

How AI Virtual Anchors Ignite the Consumption Impulse: An Exploration of the Path Based on the SOR Model

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Abstract

Against the backdrop of rapid advancements in digital technologies and the digital transformation of consumer behavior, live-streaming e-commerce has experienced substantial growth. As an innovative application integrating artificial intelligence (AI) and digital marketing, virtual anchors are reshaping traditional live-streaming interaction patterns. The influence of their unique attributes on consumer psychology and behavioral decision-making warrants further investigation. This study aims to examine the mechanisms through which the characteristics of virtual anchors—interactivity, realism, and anthropomorphism—elicit consumer interest and drive purchase intention. Drawing on the Stimulus-Organism-Response theoretical framework and empirical analysis, the findings reveal the following: 1) Interactivity and realism exert a statistically significant direct positive effect on impulsive purchase intention, whereas anthropomorphism has no direct impact. 2) Interactivity influences impulsive purchase intention via flow experience (partial mediation); realism affects impulsive purchase intention through perceived pleasure and flow experience (dual mediation); and anthropomorphism indirectly impacts purchase intention solely through perceived pleasure (full mediation); 3) Perceived trust positively moderates the relationship between interactivity and realism, AI is undergoing a profound transformation in digital marketing, evolving from an efficiency-oriented tool to an emotionally intelligent partner and impulsive purchase intention. These results indicate that virtual anchor characteristics shape consumer decision-making through distinct psychological pathways: flow experience, perceived pleasure, and perceived trust. E-commerce platforms should prioritize enhancing the interactive capabilities and perceived realism of virtual anchors, while strengthening the efficacy of anthropomorphic marketing by augmenting user-perceived pleasure.

Keywords

Digital marketing, virtual live broadcasting, artificial intelligence, e-commerce, flow experience, innovative technology, emotion.

1. Introduction

The accelerating evolution of internet and communication technologies is driving structural transformation in consumer shopping behavior. As a form of commercial innovation in the digital economy era, live-streaming e-commerce has emerged as key infrastructure reshaping consumption value chains. Within this interactive domain, the triadic elements of "people, products, and scene" form a dynamically coordinated system through digital reconstruction, propelling the transition from traditional retail logic toward contextualized, real-time consumption paradigms [1]. The value proposition of live-streaming e-commerce lies in its reconstruction of these elements, which enhances transactional efficiency, achieves multi-stakeholder value co-creation, and shifts the dominant paradigm from "product search" to

"product discovery." Artificial intelligence (AI) has further revitalized live-streaming ecosystems. By enabling intelligent recommendation systems, sentiment analysis, and automated services, AI significantly enhances operational efficiency and user experience. Virtual anchors—a pivotal AI application—leverage distinctive advantages including real-time multilingual interaction and 24/7 uninterrupted streaming, establishing themselves as transformative agents within the live-streaming e-commerce sector [2].

As an emerging marketing instrument, research examining how virtual anchor characteristics influence consumer behavior presents significant academic value. Theoretically, an interdisciplinary approach integrating frameworks from communication theory, consumer psychology, and behavioral economics not only expands scholarly understanding of virtual anchors as novel digital entities but also establishes a foundational framework for future research in this domain [3]. Practically, this study offers empirical evidence enabling enterprises to optimize virtual anchor marketing strategies through the SOR paradigm, thereby enhancing brand equity and sustainable competitive advantage. Current research examining the anchor-consumer purchase intention relationship has employed the SOR model to construct preliminary analytical frameworks, elucidating the influence mechanisms of anchor characteristics on consumers' impulsive purchase behavior [4]. Consequently, our research addresses the following questions:

- (1) Which characteristics of virtual anchors induce consumers' impulsive purchasing behavior?
- (2) Which characteristics of virtual anchors induce consumers' impulsive purchasing behavior?
- (3) How does consumers' perceived trust moderate the strength and causal pathways between virtual anchor characteristics and impulse buying intention?

2. Theoretical Foundation and Literature Review

2.1. SOR Model and its Application

The SOR model, proposed by Mehrabian and Russell, constitutes a theoretical framework explaining how external stimuli influence behavioral responses through individuals' psychological and emotional processing mechanisms. According to this model, consumer purchasing behavior is governed by three interacting components: external stimuli, the individual's cognitive and affective processing of these stimuli, and the resulting behavioral outcomes. As a foundational consumer behavior framework, the SOR model posits that external stimuli influence behavioral responses through the mediation of internal psychological states. This theoretical lens provides an explanatory framework for the influence mechanisms through which virtual anchor characteristics affect consumers' impulsive purchase intention. Virtual anchor characteristics serve as external stimuli that influence impulse buying intention through organismic mediating processes—specifically, consumers' affective responses and cognitive evaluations—thereby establishing a comprehensive behavioral analysis chain. Within this SOR framework, interactivity, realism, and anthropomorphism drive the formation of purchase intention by eliciting affective resonance and cognitive appraisal, thus unveiling a dynamic mechanism from stimulus input to behavioral output. This theoretical framework systematically integrates digital marketing contexts, providing a robust basis for analyzing consumer behavior patterns in live-streaming e-commerce. Characteristics such as visual design, voice tone, and interaction patterns of virtual anchors act as external stimuli, directly influencing consumers' sensory experiences and eliciting positive or negative emotional responses, which in turn guide their purchase decisions [5]. Building on established theoretical foundations, the SOR framework constitutes a pivotal paradigm in consumer behavior research [6]. Within live-streaming e-commerce contexts, virtual anchors' anthropomorphic design, interactive capabilities, and professional competence emerge as salient exogenous stimulus sources [7, 8]. These attributes not only rapidly capture consumer attention but concurrently

enhance trust through perceptions of expertise or social presence. The organism component centers on individual consumers, encompassing multidimensional psychological characteristics including needs, motivations, and perceptual frameworks. These internal traits constitute the cognitive foundation for consumer information processing, systematically regulating the interpretation of external stimuli—such as virtual anchors' interactivity, realism, and anthropomorphism—through attentional selection, perceptual interpretation, and cognitive integration mechanisms [9]. Empirical evidence indicates that younger consumers exhibit heightened receptivity to interactive capabilities, whereas older cohorts prioritize professional competence and credibility. Social presence has been empirically established as a significant mediating mechanism, particularly pronounced in hedonic product contexts [10]. Within live-streaming e-commerce environments, virtual anchors' core characteristics—interactivity, realism, and anthropomorphism—collectively drive consumers through integrated decision-making processes from information processing and preference formation to behavioral conversion. This occurs via synergistic psychological mechanisms including affective arousal, cognitive appraisal, and attitude formation. Empirical evidence indicates that combining visual design with interactive modalities may elicit synergistic effects exceeding the sum of individual attribute impacts. This multidimensional integration effect, substantiated by multiple studies, underscores the critical importance of holistic stimulus configuration [11, 12].

2.2. Current Research Status of Virtual Anchor Characteristics

As an outcome of deep convergence between artificial intelligence and virtual simulation technologies, virtual anchors have emerged as a focal research domain in digital communication [13]. The technological evolution originated with motion-capture-driven virtual presenters and has progressed to AI-synthesized anchors with algorithmic interaction capabilities through iterative AI advancement. The industrial advancement of this technological convergence is propelled by five core drivers: technological innovation, user demand, corporate deployment, policy support, and capital investment. Among these, breakthroughs in motion capture and affective computing constitute particularly critical technological foundations. As an emergent media form leveraging artificial intelligence and digital imaging technologies, virtual anchors have become deeply embedded within contemporary media ecosystems, serving as pivotal vehicles for cross-platform content distribution, user engagement, and commercial monetization.

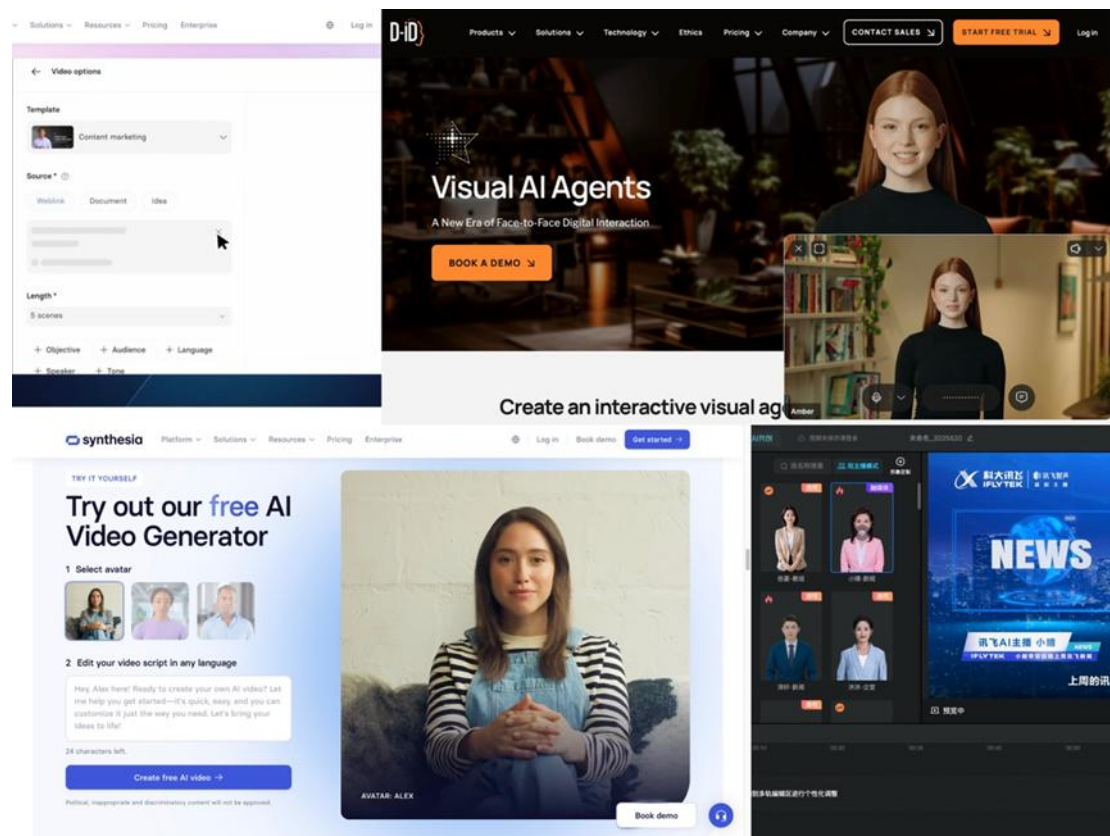


Figure 1: Virtual character creation platform.

As the service-oriented functions of anchors gain primacy and traffic resources concentrate among leading enterprises, live-streaming content is becoming increasingly specialized, personalized, and interactive. Consequently, fully digitized virtual anchors with deep learning capabilities are likely to capture a larger market share [14]. With the continuous expansion of profit models in digital marketing, AI-driven virtual anchors—owing to their significant advantages in cost control and operational efficiency—exhibit enormous market growth potential and vast market space. The interactivity, realism, and anthropomorphism of virtual anchors represent core features that demonstrate substantial practical value in digital marketing scenarios, whose mechanisms are rooted in their profound influence on consumers' psychological cognition and behavioral decisions. As noted by Liu and Dai, the emotional interaction mechanism between fans and virtual anchors reveals that the integration of superficial imagery and personality traits is crucial for forming deep emotional connections [15]. Therefore, the design of virtual anchor features should not only prioritize external attractiveness but also maintain internal consistency to satisfy consumers' multi-level psychological needs. Considering the multi-dimensional dynamic nature of virtual anchor characteristics amid technological iteration and evolving market demands, an in-depth exploration of their impact on consumers' impulse buying behavior can offer significant theoretical contributions to advancing the digital marketing theoretical framework and provide practical implications for optimizing business strategies.

2.3. The Mediating Role of Perceptual Pleasure and Mind-Flow Experience

In the interaction contexts between virtual anchors and consumers, perceived pleasure and flow experience—serving as core psychological variables—constitute a pivotal mediating chain between technological stimuli and purchasing behavior. Unveiling this mediating mechanism not only enhances the theoretical applicability of the SOR model in virtual interaction scenarios but also provides a scientific pathway for optimizing user experience in live-streaming e-commerce.

Virtual anchors, with their highly realistic 3D imagery and advanced multimodal interaction technologies, not only enhance the verisimilitude and immersiveness of user experience but also elicit positive emotional responses. This perceived pleasure stems not only from users' appraisal of product/service value but also from their appreciation of the novel experiences enabled by digital technologies [16]. In virtual anchor-led digital live-streaming scenarios, the multi-dimensional interaction system—grounded in real-time rendering technology and intelligent interaction algorithms—creates an immersive engagement experience unattainable in traditional consumption contexts. This innovative interaction mode not only reinforces users' active role in consumption decision-making but also fosters emotional connections with virtual anchors and strengthens brand identification through emotional interactions and dynamic feedback mechanisms. Meanwhile, the "ultra-responsive" characteristics of virtual anchors enable parallel processing of massive user queries with instant feedback, significantly enhancing users' flow experience. Compared to human-led live-streams, virtual anchors—by virtue of their unlimited temporal-spatial flexibility and algorithm-driven intelligent interaction systems—facilitate higher-frequency and deeper user engagement. This dynamic interaction promotes the depth of attention focus and efficient integration of cognitive resources, thereby significantly increasing the likelihood of users entering a flow state [17]. Virtual anchors transform technology-driven external stimuli—processed via users' cognitive and emotional systems—into internal psychological shifts, including brand attitude transformation and activation of purchase intention, thereby propelling consumer purchase decisions. The dual mediating effects of perceived pleasure and flow experience offer a novel theoretical framework for explaining the functional value of virtual anchors in modern marketing. This unique mediating mechanism not only reveals the potential of virtual anchors but also highlights their distinctive advantages in optimizing user experience, cultivating brand loyalty, and enhancing sales conversion [18]. From the perspective of business ecology sustainability, the widespread adoption of virtual anchors not only facilitates optimized customer lifecycle management and enhances brand equity value but also drives fundamental shifts in marketing paradigms within the digital economy era.

2.4. The Moderating Effect of Perceived Trust

Within live-streaming consumer groups, perceived trust in virtual anchors serves as an invisible link spanning the consumer decision-making chain, subtly yet profoundly shaping their interpretation of and response to live-streaming information. This trust, when strongly held, exhibits a ripple effect—spreading from the virtual anchor to the brand itself, thereby inclining consumers to endorse product quality and marketing credibility. Such trust significantly enhances purchase intention, particularly when virtual anchors leverage their technological attributes of visual tangibility and expressiveness to shorten psychological distance. In this context, perceived trust emerges as a key catalyst for impulsive buying behavior. Simultaneously, trust-derived certainty mitigates interactional uncertainties, enabling users to engage in a more pleasurable experience within a relaxed mindset. This is particularly critical for high-value commodities, as it effectively alleviates consumers' perceived risk, thereby increasing their willingness to try new products or services. Over time, consistent and reliable interactions transform trust into loyalty, converting viewers into not only frequent watchers but also long-term brand advocates. These trusted consumers spontaneously act as evangelists, sharing positive experiences via social media or word-of-mouth, thereby expanding the influence of virtual anchors and their endorsed brands. Brands and operators must therefore establish trust foundations through authentic, transparent content and consistent professionalism. Meanwhile, improving after-sales service systems to ensure prompt problem-solving can fully leverage the moderating effect of perceived trust. Such initiatives will not only

facilitate the deep integration of virtual anchors in live-streaming scenarios but also foster the long-term development of digital marketing ecosystems [19].

3. Research Model and Hypothesis Development

3.1. Virtual Digital Person Characteristics and Impulse Consumption

As a key external stimulus variable, the interactivity of virtual anchors exerts a significant positive driving effect on consumers' impulsive purchase intention by constructing a digital scene of two-way information interaction and emotional resonance. Virtual anchors communicate with audiences through real-time interaction, answering queries and providing personalized recommendations. This technology-enabled interaction mode dynamically mitigates cognitive barriers in information acquisition and needs matching, effectively reducing perceived uncertainty in the decision-making process and thereby enhancing purchase intention [20]. Real-time interaction enables virtual anchors to deliver instantaneous product information and service support, thereby reducing consumer hesitation and accelerating decision-making processes. Concurrently, through scarcity-driven marketing tactics such as limited-time offers and quantity-restricted products, virtual anchors cultivate perceptions of urgency during live-streaming sessions. This strategy prompts consumers to expedite purchase decisions to avoid missing opportunities [21]. Furthermore, the real-time social interaction environment facilitated by virtual anchor livestreams provides a conducive setting for activating social identity effects. Grounded in social learning theory, when consumers observe the active participation and purchasing decisions of fellow viewers, the resulting behavioral demonstration effect triggers cognitive processes of social comparison and information integration. This prompts individuals to adopt group behavior as a decision-making reference point, ultimately generating herd consumption patterns [22]. Finally, entertainment elements and gamification design features integrated into livestream broadcasts enhance viewing enjoyment, rendering the shopping experience more engaging and pleasurable. This environment fosters conditions conducive to impulse buying. Consequently, virtual anchors' interactivity amplifies consumer engagement, cultivates emotional connections, delivers real-time feedback, instills urgency through scarcity tactics, enables personalized recommendations, capitalizes on social proof, and incorporates entertainment value—collectively strengthening impulsive purchase intentions during livestream viewing [23]. Accordingly, the following hypotheses are proposed:

H1: The interactivity of virtual anchors has a significant positive effect on consumers' impulsive purchase intention.

The anthropomorphic realism of virtual anchors enhances consumers' sense of presence and social presence, fostering stronger emotional connections that positively influence purchase intentions. Specifically, virtual anchors exhibiting high image and behavioral similarity elicit greater brand trust by triggering perceived homophily—the sense of being "the same kind"—which increases psychological proximity. Furthermore, the technical capabilities of AI-driven virtual anchors reduce psychological distance between consumers and the virtual entity, amplifying these effects. The visual and expressive capabilities of AI-driven virtual anchors reduce psychological distance between consumers and perceived products/services. By delivering high-fidelity visualizations and lifelike behavioral simulations, this anthropomorphic realism enhances consumers' perceived proximity to offerings, thereby facilitating impulse purchases [24]. Anthropomorphic realism in virtual anchors significantly enhances user experience, elevates brand appeal, and directly influences consumer decision-making processes through multiple psychological pathways. These effects collectively increase impulsive purchase intentions [25]. Consequently, optimizing visual realism and interaction

efficacy represents a critical design imperative for virtual anchor development. Accordingly, the following hypotheses are proposed:

H2: The realism of virtual anchors has a significant positive effect on consumers' impulsive purchase intention.

Highly anthropomorphic virtual anchors elicit heightened perceptions of social presence—consumers psychologically experience these digital entities as authentic human-like social actors capable of real-time interaction [26]. This intensified social presence amplifies consumer engagement and immersion within livestream commerce environments, subsequently increasing susceptibility to impulse purchase stimuli during viewing sessions [27]. Within virtual shopping environments, consumers actively explore products at self-determined pace and interest points rather than passively receiving predetermined information [28]. Grounded in embodied cognition theory, virtual product manipulation engages sensorimotor coupling—where bodily perception and cognitive processing interact synergistically—significantly enhancing subjective product experience and emotional engagement. These heightened affective states not only intensify shopping enjoyment but also strengthen positive brand associations. When consumers establish emotional product connections and reduce uncertainty through autonomous verification, cognitive load decreases, prompting immediate purchase decisions rather than prolonged hesitation or information-seeking [29]. These accelerated purchase decisions typically reflect affect-driven processes rather than deliberate rational analysis—a core characteristic of impulse buying. Virtual anchors' anthropomorphic affordances heighten consumer engagement and autonomy, thereby augmenting hedonic shopping value. This enhanced experiential engagement not only intensifies enjoyment but also accelerates purchase decisions through positive affective priming. Consequently, brands strategically leverage such innovations to optimize sales conversion rates [30]. Accordingly, the following hypotheses are proposed:

H3: The anthropomorphism of virtual anchors has a significant positive effect on consumers' impulsive purchase intention.

3.2. Perceived Pleasure and Impulsive Consumption

The interactive capabilities, anthropomorphic realism, and embodied agency of virtual anchors stimulate impulsive consumption by eliciting hedonic sensory stimulation. Real-time interaction significantly enhances audience participation and belongingness [31], while this positive affective experience—facilitated by cognitive fluency—attenuates psychological defense mechanisms. Consequently, product recommendations undergo perceptual transformation: from persuasive stimuli to pleasurable experience extensions [32]. When interactive behaviors of virtual anchors elicit consumer pleasure, this triggers an affect transfer effect: positive affect toward the anchor generalizes to recommended products, thereby diminishing systematic processing of product attributes.

In the domain of visual representation, hyper-realistic imagery constructed by virtual anchors through 3D modeling and dynamic rendering technologies achieves precise replication of the human facial golden section ratio and kinematic characteristics of limb movement. These visual constructs are deeply congruent with the aesthetic cognitive mechanisms governed by Gestalt psychology's "Law of Prägnanz" (Gestalt tendency law) [33]. Neuroscience investigations have revealed that when the micro-expression parameters of virtual avatars approximate those of real humans, they elicit significant activation of the reward neural circuitry located in the medial prefrontal cortex [34]. This optimized visual comfort state serves a dual function: reducing consumers' cognitive load through perceptual fluency while enhancing emotional engagement by eliciting cognitive closure satisfaction. A critical design consideration involves the strategic introduction of controlled imperfection in virtual streamers' visual architectures. Specifically, incorporating elements such as regulated motion latency or subtle expressive

discrepancies has been shown to mitigate the negative affective responses associated with the Uncanny Valley phenomenon. Such deliberate design interventions strike a balance between realistic representation and perceptual acceptability, ensuring sustained positive user experiences by avoiding the dissonance caused by near-perfect but perceptually unsettling simulations.

Anthropomorphic features, such as empathetic expressions and humorous responses, influence consumption decisions by establishing anthropomorphic social relationships. Empirical studies have shown that virtual anchors' "self-awareness of mistakes" can enhance the sense of personality authenticity and avoid the alienation caused by the "perfect persona". This "moderately imperfect" strategy can activate the insula cortex of consumers and produce an emotional connection similar to that of real people. Questionnaire data show that anthropomorphism influences purchase intention by fully mediating perceived trust, and perceived pleasure is a key antecedent of trust formation. Based on the above analysis, the following hypotheses are proposed:

H4a: Perceived pleasure mediates the effect of interactivity on impulse consumption.

H4b: Perceived pleasure mediates the effect of realism on impulse consumption.

H4c: Perceived pleasure mediates the effect of anthropomorphism on impulse consumption.

3.3. Flow Experience and Impulsive Consumption

The interactive, realistic, and anthropomorphic characteristics of virtual anchors facilitate impulsive consumption behavior by eliciting consumers' flow experience [35][36]. According to flow theory, when consumers achieve a state of flow during virtual anchor live streaming, they exhibit heightened focus and enjoyment, often accompanied by a distorted perception of time [37]. Specifically, the high level of interactivity inherent in virtual anchors systematically enhances consumers' flow experience through the establishment of a cognitive loop comprising "goal-setting, feedback processing, and immersion" [38]. This process enables consumers to temporarily disregard external distractions and significantly increases their receptiveness to products or services (H5a). At the visual level, photorealistic rendering reduces processing friction while enhancing immersion and engagement—establishing necessary preconditions for flow state formation (H5b). Neuroscientific evidence confirms that avatars exhibiting micro-expressions within human behavioral parameters activate the viewer's mirror neuron system, intensifying flow through embodied simulation. Furthermore, anthropomorphic features satisfy flow's requisite skill-challenge equilibrium by activating social cognition mechanisms (H6c). Empirical studies have found that such a state of mindfulness can prompt consumers to make purchase decisions based on immediate emotions rather than rational evaluations, forming a "focus-pleasure-impulse" behavioral pathway. Together, the above mechanisms suggest that the mind-flow experience plays a key mediating role in the process of virtual anchor characteristics influencing impulse consumption. Based on the above analysis, the following hypotheses are proposed:

H5a: Flow experience plays a mediating role in the influence of interactivity on impulse consumption.

H5b: Flow experience plays a mediating role in the effect of realism on impulse consumption.

H5c: Flow experience mediates the effect of anthropomorphism on impulse consumption.

3.4. Perceived Trust and Impulse Consumption

Perceived trust constitutes a critical mediator between virtual anchor characteristics and impulse consumption [39]. Real-time interactivity significantly enhances trust toward virtual anchors by facilitating responsive consumer communication. When consumers exhibit high trust in interactive features, interactivity's effect on impulse consumption amplifies substantially. Similarly, elevated trust in anchor realism increases conversion of experiential

pleasure into purchase behavior. This trust mechanism reinforces perceived authenticity of visual experiences, thereby elevating impulse spending propensity. Furthermore, anthropomorphism-driven emotional resonance and social experiences stimulate impulse purchases through trust intensification. In digital shopping environments, the synergy of cognitive trust (from system transparency) and affective trust (from social interaction) collectively enhances impulsive consumption probabilities. Accordingly, the following hypotheses are proposed:

H6a: Perceived trust plays a moderating role in interactivity-inspired impulsive consumption.

H6b: Perceived trust plays a moderating role in realism influencing impulsive consumption.

H6c: Perceived trust plays a moderating role in anthropomorphism influencing impulse consumption.

4. Research Methods

4.1. Research Model

Based on the SOR model, this study develops a novel theoretical framework to investigate the impact of virtual anchor characteristics on consumers' impulsive purchase intention. Within this model, three key characteristics of virtual anchors—interactivity, realism, and anthropomorphism—are conceptualized as stimulus variables. Perceived pleasure and flow experience are posited as mediating variables that bridge the relationship between stimulus variables and the outcome variable. Perceived trust is introduced as a moderating variable, which influences the strength and direction of the association between virtual anchor characteristics and the outcome variable. The outcome variable of interest is consumers' impulsive purchase intention, which captures the spontaneous and unplanned purchase tendency triggered by virtual anchor interactions. This conceptualization elucidates the psychological pathways through which virtual anchors foster impulse purchases, highlighting the mediating roles of hedonic and immersive experiences, as well as the moderating effect of trust in shaping consumer response mechanisms.

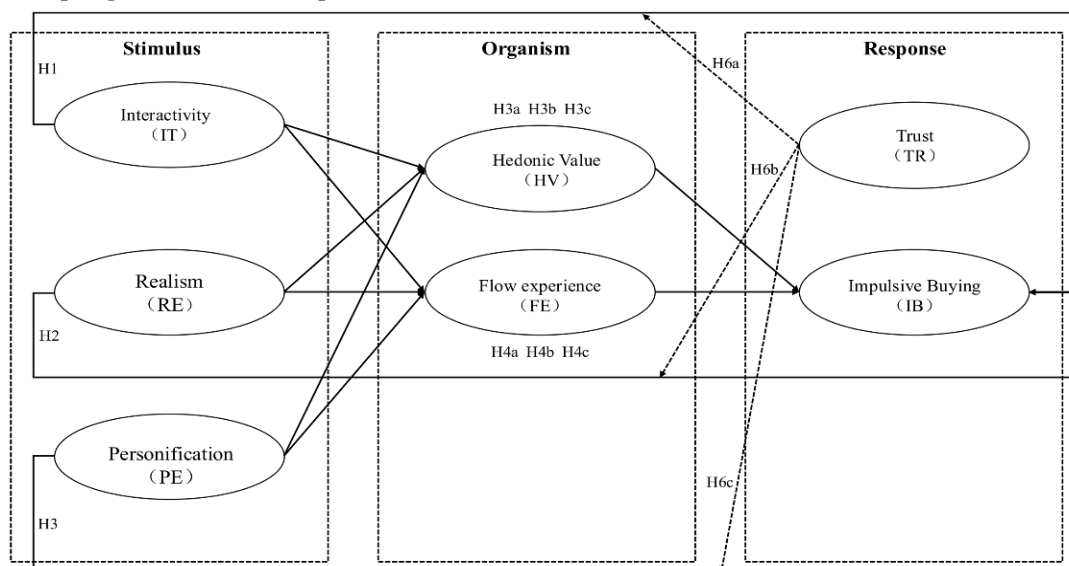


Figure 2: Research model.

4.2. Research Sample and Process

To maintain respondent confidentiality and encourage candid feedback, the questionnaire was administered in a completely anonymous manner. A screening question—"Have you ever watched or interacted with virtual live streaming?"—was incorporated to ensure sample relevance by excluding individuals without prior exposure to virtual live streaming. This

filtering process yielded 458 responses, of which 425 were deemed valid after removing incomplete or inconsistent entries. Descriptive statistical analysis of the valid dataset (see Table 1) revealed a sample demographic dominated by educated youth: 51.53% of participants fell within the 18-25 age bracket, 46.59% held college or bachelor's degrees, and female respondents slightly outnumbered males (54.82%). Income distribution exhibited a stratified pattern, with a notable proportion of low-income earners alongside a significant segment in middle- and high-income brackets. Occupational composition predominantly consisted of students, corporate employees, and freelancers. These characteristics indicate the dataset's representativeness and statistical adequacy, providing a solid foundation for subsequent analytical procedures.

Table 1: Descriptive statistics

Characteristics	Option	Frequency	Percentage (%)	Cumulative Percentage (%)
Gender	Male	192	45.176	45.176
	Female	233	54.824	100
Age	Less than18	20	4.706	4.706
	18 - 25	219	51.529	56.235
	26 - 35	87	20.471	76.706
	36 - 45	59	13.882	90.588
	Over 45	40	9.412	100
Educational	High school and below	111	26.118	26.118
	JuniorcollegeUndergraduate	198	46.588	72.706
	Master's degree and above	116	27.294	100
Monthly income	Below 3000 yuan	167	39.294	39.294
	3000 - 6000 yuan	83	19.529	58.824
	6001 - 10000 yuan	124	29.176	88
	Above 10000 yuan	51	12	100
Job	Student	137	32.235	32.235
	Enterprise employee	128	30.118	62.353
	Freelancer	116	27.294	89.647
	Civilservant/Institution staff	44	10.353	100
Total		425	100.000	100.000

4.3. Measurement

The questionnaire measurements in this study were adapted by reviewing the relevant literature and adapting them to the specific research context to ensure the scientific validity and applicability of the measurement tools. The measure of interactivity in the questionnaire was borrowed from Sledgianowski and Kulviwat, the assessment of realism referred to the work of Meng Lu et al. and the anthropomorphism measure was based on Guido and Peluso's study. The assessment of perceived trust was informed by the work of Mcknight and Chang, and the measure of perceived pleasure was based on the work of Lagace et al. and Koufaris and Liu Chenglin. The assessment of mind-flow experience also draws on the work of Lagace et al. as well as Koufaris and Liu Chenglin, while the measure of impulsive purchase intention is based on the research of Beatty and Gong Xiaoxiao. This design ensures the comprehensiveness of the questionnaire content as well as the reliability and validity of the findings, providing solid data support for an in-depth understanding of the impact of virtual anchors on consumer behavior.

Table 2: Measurement

Constructs	Items	Reference
Interactivity	IT1. The digital human responds promptly during the live stream. IT2. Does the virtual anchor provide multiple interaction methods, such as comments, likes, Q&A, etc.? IT3. The level of consumer participation during the live stream.	Sledgianowski, D., & Kulviwat, S (2009) [40]
Realism	RE1. During the virtual anchor's live stream or interaction, can you feel a situation similar to contacting a real person? RE2. During the virtual anchor's live stream or interaction, can you experience a human-like enthusiasm? RE3. During the virtual anchor's live stream or interaction, can you be aware of the existence of other participants (such as other viewers, virtual anchors, brand owners, etc.) besides yourself and feel their interaction or influence? RE4. Can you exchange information with other relevant parties?	Meng, L, Liu, F.J, et al. (2020) [41]
Personification	PE1. The virtual anchor's face is anthropologically similar. PE2. The virtual anchor's expressions are vivid. PE3. The virtual anchor's body movements are natural. PE4. The overall image of the virtual anchor is similar to that of a human in the real world.	Guido, G., & Peluso, A.M. (2015) [42]
Trust	TR1. I believe that the virtual anchor is honest with consumers. TR2. I believe that the product information provided by the virtual anchor is true and effective. TR3. I believe that the products and services recommended by the virtual anchor are of high quality. TR4. I believe that the virtual anchor has the ability and resources to provide high-quality products and services.	McKnight DH(2002) [43][43], Chang (2008) [44]
Hedonic Value	HV1. The consumption experience with the virtual anchor makes me feel happy. HV2. Considering the costs and benefits of shopping with the virtual anchor, it exceeds my expectations. HV3. The consumption experience provided by the virtual anchor makes me feel happy.	Lagace RR et al. (2022) [45]
Flow Experience	FE1. I feel time flies quickly when watching the live streaming e-commerce. FE2. I feel immersed when watching the live streaming e-commerce. FE3. I often lose awareness of the surrounding environment when watching the live streaming e-commerce.	Koufaris M (2004) etc. [46], Liu Chenglin (2023) [47]
Impulsive Buying	IB1. When I see the virtual anchor's live stream, I want to own the product. IB2. When I see the virtual anchor's live stream, I have a strong desire to buy. IB3. As soon as I see the virtual anchor recommending products in the live stream, I feel they are what I want. IB4. I had no plan to buy before watching the live stream, but I really want to buy after seeing the virtual anchor's live stream.	Beatty (1998) [48], Gong Xiaoxiao etc. (2019) [49]

5. Data Analysis and Results

5.1. Descriptive Statistics

The statistical results of these variables show that the data are reasonably distributed with no significant outliers, which enhances the reliability of the research results. Overall, the means and standard deviations of the variables show the positive effects of the virtual anchor live shopping experience and provide a reliable basis for further exploring the relationship between different variables.

Table 3: Descriptive statistics

Variable	Item	Mean	Standard Deviation	Variance	Kurtosis	Skewness	Coefficient of Variation
IT	IT1	3.062	1.395	1.947	-1.204	-0.186	0.456
	IT2	3.257	1.412	1.993	-1.161	-0.342	0.434
	IT3	3.013	1.416	2.006	-1.277	-0.023	0.470
RE	RE1	3.072	1.331	1.770	-1.097	-0.150	0.433
	RE2	3.102	1.322	1.749	-1.068	-0.163	0.426
	RE3	3.151	1.380	1.904	-1.178	-0.130	0.438
	RE4	3.243	1.335	1.782	-1.019	-0.236	0.412
PE	PE1	3.263	1.270	1.614	-0.960	-0.203	0.389
	PE2	3.191	1.326	1.759	-0.992	-0.235	0.416
	PE3	3.030	1.326	1.758	-1.104	-0.029	0.438
	PE4	3.089	1.358	1.844	-1.122	-0.178	0.440
TR	TR1	3.184	1.344	1.808	-1.061	-0.225	0.422
	TR2	3.099	1.349	1.819	-1.116	-0.132	0.435
	TR3	3.148	1.282	1.645	-0.895	-0.204	0.407
	TR4	3.158	1.262	1.592	-0.876	-0.231	0.400
HV	HV1	3.161	1.406	1.977	-1.205	-0.196	0.445
	HV2	3.115	1.363	1.858	-1.138	-0.210	0.438
	HV3	3.237	1.351	1.825	-1.051	-0.260	0.417
FE	FE1	3.132	1.363	1.857	-1.116	-0.208	0.435
	FE2	3.148	1.335	1.783	-1.083	-0.131	0.424
	FE3	3.053	1.429	2.043	-1.297	-0.148	0.468
IB	IB1	3.020	1.374	1.887	-1.191	-0.113	0.455
	IB2	2.957	1.386	1.922	-1.212	0.017	0.469
	IB3	3.161	1.408	1.984	-1.242	-0.160	0.446
	IB4	3.092	1.366	1.866	-1.126	-0.136	0.442

5.2. Reliability Test

According to the results of the reliability and validity test, the measurement instrument of this study has good fit. In terms of reliability, the Cronbach's alpha coefficients of the latent variables (Interactivity IT, Realism RE, Anthropomorphism PE, Perceived Trust TR, Perceived Pleasure HV, Heart Flow Experience FE, and Intention to Buy IB) are in the range of 0.682-0.794, and the Composite Reliability (CR) values are in the range of 0.701- 0.795 range, all of which satisfy the reliability requirements, indicating that the internal consistency of the question items is good and the measurement is stable and trustworthy. At the validity level, the factor loadings are mostly in the range of 0.551-0.86, most of which meet the standard, reflecting the strong explanatory power of the items on the latent variables; the KMO value reaches 0.968, and the Bartlett's test of sphericity $p=0.000^{***}$, which indicates that the data are suitable for factor

analysis, and that the structural validity is guaranteed. Although the AVE value of IT is slightly lower than 0.5, its CR value of $0.72 > 0.7$ and factor loading > 0.7 can be retained due to internal consistency attainment as recommended by Hair et al. (2019). The loadings of each question item in the unaffiliated constructs were < 0.4 , satisfying the Cross-loading criterion [50].

Table 4: Results of construct validity and reliability analysis.

Constructs	Items	Factor Loading	Cronbach's α	Composite Reliability (CR)	AVE
IT	IT1	0.739	0.722	0.72	0.462
	IT2	0.796			
	IT3	0.702			
RE	RE1	0.647	0.725	0.725	0.499
	RE2	0.69			
	RE3	0.67			
	RE4	0.551			
PE	PE1	0.649	0.778	0.778	0.469
	PE2	0.701			
	PE3	0.746			
	PE4	0.637			
TR	TR1	0.63	0.754	0.753	0.533
	TR2	0.674			
	TR3	0.668			
	TR4	0.66			
HV	HV1	0.687	0.689	0.701	0.428
	HV2	0.658			
	HV3	0.614			
FE	FE1	0.641	0.682	0.701	0.432
	FE2	0.573			
	FE3	0.736			
IB	IB1	0.665	0.794	0.795	0.494
	IB2	0.86			
	IB3	0.667			
	IB4	0.687			

Table 5: Discriminant validity (Fornell-Larcker criterion)

	IB	FE	HV	TR	PE	RE	IT
IB	0.680						
FE	0.74	0.706					
HV	0.766	0.736	0.685				
TR	0.784	0.694	0.745	0.730			
PE	0.626	0.58	0.702	0.618	0.654		
RE	0.756	0.708	0.772	0.756	0.679	0.657	
IT	0.7	0.666	0.664	0.661	0.68	0.739	0.703

5.3. Path analysis

According to the preliminary results of the path test, the interactivity (IT) and realism (RE) of virtual anchors show a significant positive impact on consumers' impulsive purchase intention (IB), with path coefficients of 0.169 and 0.226 respectively, and the P values are both less than 0.05, which supports hypotheses H1 and H2. However, the influence of anthropomorphism (PE) on impulsive purchase intention is not significant, with a path coefficient of 0.011 and a P value of 0.790. This means that we cannot confirm the validity of H3 in the current analysis. Therefore, H1 and H2 hold true, while H3 does not.

Furthermore, perceived pleasure (HV) and flow experience (FE), as potential mediating variables, their relationships with interactivity, realism and anthropogenicity are worthy of further exploration. Specifically, the effects of interactivity and realism on perceived pleasure and flow experience both show significance, which provides a basis for subsequent mediating effect analysis. For instance, the path coefficient of interactivity for perceived pleasure is 0.088, that of realism is 0.502, and that of realism for flow experience is 0.439. These results indicate a significant association among these variables.

Table 6: Result of structural equation modeling.

Structural Model Path	Unstandardized Coefficient	Standardized Coefficient	S.E.	C.R.	P
IT → HV	0.092	0.088	0.047	1.954	0.051*
RE → HV	0.542	0.502	0.049	11.118	0.000***
PE → HV	0.317	0.301	0.044	7.264	0.000***
IT → FE	0.292	0.278	0.054	5.376	0.000***
RE → FE	0.479	0.439	0.056	8.493	0.000***
PE → FE	0.098	0.093	0.05	1.948	0.051*
HV → IB	0.308	0.295	0.048	6.443	0.000***
FE → IB	0.26	0.252	0.041	6.299	0.000***
IT → IB	0.183	0.169	0.048	3.814	0.000***
RE → IB	0.254	0.226	0.058	4.379	0.000***
PE → IB	0.012	0.011	0.046	0.267	0.79

Note: ***, **, and * represent significance levels of 1%, 5%, and 10% respectively. The same applies below.

5.4. Mediating Effects

The summary table of the parallel mediating effect test shows that the mediating effect value of IT (interactivity) on IB (impulse consumption) through HV (perceived pleasure) is 0.028 (Boot SE=0.017), and the 95%BootCI contains zero value (-0.003-0.064). And the z value of 1.649 (p=0.100) did not reach the significant level, indicating that the mediating effect of HV was not established. The mediating effect value of IT (interactivity) through FE (flow experience) was 0.076 (Boot SE=0.021, 95%CI 0.041-0.122), z score 3.625 (p<0.001) was significant, and the direct effect c'=0.183 (p<0.001) was still significant. It was confirmed that FE played a partial mediating role. Thus suppose that H4a does not hold and H5a holds.

In the two-path test of RE (fidelity), the perceived pleasure path (a*b=0.167, SE=0.034, 95%CI 0.108-0.240) and the flow experience path (a*b=0.125, SE=0.033, 95%CI 0.070-0.198) were 4.965 and 3.825, respectively (both p<0.001), and the direct effect c'=0.254 (p<0.001) remained significant, indicating that both played a partial mediating role. It shows that both H4b and H5b hold.

The mediating effect value of PE (fitting nature) through HV (perceived pleasure) was 0.098 (SE=0.021, 95%CI 0.059-0.144, $z=4.637$, $p<0.001$), while the direct effect $c'=0.012$ ($p=0.790$) was not significant, which was in line with the complete mediating characteristics. The $a*b=0.026$ (SE=0.018, 95%CI -0.005-0.065, $z=1.462$, $p=0.145$) of FE path did not reach the significant level, and the mediating effect was not established. It shows that H4c holds and H5c does not. Bootstrap confidence intervals for all significant mediation effects did not contain zero values, supporting the robustness of the conclusions.

Table 7: Mediation effects

Path	Total Effect (c)	a (p-value)	b (p-value)	Mediating Effect (a*b)	a*b (p-value)	a*b (95% Boot CI)	Direct Effect (c')	c' (p-value)	Conclusion
IT→HV→IB	0.287	0.052*	0.000***	0.028	0.100*	[-0.067, 0.183]	0.183	0.000***	Non-significant mediation
IT→FE→IB	0.287	0.000***	0.000***	0.076	0.000***	[0.041, 0.122]	0.183	0.000***	Partial mediation
RE→HV→IB	0.546	0.000***	0.000***	0.167	0.000***	[0.108, 0.240]	0.254	0.000***	Partial mediation
RE→FE→IB	0.546	0.000***	0.000***	0.125	0.000***	[0.070, 0.198]	0.254	0.000***	Partial mediation
PE→HV→IB	0.136	0.000***	0.000***	0.098	0.000***	[0.059, 0.144]	0.012	0.79	Complete mediation
PE→FE→IB	0.136	0.053*	0.000***	0.026	0.145	[-0.070, 0.012]	0.012	0.79	Non-significant mediation

5.5. Moderating Effects

After adding the interaction term IT×TR into the model, we found that the coefficient of the interaction term was 0.179, and the p-value was less than 0.001, indicating that perceived trust (TR) significantly enhanced the positive influence of interactivity (IT) on impulsive purchase intention (IB), and there was an obvious positive moderating effect. At this time, the explanatory power of the model reaches 69.6%, the incremental R^2 is 0.022, and the p value is less than 0.001. The F test result is significant ($p<0.001$), which proves that the model setting is reasonable. Comprehensively analyzing the results, we can confirm that perceived trust (TR) plays a significant positive moderating role in the relationship between interactivity (IT) and impulsive purchase intention (IB), thus supporting the moderating effect hypothesis H6a.

For the relationship between fidelity (RE) and impulsive purchase intention (IB), the coefficient of RE×TR interaction term is 0.157, corresponding t value is 5.228, and p value is less than 0.001, which confirms that perceived trust (TR) positively regulates the relationship between RE and IB: with the increase of perceived trust level, the promotion effect of RE on IB is strengthened. The explanatory power of the model was further improved to 69.7%, the incremental R^2 was 0.020, the corresponding F change value was 498.17, and the p value was less than 0.001. The F test of all models reached the significance level of 1%, which verified the validity of hypothesis H6b.

After adding the interaction term PE×TR into the model, the results show that the coefficient of the interaction term is 0.180, and the p-value is less than 0.001, which confirms that perceived trust (TR) significantly enhances the positive effect of quasi-personality (PE) on impulsive purchase intention (IB). This finding suggests that when consumers have high trust in the brand or platform behind the virtual anchor, the quasi-human characteristics of the virtual anchor are more effective in promoting consumers' impulse buying behavior. The explanatory power of the model was increased to 69.6%, the incremental R^2 was 0.022, the p value was less than 0.001, and the F test result was significant ($p<0.001$), indicating that the model was reasonable. Taken together, perceived trust (TR) plays a significant positive moderating role in the

relationship between quasi-personality (PE) and impulsive purchase intention (IB), supporting the moderating effect hypothesis H6c.

Table 8: Moderating effects of brand trust

Structural Model Paths	Factor	Standard Deviation	t-Value	p-Value	ΔR^2	Adjusted R^2	Result
IT $\times$ TR	0.179	0.032	5.507	0.000***	0.696	0.693	Accepted
RE $\times$ TR	0.157	0.030	5.228	0.000***	0.697	0.695	Accepted
PE $\times$ TR	0.180	0.031	5.886	0.000***	0.674	0.672	Accepted

6. Discussion

This multidisciplinary study integrates empirical analysis and theoretical deduction to systematically deconstruct how virtual anchors' technological affordances and emotional expressivity jointly influence impulsive purchase intentions. These findings converge with extant research on AI-mediated consumption behavior, reinforcing the pivotal role of human-computer interaction in driving consumer decision-making processes.

The analysis of mediating mechanisms reveals that different features influence consumer decisions through differentiated paths: realism works through both the perceptual pleasure and mind-flow experience paths, which is consistent with previous findings on multimodal sensory stimulation; interactivity relies mainly on the mediating path of mind-flow experience, which supports the theoretical view of the importance of cognitive immersion in digital interactions [51]; and anthropomorphic nature influences mainly through the perceptual pleasure path, which is consistent with previous findings on multimodal sensory stimulation. This finding corroborates with the research on emotional design of avatars [52].

Notably, the mediating pathway from interactivity to impulse consumption through perceived pleasure was non-significant. This null effect aligns with Interaction Load Theory [53], wherein excessive interaction may generate cognitive load that attenuates hedonic responses. Concurrently, the anthropomorphism $\rightarrow$ flow experience $\rightarrow$ consumption pathway remained unsupported, suggesting the uncanny valley effect's distinct manifestation in immersive contexts. This phenomenon finds parallel empirical support in related domains [54].

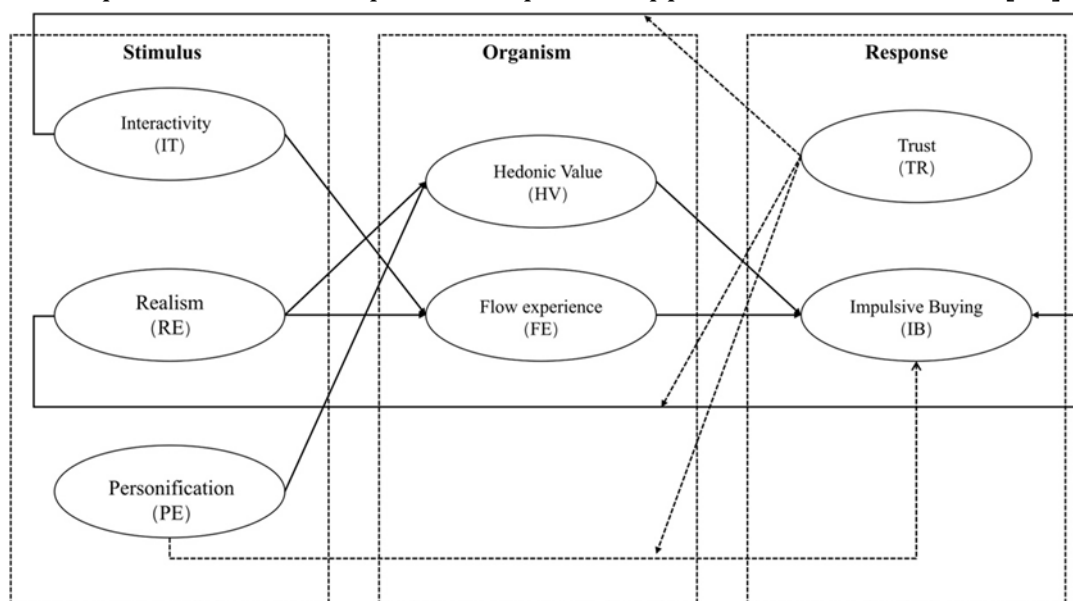


Figure 3: Research analysis.

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