live marketing [8]. Yet, few studies have comprehensively examined the process mechanisms through which the streamer's social capital influences user stickiness. Building on existing research, this study defines the streamer's social capital as the resources, such as information, power, and emotional support, obtained through interacting with users, showcasing professional skills, and establishing connections via the live streaming platform. The research further categorizes the social capital of streamers into its structural, cognitive, and relational components.

2.2. E-Commerce Live Streaming, Perceived Value, and Flow Experience

Individuals' perceived value emerges from their subjective experience, which is an objective consideration of the attributes and features of a given entity. Initially, perceived value was applied in the consumer domain, described as the total evaluation by consumers of the practicality of a product [15]. With the progress in information technology and the rise of various online services, like e-commerce, online communities, and instant messaging, academic attention shifted from offline consumer perceived value to online user perceived value, placing greater emphasis on user experience and continued usage intentions [16]. With the increasing prevalence of streaming, scholars have embarked on the exploration of how to enhance user-perceived value in this context. Research and practice indicate that elements such as scenes, anchors, and merchandise in live broadcasts can all influence user-perceived value, thereby affecting user intentions and behaviors. Perceived value has been confirmed to be associated with the purchase intentions and engagement of users. Moreover, a number of studies have explored the mediating role of perceived value. For instance, in branded live streaming sessions, perceived value acts as a mediator between streamer-brand fit and purchase intention, while the characteristics of the streamer's information sources influence purchase intentions through two types: utilitarian and hedonic [17]. Perceived value is selected to serve as the mediating variable, aiming to investigate the extent to which the streamer's social capital impacts user stickiness through the pathway of perceived value.

Perceived value was initially divided into utilitarian and hedonic dimensions [18] and has been categorized into different dimensions for various contexts. In the information service domain, it is divided into product, service, personnel, and situational values, contrasting with its categorization into product, service, and social aspects within the sphere of online shopping [19]. Meng classified it into content, contextual, and infrastructure value

based on the characteristics of live streaming platforms [20]. Building on previous research and current practices, this study categorizes it into two main dimensions: product and service. The perceived value of products derives from users' assessment of the cost-effectiveness of the products featured by the streamer, and perceived service value is derived from users' opinions on the streamer's service proficiency during live sessions.

The flow experience is influenced by social presence and interactivity [21], and it encompasses senses of control, focus, and enjoyment. As an unconscious experience, flow is characterized by a certain level of control and engrossment, which enables users to fully engage with and enjoy all internal states and experiences while browsing live streaming platforms and related content. Currently, flow theory is primarily applied in academic research related to situational marketing and streamers, highlighting that the experience users derive from live streaming environments can enhance user stickiness, improve overall experience, and boost purchase intentions [17]. It is also recognized that streamers have a significant impact on inducing flow experiences among users [22]. Regrettably, limited research has delved into the internal aspects of flow experiences within the live-streaming e-commerce sector. Hence, this research expands upon the classic dimensions of flow experience by distinguishing three unique categories of user flow experiences: sense of control, focus, and enjoyment.

2.3. E-Commerce Live Streaming and User Stickiness

This study delineates the concept of user stickiness in the context of e-commerce live streaming from a behavioral perspective. It does so by examining the perspective of the service provider and focusing on the repeated and sustained visiting behaviors exhibited by users. This study places particular emphasis on passive attraction as a significant factor in understanding user stickiness [23]. User stickiness in live streaming contexts refers to users' cognitive and emotional engagement that drives consistent participation in a specific streamer's broadcasts. Lin (2007) determined the level of user stickiness by examining how long customers spent on e-commerce websites within the e-commerce sector [24]. Furthermore, we collectively employ user behaviors driven by e-commerce streamers' influence to measure user stickiness, including revisiting live rooms, extending stay duration, and engaging in in-depth browsing.

Prior scholarly work has identified various elements that strongly impact user stickiness, such as the interactive dialogue between streamers and their audiences [25], patterns of sharing and sustained motivation [26], affective experiences [27], and levels of trust and satisfaction. Viewers are driven to tune into live streams for a spectrum of motivations, including information acquisition, social interaction, and entertainment needs [28]. Streamers who engage in emotional labor to satisfy users' hedonic value can significantly enhance users' loyalty to the live streaming service, thereby increasing user stickiness. While numerous studies have looked at how e-commerce live streaming broadly affects user stickiness, there has been little focus on the impact of streamer traits and actions on user stickiness. This research addresses the gap by exploring the process mechanisms through which the streamer's social capital, along with users' perceived value and flow experience, affects user stickiness.

3. Hypotheses and Research Model

3.1. Social Capital, Perceived Value, and Flow Experience

Streamers' social capital includes information, power, and emotional ties that they obtain via live streaming channels. This social capital can stimulate users' perceived value from three aspects: structural capital, cognitive capital, and relational capital. To begin with, a streamer's structural capital is the framework of links that result from social interactions

on the live streaming platform. These links, whether between the streamer and users or among users themselves, facilitate the sharing of information and resources. This can provide users with richer product information and reduce the time cost associated with searching for and verifying information, thereby positively influencing their perceived value [29]. Second, cognitive capital is the shared interpretive resource within the live stream [5], which primarily includes the streamer's expertise and ability to create a shared vision with users. The streamer's professional explanation of products helps to enhance users' understanding of product functions, features, and usage methods. Furthermore, interactive communication between the streamer and users, through immediate feedback, personalized responses, and engaging users, fosters a shared vision and enhances users' product knowledge, thus collectively increasing their perceived value. Third, relational capital in the live stream is based on the collective emotional connections centered around the streamer [30]. Two dimensions are considered: trust and reciprocity. Trust is built as the streamer demonstrates qualities such as professionalism, authenticity, approachability, reliability, and responsibility. For example, when streamers show profound knowledge and unique insights in their field, or when they test and describe the efficacy and quality of products [31], they earn users' trust, which in turn enhances users' perceived value. Reciprocity between the streamer and users is primarily reflected in information sharing, co-creating experiences, emotional bonds, social interactions, and mutual benefits. For instance, by sharing information, feedback, and experiences during the live stream, streamers help users gain a deeper understanding of products, which also assists the streamer in improving their content. By demonstrating genuine concern for the requirements of users, a streamer can nurture a community spirit and foster user loyalty, thereby increasing their own fame. This reciprocal relationship motivates the streamer to better meet user needs, which can ignite users' enthusiasm for participating in the live stream, increase satisfaction and loyalty, and ultimately boost perceived value. From this, the following hypotheses are formulated:

H1. *The streamer's structural capital (H1a), cognitive capital (H1b), and relational capital (H1c) positively influence perceived value.*

Flow experience is the term for a mental condition where individuals are so deeply involved in an activity that time seems to vanish, they pay no heed to their surroundings, and they are utterly engrossed and delighted by the experience. This study defines flow experience as the positive engagement of users in a live streaming setting, distinguished by increased control, focus, and enjoyment influenced by the streamers [32]. The experience is enhanced by the streamer's structural, cognitive, and relational capitals. Firstly, the structural links created through social interaction by the streamer enable users to independently engage in activities like liking and commenting during live streaming, surpassing the social dynamics of traditional web shopping. This not only heightens the enjoyment of live shopping but also conveys a more significant sense of social freedom and control [33], thereby increasing the sense of control, focus, and enjoyment. Second, the streamer's shared vision and expertise can be conveyed through narration, thereby facilitating a sense of control, focus, and enjoyment. The professional recommendations and experience sharing by the streamer help to build a common understanding and spread a shared vision, making it easier for users to emotionally resonate [34], perceive the quality of the product or service as controllable, stay focused on the live streaming activity, and enjoy a pleasant shopping experience. Finally, through interaction, streamers build relational capital with users and use emotional engagement to stimulate users' enthusiasm and positivity [31]. By creating a pleasant atmosphere in various ways, streamers encourage users to focus on the live streams, which in turn nurtures a feeling of social autonomy and mastery within the interactive space of live streaming. Hence, the forthcoming hypotheses are presented:

H2. *The streamer's structural capital (H2a), cognitive capital (H2b), and relational capital (H2c) positively influence flow experience.*

3.2. Perceived Value, Flow Experience, and User Stickiness

Within the realm of live-streaming e-commerce, users' perceived value incorporates aspects of both products and services, which form the cognitive basis for evaluating product cost-effectiveness and the streamer's service level and capabilities. Users' perceived value significantly impacts their flow experience. When users perceive the streamer's personality, professionalism, friendliness, and efficiency as valuable, it can lead to positive emotional experiences such as focus and enjoyment. Similarly, the perception of a product being of excellent quality at a low price can stir up positive emotions such as happiness, a feeling of achievement, and a sense of autonomy. Further, users who perceive the emotional value provided by the streamer are more likely to experience flow [35]. Perceived value is closely linked to user stickiness [36], as it influences users' continued viewing behaviors, which is manifested in prolonged stays and revisits to the live stream [37]. Regarding the perceived value of products, streamers enhance this perception by thoroughly presenting product information such as quality and price through narrative and physical demonstrations. This multi-sensory presentation encourages users to stay longer or revisit the live stream, driven by a desire to gain more product information. With respect to service perceived value, when users perceive the streamer's recommendations as reliable and sincere, the likelihood of revisiting the live stream increases. Moreover, the streamer's precise and efficient positive feedback can enhance users' perception of service value, thereby strengthening user stickiness. Hence, the forthcoming hypotheses are presented:

H3. *Perceived value positively influences flow experience (H3a) and user stickiness (H3b).*

The flow experience denotes the sense of fulfillment and pleasure users experience when they become fully engrossed in a particular product or service during a live streaming session. This experience can substantially influence user behaviors [7], including the persistence and frequency of such behaviors. Specifically, when users experience flow, they may develop emotional resonance and a distorted sense of time, leading to an unconscious extension of their viewing time. This immersion often results in revisits and sustained attention to the streamer [38], thereby enhancing user stickiness. Thus, the subsequent hypotheses are put forward:

H4. *Flow experience positively influences user stickiness.*

3.3. Perceived Value and Flow Experience as Chained Mediators

The hypotheses indicate that perceived value and flow experience are positioned to mediate the effects of a streamer's social capital on user stickiness. First, the links established by the streamer enrich users' shopping information and expand their social circles. The streamer serves as a direct bridge between the product and the user, leading users to perceive the utility of the product more strongly than they would through simply browsing shopping websites. Therefore, a streamer's structural capital influences user stickiness through perceived value. Second, the streamer's interaction and professional skills are essential in determining user stickiness. Streamers with expert product knowledge and sales techniques can accurately provide information and recommendations on product usage, performance parameters, and pricing advantages during the live stream. This enhances the probability that users will return to view the live stream, illustrating the manner in which a streamer's cognitive capital affects user stickiness via perceived value.

Finally, the efficacy of a streamer in drawing and immersing users through expressive language and emotional resonance is instrumental in forging a more intense trust bond with the audience. Based on this trust, users are more likely to believe that the streamer can consistently provide products that meet their needs, leading to a “trust transfer effect,” which further enhances user stickiness.

Streamers with rich social capital are more capable of inducing flow experiences in users, which can enhance user engagement [31]. First, a streamer’s structural capital influences flow experience and increases user stickiness. The personal image and style that a streamer develops through live streaming can attract specific types of users, and the fan base accumulated in this way is more likely to experience flow, resulting in greater stickiness. The traffic, attention, and interaction data that streamers accumulate on live streaming platforms are part of their structural capital. The use of this data can enhance users’ sense of control [33], thereby increasing user stickiness. Second, a streamer’s cognitive capital influences user stickiness through flow experience. For example, the streamer’s expertise can enhance users’ sense of gain and focus while watching the stream, which in turn increases the time they spend in the live stream. Finally, the streamer’s relational capital can induce flow experience through user interaction, which attracts users to stay longer in the live stream, actively respond to the streamer, and engage in behaviors such as liking, commenting, and purchasing products, all of which increase user stickiness. These insights lead to the formulation of the following hypotheses:

H5. *Perceived value mediates the relationship between the streamer’s structural capital(H5a), cognitive capital (H5b), relational capital (H5c), and user stickiness.*

H6. *Flow experience mediates the relationship between the streamer’s structural capital(H6a), cognitive capital (H6b), relational capital (H6c), and user stickiness.*

Based on the discussion concerning H1-H6, a chained mediation model can be proposed to illustrate how the streamer’s social capital influences user stickiness. To be specific, the streamer’s social capital can impact user stickiness both through perceived value and flow experience or by influencing flow experience via perceived value, which then affects user stickiness. Previous research rooted in emotional theory has found that perceived value can enhance the flow experience [39]. Building on this, empirical evidence has confirmed the sequential connection between perceived value and flow experience. A relevant example is the tourism consumption sector, where flow experience has been shown to mediate the link between perceived value and consumer conduct [11]. As a result, we hypothesize that perceived value may amplify users’ flow experience, leading to an effect on user stickiness. Accordingly, the following hypotheses are formulated:

H7. *Perceived value and flow experience sequentially mediate the relationships between the streamer’s structural capital (H7a), cognitive capital (H7b), relational capital (H7c), and user stickiness.*

Based on the above assumptions, the theoretical framework of the driving factors of user stickiness proposed in this paper is shown in Figure 1.

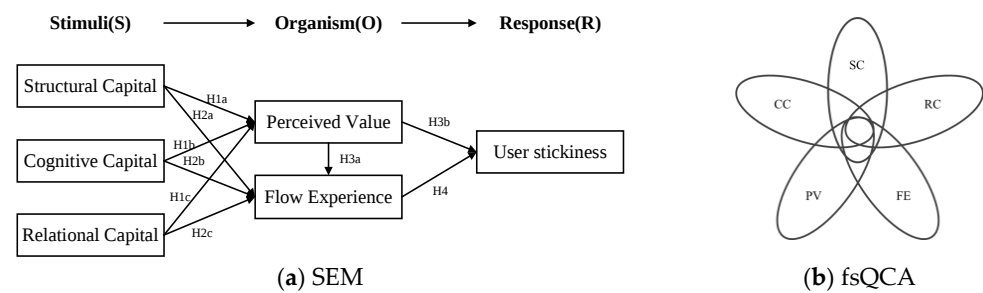


Figure 1. Theoretical framework of factors influencing user stickiness.

4. Methods

4.1. Measures

The research model includes social capital, perceived value, flow experience, and user stickiness, with all variables assessed on a five-point Likert scale. Participants rated each variable, ranging from 1 for “strongly disagree” to 5 for “strongly agree”. This measurement scale ensured that each construct was consistently evaluated across respondents. The social capital measures are based on the studies by [30,40,41]. They encompass the following aspects: structural capital, measured by social interaction (SI), cognitive capital, measured by shared vision (SV) and expertise (EX), and relational capital, measured by trust (TR) and reciprocity (RE). Perceived value (PV) is measured regarding the work of [42,43]. Flow experience (FE) is measured using the scale developed by [44]. User stickiness (US) is measured according to [24]. Control variables for this study include demographic factors such as gender, age, and educational background.

4.2. Sampling and Data Collection

In the preliminary phase, the research team collected data through semi-structured interviews and unstructured observations. The semi-structured interviews were conducted in a one-on-one format, combining online and offline approaches, targeting live streaming users (including four e-commerce streamers, four users who followed specific streamers’ updates, four users who frequently watched specific streamers’ live streams, and three users who had spent over one hour daily on average watching specific streamers’ live streams in the past month). Unstructured observations primarily involved collecting users’ behavioral trace data on live streaming platforms (e.g., login frequency, viewing duration, and tipping frequency) with their consent. After data collection, independent coding and group discussions were conducted for material coding. Building on existing studies, the research scope was narrowed to users who had watched e-commerce live streamers and followed specific streamers. Considering the spatially dispersed yet digitally clustered nature of live streaming users and the unique appeal of online survey platforms to this population, this study utilized Credamo, a professional questionnaire platform, to design and distribute the survey. Questionnaires were disseminated through private messages in e-commerce streamer-user communication communities (e.g., WeChat groups). To broaden participation and ensure alignment with research requirements, the formal questionnaire was precisely distributed nationwide via Credamo to users who had watched e-commerce live streams and followed streamers. To ensure validity, a pilot survey focusing on “the impact of the streamer’s social capital (structural capital, cognitive capital, relational capital) on user stickiness” was conducted prior to the formal survey. Respondents were required to meet two criteria: having watched live streams and followed streamers. Screening questions (“Have you watched live streams on e-commerce platforms?” and “Do you follow any streamers on e-commerce platforms?”) were included to filter participants. Trap questions (e.g., “I do not follow any streamers; please select ‘strongly disagree’” and “I

will no longer use Douyin; please select ‘strongly disagree’”) were embedded to identify invalid responses. Incomplete questionnaires and those completed in under two minutes were excluded. The pilot survey collected 120 responses via WeChat groups and social networks, yielding 116 valid responses. The overall Cronbach’s alpha coefficient was 0.921, with all variables exceeding 0.7. Item wording was refined based on pilot feedback.

The formal survey was conducted from 1 November to 1 December 2023, using Credamo. To mitigate common method bias, a three-stage sampling strategy with 10-day intervals was adopted: Stage 1: Measured perceptions of the streamer’s social capital (structural capital, cognitive capital, relational capital) and demographic information (633 responses collected). Stage 2: Collected perceived value and flow experience data from Stage 1 participants (524 responses collected). Stage 3: Assessed user stickiness from Stage 2 participants (415 responses collected). During data screening, problematic responses (e.g., mismatched stages, uniform answers, extreme reverse-item deviations, or patterned selections) were rigorously excluded, resulting in 322 valid samples (77.6% validity rate). Sample characteristics (Table 1) showed that over 60% of participants were aged 21–30, held bachelor’s degrees or higher, and were predominantly employees or students with limited work experience. Over 80% watched live streams at least twice weekly, indicating a representative and balanced sample.

Table 1. Sample characteristics.

Dimension	Category	Frequency	Percentage
Gender	Male	125	38.8%
	Female	197	61.2%
Age	20 years and below	20	6.2%
	21–30 years	183	56.8%
	31–40 years	82	25.5%
	41–50 years	25	7.8%
	51 years and above	12	3.7%
Education	High school	34	10.6%
	Diploma	57	17.7%
	Bachelor’s degree	140	43.5%
	Master’s degree and above	91	28.3%
Occupation	Corporate employee	136	42.2%
	Public sector/Government employee	39	12.1%
	Freelancer	25	7.8%
	Student	97	30.1%
	Other	25	7.8%
Work Experience	Less than 1 year	101	31.4%
	1–3 years (excluding 3 years)	57	17.7%
	3–5 years (excluding 5 years)	60	18.6%
	5–10 years (excluding 10 years)	55	17.1%
	10 years and above	49	15.2%

Table 1. *Cont.*

Dimension	Category	Frequency	Percentage
Monthly Income	1000 RMB and below	61	18.9%
	1001–3000 RMB	61	18.9%
	3001–5000 RMB	62	19.2%
	5001–10,000 RMB	71	22.0%
	Above 10,000 RMB	67	20.8%
Weekly Live Stream Viewing Frequency	0–1 times per week	60	18.6%
	2–3 times per week	122	37.9%
	4–5 times per week	58	18.0%
	6–7 times per week	31	9.6%
	More than 7 times per week	51	15.8%

4.3. Analysis Methods

This study applied Structural Equation Modeling (SEM) to evaluate the proposed hypotheses, a method well-suited for forecasting linear associations and dissecting intricate structures. First, Mplus8.1 was used to conduct SEM and mediation tests to reveal the mechanisms through which a streamer’s structural capital, cognitive capital, and relational capital influence user stickiness, as well as the chained mediating effects of perceived value and flow experience. Subsequently, Qualitative Comparative Analysis (QCA) was utilized to investigate how the interaction among streamers’ social capital, perceived value, and flow experience impacts user stickiness. QCA is a method that draws causal inferences based on the set relationships between condition sets and outcome sets. It can analyze the asymmetry in the relationships among a limited number of cases and focuses on combination effects, allowing for the exploration of how combinations of explanatory variables, rather than their net effects, influence the dependent variable. Using the fsQCA3.0 software, the present study explored all logical combinations that lead to the expected outcomes in order to identify the combinatorial paths through which the streamer’s social capital influences user stickiness.

5. Results

5.1. Measurement Model

The outcomes of the confirmatory factor analysis are presented in Tables 2 and 3. Cronbach’s alpha and Composite Reliability (CR) metrics were utilized to evaluate the reliability of the scales [45]. Table 2 indicates that all variables have Cronbach’s alpha values above 0.8, with CR values also above 0.8, signifying robust reliability. Convergent validity was confirmed by analyzing factor loadings and Average Variance Extracted (AVE) scores; variables show factor loadings above 0.7 and AVE values above 0.5, denoting good convergent validity. To evaluate the discriminant validity of the constructs, this study utilized the Fornell–Larcker criterion. Table 3 shows that the square roots of the AVE for each variable are higher than the correlation coefficients between variables, indicating that the constructs are distinct and exhibit good discriminant validity.

The Harman single-factor test was employed to detect common method bias, with principal component analysis used for all items to reduce dimensions. After applying the varimax rotation method, six factors were extracted, with the first explaining 33.04% of the variance, under the 40% threshold. The results imply no substantial common method bias in this research.

Table 2. Reliability and convergent validity testing.

Variable	Item	Statement	Factor Loading	Cronbach's Alpha	CR	AVE
SI	SI1	Your followed streamer interacts well with everyone during the live stream.	0.725	0.849	0.853	0.593
	SI2	Your followed streamer ensures that everyone can effectively participate during the live stream.	0.835			
	SI3	Your followed streamer actively responds to everyone's questions.	0.767			
	SI4	Your followed streamer frequently exchanges product information with everyone during the live stream.	0.749			
SV	SV1	You and your followed streamer have a common language and can communicate effectively.	0.794	0.843	0.843	0.642
	SV2	You and your followed streamer share similar life goals.	0.813			
	SV3	You understand and agree with the views of your followed streamer.	0.797			
EX	EX1	Your followed streamer has professional knowledge in the field of the products they recommend.	0.797	0.886	0.886	0.66
	EX2	Your followed streamer possesses special skills and expertise.	0.845			
	EX3	Your followed streamer can effectively evaluate the products they recommend.	0.789			
	EX4	Your followed streamer has extensive experience using the products they recommend.	0.818			
TR	TR1	You trust your followed streamer.	0.766	0.827	0.828	0.616
	TR2	The content of your followed streamer's live broadcasts is trustworthy.	0.82			
	TR3	You believe in your followed streamer's product recommendations.	0.768			
RE	RE1	You get better deals by purchasing the products recommended by your followed streamer.	0.781	0.813	0.816	0.69
	RE2	When your followed streamer asks you to like or comment, you are willing to help.	0.878			
PV	PV1	The products in your followed streamer's live streams are economically valuable.	0.757	0.859	0.859	0.603
	PV2	The products in your followed streamer's live streams are of good quality.	0.786			
	PV3	Watching your followed streamer's live streams helps you make better shopping decisions.	0.799			
	PV4	Watching your followed streamer's live streams saves you time in selecting products.	0.764			
FE	FE1	When watching your followed streamer's live streams, you focus and temporarily forget other things.	0.771	0.818	0.82	0.602
	FE2	When watching your followed streamer's live streams, time seems to pass quickly.	0.782			
	FE3	When watching your followed streamer's live streams, you feel very happy.	0.775			

Table 2. *Cont.*

Variable	Item	Statement	Factor Loading	Cronbach's Alpha	CR	AVE
US	US1	You frequently log in to the streaming platform to watch your followed streamer's live broadcasts.	0.79	0.868	0.869	0.624
	US2	You stay in your followed streamer's live room for a long time.	0.824			
	US3	You plan to extend the time you watch your followed streamer's live streams.	0.778			
	US4	You will continue to follow the updates of your followed streamer.	0.767			

Table 3. Discriminant validity testing.

	SI	SV	EX	TR	RE	PV	FE	US
SI	0.770							
SV	0.269	0.801						
EX	0.273	0.580	0.813					
TR	0.200	0.201	0.231	0.785				
RE	0.108	0.083	0.146	0.515	0.831			
PV	0.400	0.382	0.392	0.367	0.454	0.777		
FE	0.347	0.285	0.228	0.424	0.382	0.560	0.776	
US	0.305	0.300	0.289	0.460	0.412	0.596	0.618	0.790

Note: The diagonal values represent the AVE square roots of each construct, and the non-diagonal values represent the correlation coefficients between the constructs.

In this study, SEM was used to construct and compare three models. M1 (Theoretical Model) assumes no direct effect of social capital on user stickiness; M2 (Nested Model) builds upon the theoretical model by adding a direct effect; and M3 (Alternative Model) assumes no mediating effects, with social capital, perceived value, and flow experience all directly affecting user stickiness.

The data in Table 4 show that all models are fitting effectively. First, M2 was compared with M1 using the chi-square difference test [46]. The findings show that the chi-square difference between M1 and M2 was not statistically significant ($\Delta\chi^2(1) = 7.132$; $p > 0.05$), indicating that the addition of a direct path did not markedly enhance model fit. Next, the models were compared using BIC [47]. The BIC for M3 was 20267.980, while the BIC for M1 was 20,257.790. With a ΔBIC of 10.19 ($\Delta\text{BIC} > 10$), the model with the lower BIC, which in this case is M1, is better supported. In summary, M1 is superior to both M2 and M3. Therefore, this study selected M1 for further analysis.

Table 4. Comparison of fit indices for the three models.

Model	χ^2/df	CFI	TLI	RMSEA	SRMR	Remarks
M1 (Theoretical Model)	1.405	0.973	0.969	0.035	0.042	$\Delta\chi^2(1) = 7.132$; $p > 0.05$ compared to M1
M2 (Nested Model)	1.405	0.974	0.970	0.035	0.039	
M3 (Alternative Model)	1.396	0.974	0.97	0.035	0.039	

5.2. Calculation of the Inner Model

This study conducted tests using M1 (theoretical model), controlling for age, gender, and education level. The results in Table 5 reveal that the three forms of capital exert

a significantly positive influence on perceived value, supporting H1a, H1b, and H1c. Structural and relational capital significantly positively affect flow experience, supporting H2a and H2c. However, cognitive capital does not substantially impact flow experience ($\beta = 0.005$; $p > 0.05$), which means H2b is not upheld. Perceived value significantly influences both flow experience and user stickiness, confirming H3a and H3b. In addition, flow experience positively affects user stickiness, thus validating H4.

Table 5. Direct effect testing.

Hypothesis	Path Model	Estimate	S.E.	Est./S.E.	p-Value	Test Result
H1a	SC → PV	0.218	0.059	3.727	***	Supported
H1b	CC → PV	0.327	0.063	5.163	***	Supported
H1c	RC → PV	0.492	0.059	8.344	***	Supported
H2a	SC → FE	0.15	0.064	2.357	*	Supported
H2b	CC → FE	0.005	0.08	0.066	0.947	Not Supported
H2c	RC → FE	0.367	0.094	3.91	***	Supported
H3a	PV → FE	0.353	0.106	3.33	**	Supported
H3b	PV → US	0.39	0.071	5.499	***	Supported
H4	FE → US	0.476	0.071	6.72	***	Supported

Note: ***, **, and * indicate $p < 0.001$, $p < 0.01$, and $p < 0.05$, respectively. Structural Capital (SC); Cognitive Capital (CC); Relational Capital (RC); Perceived Value (PV); Flow Experience (FE); User Stickiness (US).

The multiple mediating effects between variables were tested using Bootstrap with 5000 samples. Table 6 details the outcomes. The mediation analysis revealed that perceived value significantly influences the link between structural capital (CI [0.034, 0.155]), cognitive capital (CI [0.064, 0.211]), and relational capital (CI [0.09, 0.316]), and user stickiness is significant, supporting H5a, H5b, and H5c. Flow experience significantly mediates the relationship between structural capital (CI [0.004, 0.156]) and relational capital (CI [0.044, 0.342]) and user stickiness, supporting H6a and H6c. However, the mediation of flow experience between cognitive capital (CI [−0.081, 0.094]) and user stickiness is not significant; thus, H6b is unsupported. The combined mediating effects of perceived value and flow experience between structural capital (CI [0.008, 0.085]), cognitive capital (CI [0.012, 0.123]), relational capital (CI [0.027, 0.159]), and user stickiness are significant, confirming H7a, H7b, and H7c.

Table 6. Mediating effect testing.

Path	Estimate	p-Value	95% Confidence Interval			
			Uncorrected		Bias-Corrected	
			Lower Limit	Upper Limit	Lower Limit	Upper Limit
SC → PV → US	0.085	**	0.04	0.182	0.034	0.155
SC → FE → US	0.058	0.084	0.007	0.178	0.004	0.156
SC → PV → FE → US	0.032	0.068	0.009	0.101	0.008	0.085
CC → PV → US	0.082	*	0.068	0.243	0.064	0.211
CC → FE → US	0.003	0.081	−0.091	0.099	−0.081	0.094
CC → PV → FE → US	0.045	0.399	0.013	0.141	0.012	0.123
RC → PV → US	0.124	*	0.12	0.555	0.09	0.316
RC → FE → US	0.137	**	0.076	0.546	0.044	0.342
RC → PV → FE → US	0.068	*	0.041	0.278	0.027	0.159

Note: ** and * indicate $p < 0.01$, and $p < 0.05$, respectively. Structural Capital (SC); Cognitive Capital (CC); Relational Capital (RC); Perceived Value (PV); Flow Experience (FE); User Stickiness (US).

5.3. Fuzzy Set Qualitative Comparative Analysis

This study opted for a set of five key variables, structural, cognitive, and relational capitals, along with perceived value and flow experience as antecedent conditions. The antecedent variables' mean values were determined, and the data calibration was performed using the Calibrate function within the fsQCA3.0 software. Specifically, the calibration anchors were determined based on the following theoretical and methodological considerations:

First, the calibration anchor setting follows the theory-driven principles proposed by Ragin [48] and Schneider and Wagemann [49], whereby the calibration process should reflect researchers' deep understanding of the substantive meaning of variables rather than purely statistical distribution characteristics. Given that this study employs a five-point Likert scale (1 = "strongly disagree", 5 = "strongly agree"), the calibration anchors must reflect qualitative differences in respondent attitude intensity.

Second, full membership (1.0) was set at 5 points, reflecting respondents' strong agreement with relevant constructs, indicating that the case fully meets the set requirements for specific conditions. The full non-membership (0.0) was set at 1 point, representing respondents' strong disagreement, indicating that the case completely fails to meet the set conditions. The crossover point (0.5) was set at 3 points, corresponding to the neutral attitude of "neither agree nor disagree." This setting aligns with the core concept of "maximum ambiguity" in fuzzy-set theory, where cases at this point are neither more inclined toward membership nor non-membership in the set.

Third, to avoid technical problems arising from cases falling exactly at the 0.5 crossover point, this study follows established research conventions [50] by applying a minor adjustment (+0.001) to the crossover point, ensuring that the fsQCA software can correctly handle boundary cases. This micro-adjustment does not alter substantive membership judgments but enhances the technical robustness of the analysis. Data calibration was performed using the Calibrate function in fsQCA3.0 software, with all antecedent variables' fuzzy membership values continuously distributed between 0 and 1.

5.3.1. Necessity Analysis

As a precursor to configuration analysis, it is imperative to verify if any singular antecedent variable is a necessary condition for the outcome. The necessity analysis for individual antecedent variables, as presented in Table 7, shows that the highest consistency level among them is 0.898, which falls short of the 0.9 threshold. This indicates that no single antecedent variable is essential for affecting user stickiness, which supports the rationale for advancing to configuration analysis.

Table 7. Sufficiency and necessity analysis of antecedent conditions for user stickiness.

Causal Conditions	Consistency	Coverage
SC	0.814	0.887
~SC	0.409	0.881
CC	0.838	0.882
~CC	0.385	0.889
RC	0.888	0.896
~RC	0.348	0.891
PV	0.898	0.909
~PV	0.344	0.871
FE	0.898	0.909
~FE	0.339	0.86

Note: Structural Capital (SC); Cognitive Capital (CC); Relational Capital (RC); Perceived Value (PV); Flow Experience (FE).

5.3.2. Sufficiency Analysis

A truth table was constructed by analyzing the calibrated values, employing a consistency threshold of 0.85, a case frequency threshold of 4, and a PRI threshold of 0.7 [50]. Subsequent to this analysis, the results of the fsQCA are detailed in Table 8, where ● denotes a core condition, • represents a peripheral condition. The blank space points to the fact that the condition's presence or absence in the configuration is indeterminate. Table 8 shows an overall consistency of 0.928, surpassing the threshold of 0.75, which indicates that the overall solution exhibits strong consistency. The solution coverage is 0.8804. After categorization, the antecedent condition configurations for user stickiness in this study can be divided into three patterns: Perceived Value Model (S1), Flow Experience Model (S2), and Hybrid Model (S3).

Table 8. Configuration of antecedents of user stickiness.

Configuration	User Stickiness				
	S1	S2a	S2b	S3a	S3b
SC		•			•
CC	●		●		●
RC	•	•	•	•	
PV	●			●	●
FE		●	●	●	●
Consistency	0.954	0.957	0.960	0.956	0.970
Raw Coverage	0.742	0.723	0.732	0.788	0.676
Unique Coverage	0.033	0.007	0.014	0.022	0.028
Overall Consistency			0.928		
Overall Coverage			0.880		

Note: Structural Capital (SC); Cognitive Capital (CC); Relational Capital (RC); Perceived Value (PV); Flow Experience (FE). “●” denotes a core condition, “•” represents a peripheral condition.

Perceived Value Model (S1): S1 demonstrates that high cognitive capital and high perceived value, as central conditions, along with high relational capital as a secondary condition, can result in increased user stickiness. This suggests that in the perceived value model, cognitive capital and perceived value play crucial roles. Specifically, when users watch e-commerce live streams, their stickiness is primarily enhanced through the perceived value pathway, driven by the streamer's product presentations and display of professional expertise, which in turn boosts the users' perceived value of the products and services.

Flow Experience Model (S2a, S2b): S2a identifies high flow experience as a core condition, with high structural capital and high relational capital as peripheral conditions, as a combination that can result in high user stickiness. S2b shows that when high cognitive capital and high flow experience are the primary conditions and high relational capital is a supporting condition, this mix can also yield high user stickiness. Both configurations in the flow experience model confirm that social capital and flow experience significantly contribute to increased user stickiness. Moreover, both combinations emphasize the synergistic effect of relational capital and flow experience on user stickiness. However, S2b outperforms S2a in terms of consistency and coverage, highlighting the critical role of cognitive capital within the flow experience pathway.

Hybrid Model (S3a, S3b): S3a points out that a combination of high perceived value and high flow experience as central factors, along with high relational capital as a secondary factor, can lead to high user stickiness. S3b reveals that high cognitive capital, high perceived value, and high flow experience as core conditions, accompanied by high structural capital as a peripheral factor, can also lead to high user stickiness. This finding

partially confirms the sequential mediating roles of perceived value and flow experience between a streamer's social capital and user stickiness and underscores the complex mechanisms by which different dimensions of social capital and intermediary variables influence user stickiness.

5.3.3. Testing for Predictive Validity

To verify the robustness of research results, this study conducted systematic robustness tests on key parameters of fsQCA analysis. Firstly, the PRI consistency threshold was adjusted from 0.70 to 0.75. Results showed that for configurations generating high user stickiness, when the PRI consistency threshold was increased, the configurational paths remained unchanged, still presenting five types of configurational paths: "cognitive capital * relational capital * perceived value," "structural capital * relational capital * flow experience," "cognitive capital * relational capital * flow experience," "relational capital * perceived value * flow experience," and "structural capital * cognitive capital * perceived value * flow experience." The solution coverage (0.880356) and solution consistency (0.928237) remained completely identical.

Secondly, when the PRI consistency threshold was further adjusted from 0.75 to 0.80, the empirical results remained unchanged, with coverage and consistency indicators for all configurations maintaining complete stability. Simultaneously, when the raw consistency threshold was adjusted from 0.85 to 0.90, the results similarly showed that solution coverage and solution consistency remained completely unchanged, with configurational paths maintaining complete consistency.

Finally, when the case frequency threshold was adjusted from 4 to 5, the coverage and consistency of the intermediate solution remained stable. Although the parsimonious solution could not be generated, the core intermediate solution results remained unchanged. Through systematic adjustments of PRI thresholds, raw consistency thresholds, and case frequency thresholds, the core analytical results demonstrated extremely high robustness under all parameter variations, fully confirming the high reliability of research results obtained through fsQCA analysis.

6. Conclusions

This paper, grounded in the SOR framework and social capital theory, utilizes SEM to explore how the streamer's social capital influences user stickiness, along with the chained mediating effects of perceived value and flow experience. Additionally, QCA is utilized to explore the antecedent configurations leading to user stickiness. The following conclusions are reached:

6.1. The Influence Mechanism of the Social Capital of Streamers

User stickiness is shaped by three sequential mechanisms: "Social Capital, Perceived Value, Flow Experience, User Stickiness". A user's perceived value and flow experience are shaped by the social capital of a streamer. Empirical evidence shows that streamers' social capital positively impacts users' perceived value, both perceived value and flow experience significantly positively affect user stickiness, with the chain mediation effect of perceived value and flow experience being identified. Additionally, streamers' structural capital, relational capital, and perceived value have positive impacts on users' flow experience. However, cognitive capital shows no significant effect on users' flow experience; thus, hypothesis H2b is not verified. In the context of live streaming, the unique role of streamers' cognitive capital is found to be constrained, necessitating its integration with relational capital to exert a notable influence on users. This finding also echoes Robert's research emphasizing the critical importance of streamers' relational capital in transient digital

interactions [51]. Specifically, the real-time interactivity and entertainment orientation of e-commerce live streaming indicate that the streamers' cognitive capital cannot always fully dictate users' flow experience.

On the one hand, the real-time interactivity of e-commerce live streaming hinders the establishment of the deep immersion and continuous experience necessary for achieving flow. First, continuous external stimulus sources, such as bullet comments, instant Q&A, likes, and rewards generated by real-time interaction, constitute interference sources of users' attention. This makes it difficult for users to maintain the "highly focused" state required for deep immersion. Secondly, the occurrence of real-time interaction may result in a dynamic imbalance between the challenges faced by users and the competencies exhibited by streamers. The streamers are obligated to respond to unexpected questions posed by users at any time, as well as to deviations in the direction of comments. A reliance on cognitive capital alone can impede the efficient and suitable processing of interactions, thereby hindering the realization of a balanced state necessary for achieving a state of flow [52]. Thirdly, the potential for real-time interactivity to induce a conflict between target clarity and immediate feedback is a salient concern. The objectives of knowledge transmission in professional settings, as delineated by the streamer, become obscured or hindered by real-time interaction. This necessitates a response from the streamer, thereby diminishing the efficacy of cognitive capital in fostering flow [53].

On the other hand, the entertainment orientation of e-commerce live streaming imposes limitations on the potential of cognitive capital to induce flow. Firstly, the cognitive depth of users is supplanted by superficial stimuli. Entertainment orientation is characterized by the pursuit of immediate sensory stimulation and relaxation. The allure of superficial entertainment elements proves to be a significant draw for users, effectively overshadowing the intrinsic value of deep cognitive engagement. This phenomenon impedes the fundamental drivers of flow, hindering the process of achieving optimal mental performance [54]. Secondly, the phenomenon of information fragmentation and structural disintegration must be addressed. In order to maintain engagement, live-streaming content frequently exhibits a rapid pace and a tendency to jump between topics, leading to content that is fragmented and lacks structure, even when professional knowledge is provided. It is challenging for users to construct a coherent cognitive framework and to make continuous and in-depth investments, thereby undermining the foundation of the "structured activities" required for flow.

Further fsQCA analysis in this study reveals that streamers' cognitive capital serves as a core element influencing user stickiness in the flow experience-oriented (S2b) configuration path, this path must simultaneously have relational capital as a peripheral condition, which strongly validates the nature that the influence of cognitive capital on the central flow experience in the live streaming environment is context-dependent and interactive.

6.2. The Antecedent Configuration of User Stickiness

Further analysis using fsQCA reveals that the critical role of cognitive capital is primarily transmitted through perceived value, which in turn affects user stickiness. Cognitive capital, perceived value, and flow experience are identified as core conditions influencing user stickiness, while structural capital and relational capital serve as peripheral conditions. This study confirms the combined influence of social capital, perceived value, and flow experience on user stickiness. From the perspective of causal pathway mechanisms, there are three configuration types that influence user stickiness: the Perceived Value Model (cognitive capital, relational capital and perceived value), the Flow Experience Model (social capital and flow experience), and the Hybrid Model (social capital, perceived value and flow experience). The qualitative comparative results complement the empirical findings

and confirm the significant impact of cognitive capital as a core condition on user stickiness, and this influence is primarily transmitted through perceived value (S1, S3b). In the S2b configuration, cognitive capital and flow experience (as core conditions) need to work together with relational capital (as a peripheral condition) to enhance user stickiness.

7. Discussions

7.1. Theoretical Implications

This paper advances theoretical knowledge in the following aspects:

First, based on social capital theory, this study deeply explores the influence mechanism of e-commerce live streamers' structural capital, cognitive capital, and relational capital on user stickiness, enriching theoretical perspectives in related fields. Despite the plethora of empirical studies in the extant literature concerning the influence of live streamer characteristics [3,20,55], the majority of these studies focus on the impact of live streamers' attractiveness, similarity, professionalism, and credibility on user stickiness, without sufficient attention to the influence of live streamers' social capital. A plethora of related studies have centered on perspectives such as social interaction, social exchange [56], and value creation [57]. These studies have concluded that streamers enhance user retention by cultivating quasi-social relationships or building trust, a conclusion that aligns with the findings of our research. Some studies have sought to examine the relationship between social capital and user retention from the vantage point of social capital. However, these studies often focus on a single dimension. For instance, Jin (2020) links structural capital to audience traffic, while this study combines it with cognitive and relational mechanisms [58]. Zeng (2023) associates relational capital with tipping behavior, but this study reveals its role in triggering flow [56]. Chen (2025) explores the role of cognitive capital in risk-taking, while this study focuses on its relationship with value perception [59]. This paper introduces the concept of social capital into the domain of e-commerce live streaming research, integrating social capital theory, perceived value, and flow theory to explore the mechanisms that underpin user stickiness in e-commerce live streaming. This study illuminates the manner in which a streamer's social capital exerts an influence on the phenomenon of user stickiness, thereby offering supplementary insights that serve to augment extant research in this field. Furthermore, this study offers novel insights into the application of social capital theory within the domain of e-commerce live streaming, providing empirical substantiation for the theoretical framework.

Second, by introducing perceived value and flow experience into the mechanism of streamer characteristics' impact on user stickiness within the social capital theoretical framework, this study enriches the theoretical model of user stickiness. Most of the existing studies have used SOR theory, Technology Acceptance Model (TAM), Community Identity theory, and Attachment theory [60] to explore the effects of single mediator variables such as users' flow experience, perceived value, satisfaction [61], habit [62], and trust [63] on user stickiness. However, few studies have comprehensively explored the parallel mediation mechanisms of flow experience and perceived value in streamers' social capital effects on user stickiness. Our social capital-based parallel mediation framework not only captures users' psychological state changes following external stimuli from streamers but also clarifies the psychological mechanisms generating user stickiness.

Third, the construction of a chain mediation model involving perceived value and flow experience provides richer perspectives and more comprehensive evidence for understanding streamers' social capital impacts on user stickiness. Although both perceived value and flow experience are widely recognized as individual mediating factors in SOR-based studies, their chained mediation relationship remains underexplored. While previous research has discussed their interactions [31,64], our empirical findings demonstrate that

in live streaming e-commerce contexts, users' perceived value of streamers leads to flow experiences, supporting conclusions from [11,65]. This enriches research on the interaction between perceived value and flow experience mechanisms while advancing studies on antecedents and consequences of these psychological mechanisms in live streaming e-commerce contexts.

7.2. Management Implications

For streamers, our research indicates that enhancing social capital in e-commerce live streaming effectively strengthens user stickiness. Previous studies have revealed the positive impacts of streamers' characteristics such as attractiveness [66], humor [67], expertise [68], passion, and warmth [20] on user engagement. This study systematically analyzes from the perspective of social capital, finding that streamers' structural capital, cognitive capital, and relational capital significantly influence users' perceived value, while structural capital and relational capital notably affect users' flow experience. These elements form transmission pathways affecting user stickiness through both concurrent and chained mediation mechanisms. Although cognitive capital does not directly trigger flow experience, fsQCA analysis shows it serves as a crucial component in three configuration paths influencing user stickiness: perceived value-driven, flow experience-driven, and hybrid types. Therefore, streamers should focus on accumulating and optimizing social capital. On one hand, continuously improving structural, cognitive, and relational capital can satisfy users' rational demands, emotional needs, and ethical expectations [69] during live streams. On the other hand, dynamically configuring these three capitals according to situational contexts and user demographics can enhance conversion rates and user retention.

For merchants, the alignment of streamers' social capital deserves attention. Existing research shows that consistency between merchant-streamer tonality enhances consumer trust, professional training significantly improves audience conversion [68], and streamers aligning with brand philosophy and product features effectively boost user stickiness [70]. This study reveals that streamers' structural and relational capital significantly enhance users' perceived value and flow experience, while cognitive capital indirectly affects flow experience through perceived value, ultimately forming a triple mechanism influencing user stickiness. Therefore, merchants should not only consider aggregate social capital metrics (follower count, professional background, marketing skills) but also dynamically select streamers with structurally aligned social capital based on product attributes and user demographics. Specifically, from the perspective of social capital structure, for products with clear user profiles, data tools can identify streamers with overlapping fan bases; for specialized products, professional training systems can transform cognitive capital into tangible value; for emotionally-driven products, prioritizing streamers with strong relational capital can foster emotional resonance through immersive interactions, creating a "value-immersion" dual-path retention mechanism. From the perspective of dynamic selection and configuration processes, several sequential steps are essential. Firstly, a comprehensive analysis of streamers' social capital is imperative. This analysis should encompass the streamer's fan base, the frequency of their interactions, and their platform influence. Secondly, the types of social capital required should be determined based on live streaming content or brand positioning. Thirdly, streamers with a high alignment between their social capital structure and live streaming content or brand positioning should be identified through real-time tracking and evaluation. Records of streamers' social capital data and historical performance should be maintained to facilitate rapid selection and configuration. Finally, the establishment of long-term collaborative relationships with streamers is imperative. These relationships must be supported by incentive mechanisms

and training programs, the objective of which is to enhance streamers' social capital. This, in turn, ensures sustained high-level alignment with brand or content positioning.

For platforms, constructing differentiated empowerment systems based on streamers' social capital proves crucial. Existing studies demonstrate that platform algorithms' visibility control significantly impacts user engagement [71], while institutional optimization affects streamer credibility [72]. Our findings reveal the multi-layered mechanisms of streamers' social capital on user stickiness and the chained transmission effects of perceived value-flow experience. This suggests platforms should refine empowerment systems by segmenting streamer types (celebrities, KOLs, KOCs, amateurs) [73], establishing differentiated promotion criteria based on social capital to foster fair competition. Simultaneously, systematic operational optimizations should be implemented: for knowledge driven streams, third party certification systems can institutionalize cognitive capital; for niche streamers with stable audiences, machine learning can enable intelligent audience matching through behavioral pattern recognition; for emotion focused streamers, enhanced real time interaction tools can optimize emotional engagement, driving technological innovation to amplify value perception and flow experiences.

7.3. Limitations and Future Studies

This research possesses both theoretical value and practical significance, yet it also faces certain limitations regarding content and data. In terms of content, the present study mainly concentrates on the individual psychological perceptions of users, examining how streamers influence user stickiness via perceived value and flow experience. Future research could include more multidimensional analysis by considering factors related to the platform, brand, and supply chain partners as antecedent variables influencing user stickiness. This broader approach could aid in identifying additional mediating variables and offer a more comprehensive understanding of the mechanisms by which streamers affect user stickiness. Regarding data, the independent and dependent variables in this paper are derived from users' self-reported data, thus lacking comprehensive objective metrics to measure the streamer's social capital. In addition, this study uses a cross-sectional survey design, making it challenging to capture the dynamic impact of changes in the streamer's social capital on user stickiness over time.

Furthermore, the manuscript disregards the limitations associated with the cultural context. The live-streaming e-commerce ecosystem in China is characterized by its unique cultural nuances. An examination of China's e-commerce live streaming ecosystem reveals distinctive cultural characteristics. China's e-commerce live streaming has established a universalized ecological system, with live streaming transaction volumes accounting for 17% of total e-commerce transaction volumes. In contrast, social commerce, including live streaming e-commerce, represents approximately 5% of total e-commerce sales in the United States. Chinese users demonstrate a reliance on a collective decision-making model that is characterized by the following elements: "streamer trust, social interaction, and time-limited discounts." Cultural factors inherent to relationship-oriented societies, such as personal relationship interaction patterns and the "differential mode of association" social engagement structures, significantly influence users' perception and response to streamers' social capital. This, in turn, affects the formation mechanisms of perceived value and flow experience. Conversely, Western consumers prioritize autonomous purchasing and privacy protection, exhibiting resistance toward promotional live streaming approaches [74]. Therefore, the applicability of the findings to users in Western markets necessitates further testing. Future research could focus on longitudinal data to enable a comparative analysis over time, thereby providing deeper insights into how fluctuations in the streamer's social capital affect user stickiness.

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