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Research on Obstacles and Optimization Paths of Emotional Connection between Virtual Anchors and Consumers

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KEYWORDS

Virtual anchor;
Emotional connection;
Human-Computer interaction;
Optimization path

ABSTRACT

With the deep integration of artificial intelligence and virtual reality technology, virtual anchors have become an important media form in e-commerce platforms, news communication, and other fields. This article systematically analyzes the three core obstacles of technology, cognition, and operation in the emotional connection between virtual anchors and consumers, as well as the deep-seated causes. The research found that the rigid human-computer interaction at the technical level stems from the ceiling of motion capture simulation technology, the lack of trust at the cognitive level is rooted in the perception of emotional commodification, and the homogenization at the operational level is attributed to security dependence; the three-dimensional optimization path can effectively solve the above obstacles by strengthening sensory immersion, balancing real perception. This research addresses fragmented studies and offers theoretical and practical support for the industry's sustainable, high-quality development.

INTRODUCTION

With breakthroughs in key technologies including generative artificial intelligence (AIGC), virtual reality (VR), and real-time rendering, virtual anchors have rapidly advanced from the conceptual experimental stage to large-scale commercial application and have been widely deployed in various highly interactive scenarios. To illustrate, live e-commerce, brand marketing, news broadcasting, online education, and customer service, aiming to meet the diverse needs of enterprises and consumers for novel interactive forms in digital survival. However, behind the prosperity of the industry lies a core contradiction: the high-tech interactive medium itself is not equivalent to an effective emotional bond. A large amount of market feedback and preliminary research show that while virtual anchors achieve information transmission and visual attraction, they often find it difficult to establish a continuous, stable, and deep emotional connection with consumers[1]. This lack of emotional connection has become a key bottleneck restricting virtual anchors from upgrading from attracting attention to winning hearts, and from traffic tools to brand assets.

Continuous policy support empowers the industry. However, behind the technological iteration, insufficient emotional interaction has become a core bottleneck for the high-quality development of the industry. Although virtual anchors boast numerous advantages including 24/7 availability and customizable images, their user experience and emotional connection with consumers are significantly weaker than those of real anchors. Among them, the proportion of young Generation Z groups is relatively high. Emotional connection has become a key element for virtual anchors to break through homogeneous competition and build core barriers, and it is also the core starting point for their upgrade from tool attributes to value attributes. Academic research confirms the importance of this pain point. Existing research has confirmed that the emotional connection and trust between consumers and anchors are key variables affecting purchasing decisions and brand loyalty. Emotional computing theory and quasi-social interaction theory point out that the core value of human-computer interaction lies in emotional resonance, and natural emotional expression and accurate emotional response are the keys to emotional

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connection in virtual scenarios. However, in practical applications, virtual anchors still face multiple dilemmas: technically, interaction delays and rigid micro-expressions lead to emotional expressions that are similar in form but different in spirit; cognitively, consumers' psychological barriers to virtual identities form trust barriers; in terms of experience, standardized responses and homogeneous personas cannot meet personalized emotional needs.

Academic research has confirmed the importance of this practical pain point from multiple dimensions. Studies based on emotional computing theory, quasi-social interaction theory, and social presence theory generally point out that the ultimate value of human-computer interaction is not pure functional efficiency, but whether it can trigger emotional resonance. Consumers' purchasing decisions, brand attitudes, and long-term loyalty are largely influenced by the emotional connection and trust relationship they establish with interactive media. However, when mapping the theory to the specific scenario of virtual anchors, multiple real dilemmas can be found: in terms of technical performance, problems.To illustrate, interaction delays, rigid micro-expressions, and uncoordinated multi-modal information lead to emotional expressions that are similar in form but not in spirit; in terms of consumer cognition, a clear understanding of the essence of virtual identity forms a natural psychological barrier and trust barrier, and emotional expressions are often attributed to algorithm-driven mechanical performances; in terms of operational experience, standardized response scripts, homogeneous role settings, and utilitarian content design cannot meet consumers' growing personalized and deep emotional needs. These dilemmas are intertwined and jointly hinder the establishment of deep emotional connections.

Therefore, systematically sorting out the core obstacles in the process of emotional connection between virtual anchors and consumers, deeply analyzing the technical limitations, cognitive psychology, and operational logic behind them, and exploring collaborative and operable optimization paths on this basis is not only an urgent need to solve the current industry's pain point of advanced technology but insufficient experience, but also a response to the trend of cross-disciplinary integration of human-computer interaction, communication, and other disciplines, and promotes the transformation of artificial intelligence technology from functional realization to emotional and humanized value creation. Important theoretical topic.

1.Research Significance

1.1.Theoretical Perspective

Firstly, it helps to fill the core gap in the fragmented research on emotional connection of virtual anchors. Existing studies are mostly scattered in isolated discussions of technology implementation, user acceptance, or short-term marketing effects, lacking a unified analysis framework. This study focuses on the dynamic emotional interaction between virtual subjects and consumers, integrates multidisciplinary perspectives of computer science, psychology, and communication, and constructs a closed-loop analysis framework covering obstacle identification, cause analysis, and path optimization, aiming to incorporate scattered issues into a coherent logical system and provide structured analysis tools for subsequent research. Secondly, it breaks through the boundary of traditional emotional connection research relying on real subjects, extends the theory to virtual scenarios, analyzes the synergistic mechanism of technology and emotional attributes empowered by digital technology, clarifies the unique evolution path of emotional connection from technical interaction to emotional resonance, and enriches the theoretical application scenarios and connotations. Thirdly, it verifies the cross-disciplinary theoretical crossover adaptability and proposes a three-dimensional analysis framework of social presence enhancement, authenticity balance, and quasi-social relationship construction, providing a new paradigm for subsequent research. At the same time, it guides the industry to transform from traffic competition to emotional value competition model, reduces the waste of homogeneous resources, and improves the overall development quality of the industry. Fourthly, it promotes the industry to transform from technology accumulation to value cultivation, extending the core research logic of human-computer interaction from early video conferencing and virtual game scenarios to the emerging scenario of e-commerce platform with high dynamics and high commercial attributes, exploring the particularity of emotional interaction between virtual subjects and consumers, and guiding resources to high-quality directions. To illustrate, user emotional needs mining and original content design.

1.2.Practical Perspective

This research empowers multiple subjects and industrial

development: Firstly, it provides precise guidance for all parties in the industrial chain - technology research and development institutions clarify key research directions, operators avoid pitfalls. To illustrate, homogenization of persona, and brand owners obtain collaborative implementation paths. Secondly, the emotional connection between virtual anchors and consumers is not only a basic challenge in technical practice and commercial application, but also an important topic in user experience research in the digital economy era. First, the research on this topic helps to deeply understand the role of emerging technologies in human emotional interaction, which can not only provide enterprises with strategies to optimize consumer experience, but also strengthen consumers' brand identity, which has been verified by multiple cross-level studies[1]. The optimization of emotional connection is also related to the future expansion of virtual anchor application scenarios. By solving the existing obstacles, enterprises can further stimulate user loyalty and participation and bring more far-reaching economic benefits to the digital market[2]. It helps the industry to transform its development strategy, and the research guides the industry to shift from the competition mode of simply pursuing traffic growth and short-term conversion to a healthy mode of cultivating emotional value and long-term user relationship. By optimizing emotional connection, it can reduce the waste of resources caused by low-level homogeneous competition, improve the life cycle value of users, and thus promote the transformation of the entire virtual marketing industry to high-quality and sustainable development. At the same time, it provides inspiration for enterprises to build innovative business models. For example, by introducing immersive shopping experience and virtual spokesperson operation mode through virtual anchor technology, enterprises can effectively integrate online user resources and create sustainable commercial value[3].

Thirdly, it responds to the policy requirements of the digital economy, proposes an optimization framework based on China's market practice, provides reference for the global virtual industry, enhances international discourse power; at the same time, it helps consumers establish rational cognition, enhance emotional interaction experience, and realize the coordinated development of technological progress and humanistic care, providing practical guidance for the transformation from technology accumulation to value cultivation. Fourthly, it responds to the core controversies. To illustrate, whether virtual subjects can trigger real emotional resonance, clarifies the dialectical relationship of virtual emotional expression, and enhances consumers' virtual interaction experience. By optimizing the emotional response quality and personalized interaction ability of virtual anchors, it alleviates consumers' trust crisis in technology-simulated emotions and reduces the experience loss caused by emotional alienation - for example, allowing virtual anchors to have a full-chain dynamic ability of emotion recognition, empathetic response, and solution, and can not only express understanding for consumers' product anxiety, but also give personalized suggestions based on product characteristics to avoid the resistance caused by mechanical promotion rhetoric; at the same time, it reduces consumers' cognitive defense through transparent operation, and ultimately achieves a win-win situation for enterprise commercial value and consumer emotional needs.

2.Literature Review

2.1.Technology Development and Emotional Computing Research

As an emerging media form, technological iteration is the core support for virtual anchors to establish emotional connections with consumers, and its enabling role runs through the entire dimension of interaction form, response efficiency, and experience immersion. Early graphic rendering and motion capture technology realized the basic image concretization of virtual anchors, making them have the basic function of information transmission, but at this time, emotional transmission only stayed at the level of text and simple voice, and it was difficult to form effective emotional resonance. With the integrated application of AIGC technology and multi-modal interaction technology, virtual anchors have realized the coordinated synchronization of voice, expression, and body movements, which has significantly improved the simulation and adaptability of interaction. Wolter et al. proposed that Consumer-Company Identification (CCI) is one of the core mechanisms for building emotional connections, which is driven by consumers' interpretation of brand symbolic value, identity, and social significance[1].As an interactive medium between brands and consumers, virtual anchors can enhance consumers' social identity through customized image design and emotional interaction. However, research also points out

that if consumers are skeptical about the authenticity of virtual anchors, it may weaken this identity, thereby affecting brand loyalty and user engagement.

Today's artificial intelligence is still data-driven intelligence, and Machines' emotional expressions essentially stem from extensive data training. Emotional computing technology equips machines with the ability to recognize, understand, and express emotions, allowing them to respond to human emotional states in an anthropomorphic manner—providing corresponding emotional guidance, encouragement, or comfort to help people adjust their cognitive and emotional states[4]. It clarifies the core function of emotional computing technology, realizes anthropomorphic feedback through identifying, understanding, and expressing emotions, and helps humans adjust cognitive and emotional states; at the same time, it warns of technical limitations, and one-way emotional output may constitute potential manipulation, weakening human's autonomous control over their own emotional occurrence. However, scenario differentiation remains insufficient, risk argumentation lacks clarity, and a balanced perspective is missing — details like interaction modes, risk boundaries, and optimization paths tailored to application scenarios need supplementation.

2.1.Consumer identification and emotional connection mechanism

Nagy et al. once proposed the concept of imagination affordance, pointing out that people may have certain expectations for technology, and then shape the way they use and perceive technology, thus describing how technology mediates emotional experience. Imagination affordance regards certain characteristics of technology as emotional clues for users and regards technology as an emotional relational entity or social actor[5]. However, it does not define which technical features can be regarded as emotional clues, which makes it difficult to accurately locate key influencing factors in practice; secondly, it does not explain in which scenarios and cognitive states users develop emotional expectations for technology or whether differences exist in users' imagination affordance, and it overlooks scenario differentiation considerations. Two core conclusions have been formed around the marketing value of emotional connection: First, Emotional connection yields scenario-specific marketing effects, with stronger conversion in emotion-oriented product categories; second, the strength of emotional connection is positively correlated with the marketing effect, but excessive emotional marketing is easy to cause consumer resistance and form emotional fatigue. A quantitative relationship model between emotional connection and marketing effect remains absent, research on differentiated effects across age groups and consumption levels remains inadequate, and discussions on the long-term impact mechanism of emotional connection on brand asset accumulation remain scarce, and more focus is on short-term purchase conversion, ignoring the long-term marketing value of emotional connection, and failing to deeply reveal how this connection is constructed or hindered in a dynamic and contextualized interaction process,

To summarize, current research exhibits a clear gap: technology and effect-oriented studies dominate, with no in-depth qualitative description of consumers' subjective experiences and no systematic focus on the specific process of emotional connection. Therefore, it is urgent to deeply explore the specific emotional obstacles and their socio-psychological roots perceived by consumers when interacting with virtual anchors.

3.Core Obstacles and Cause Analysis of Emotional Connection between Virtual Anchors and Consumers

The construction of emotional connection between virtual anchors and consumers is essentially a collaborative process of technical interaction, cognitive identity, and operational adaptation in multiple dimensions. However, in actual scenarios, the emotional connection between virtual anchors and consumers still faces obstacles in three core levels: technology, cognition, and operation, and its causes are closely related to technical limitations, consumer psychological characteristics, and operational defects, and the specific analysis is as follows:

3.1.Technical Level Obstacles and Cause Analysis

The core technical obstacle is the fundamental bottleneck in establishing emotional connection. Firstly, the technical traces of virtual anchors may make it difficult for consumers to experience real emotions, increasing the psychological distance for users. Studies have shown that consumers' emotional acceptance of virtual characters largely depends on their perception of technical authenticity[6]. In addition,

the behavior patterns and emotional expressions of virtual anchors cannot currently fully reach the level of human interaction subtlety, thus limiting the possibility of deep emotional interaction. Secondly, the shortcomings in realistic expression lead to incomplete transmission of non-verbal cues, to illustrate, stiff facial expressions, asynchronous lip movements and speech, and mechanical body movements. When expressing apology, a few virtual characters can only complete the action of bowing their heads, but cannot present accompanying emotional signals, to illustrate, frowning and slowing down their tone; when expressing joy, they can only complete the switching of smiling expressions, but lack details, to illustrate, bright eyes and slight body shaking. These details are the core elements of conveying real emotions and building social presence, and their incompleteness will directly reduce consumers' emotional involvement.

The social presence of virtual anchors plays a crucial role in emotional connection. However, due to technical limitations, the facial expressions, vocal tones, and multimodal emotional coordination of virtual anchors still need further optimization. For example, one study pointed out that virtual anchors appear relatively stiff in emotional performance, which leads to consumers questioning their authenticity, weakening emotional resonance and interaction effects[7]. From the perspective of cognitive bias in realism, a few technology research and development excessively pursue objective realism. When the realism reaches a certain threshold, it exposes the mechanical nature of emotional expression due to over-realism — for example, the facial details of a certain high-realism virtual anchor can clearly show pores, but when responding to consumers' emotional appeals, the expression switching is stiff and lacks transition. This contrast between high-realism form and low-realism emotion triggers a strong sense of incongruity in consumers, making emotional responses superficial and difficult to resonate with.

The deep-seated causes of technical obstacles stem from multiple constraints of R&D orientation, technical bottlenecks, and market reality. Firstly, technological R&D direction suffers from deviations. The goal setting of abundant technical breakthroughs is to improve hard indicators. To illustrate, graphics rendering resolution and increase the capacity of the action database, rather than focusing on optimizing the ultimate user's social presence and subjective perception of authenticity. This technology-for-technology's-sake orientation leads to a mismatch between technological upgrades and the need for real emotional connection. Secondly, core technical bottlenecks restrict the implementation of theories. Micro-expression capture technology remains immature and cannot accurately capture consumers' emotional fluctuations to deliver matched emotional responses. The current mainstream emotional computing algorithms have insufficient accuracy in identifying complex emotions (anxiety with anticipation, satisfaction with hesitation), and micro-expression capture technology is also difficult to restore key emotional signals. To illustrate, human eye micro-movements and subtle upward movements of the corners of the mouth, which makes it difficult to supplement the authenticity of interaction and to crack the cognitive bias of realism. Thirdly, cost restricts the popularization of high-quality technologies. Building a virtual anchor that can conduct high-naturalness emotional interaction requires huge capital investment in hardware equipment, algorithm research and development, and content production, which is far beyond the affordability of small and medium-sized businesses and individual creators. As a result, the market is filled with many virtual anchors that use low-cost, templated technical solutions, which have limited interaction capabilities and further solidify consumers' negative perception of virtual anchors' emotional dullness.

3.2.Cognitive Obstacles and Causes

The essence of cognitive obstacles is the lack of real sense of identity and the emotional involvement obstacles caused by insufficient social presence. Firstly, questioning the sincerity of emotions is the core pain point. Consumers generally attribute the emotional expression of virtual anchors to technical simulation, believing that they lack a real emotional core. This denial of subjective authenticity makes it difficult for them to generate emotional resonance. Consumers' trust in virtual anchors largely depends on their anthropomorphic characteristics and the naturalness of emotional expression. For example, if consumers feel a mechanical response after confiding their consumption confusion to a virtual anchor, they will feel a sense of loss from talking for a long time, and then completely give up emotional interaction; secondly, the designed attribute of virtuality strengthens cognitive defense, and the low willingness to connect emotionally is a direct manifestation

of insufficient emotional involvement. Consumers know that their words and deeds are driven by algorithms, and behind them is the commercial purpose of enterprises, which further questions the sincerity of emotional expression. Virtual anchors usually rely on facial expressions, voice content, and text information to convey emotions, but mismatches in cross-modal emotional elements may trigger emotional cognitive conflicts in the user experience.

Research has found that when the voice tone of virtual anchors is inconsistent with the text emotional information, consumers' sense of participation in their interaction decreases significantly [8]. They believe that the care and empathy shown by virtual anchors to consumers are all to promote sales, rather than real emotional care. This cognitive defense directly hinders the establishment of emotional connection, especially in scenarios with strong emotional needs. To illustrate, emotional expression, personalized consultation, this sense of rejection is more obvious. Consumers believe that virtual anchors cannot replace the genuine emotional interaction offered by real anchors and thus naturally resist establishing deep emotional connections with virtual influencers. At the same time, in the context of globalization, consumers of different cultures have significant differences in the emotional expression of virtual anchors. For example, Eastern consumers tend to accept gentle and polite interaction styles, while Western consumers prefer humorous or direct expressions. If virtual anchors fail to integrate different cultural symbols in the design and interaction process, it may reduce their cross-cultural emotional connection ability[9].

The deep-seated causes are highly related to the essential characteristics of virtual interaction and the current situation of the industry: First, emotional connection depends on the perception of the presence of real subjects, while virtuality lacks autonomous emotional experience and initiative, and cannot meet the human need for real emotional communication; The essential need for human emotional connection has a natural contradiction with virtual attributes. The establishment of emotional connection depends on two-way real emotional resonance, while virtuality lacks autonomous emotional experience and initiative, and cannot generate real emotional resonance like humans, and can only simulate emotional expression through algorithms. This one-way simulation interaction mode is difficult to meet the human need for real emotional communication.Secondly, the stronger the perception of high fidelity but non-realness among digital consumers, the lower the subjective authenticity score and the more difficult it is to establish emotional trust. In addition, industry chaos intensifies cognitive biases, and several merchants engage in deceptive virtual promotions — for instance, one merchant's virtual anchor concealed its virtual nature and recommended products under the guise of real-person reviews, which triggered an industry trust crisis after being exposed, leading more consumers to question the virtual emotional expression, and further strengthened consumers' cognitive labels of virtual non-realness and utilitarianism.

3.3.Operational Obstacles and Causes

Operational obstacles make it difficult to continuously deepen emotional connection. First, the homogenization of personality is serious, and it is impossible to build differentiated emotional involvement points. In practical applications, virtual anchors usually adopt standardized image design and operation strategies to achieve scale and economic benefits. However, this templated design is difficult to meet consumers' needs for personalized interaction. Studies have shown that content homogenization reduces long-term consumer interest and weakens the depth of emotional connection[10]. The same young and lively personality is difficult to match the emotional preferences of different consumer groups - for example, for the health category live broadcast for middle-aged and elderly groups, it is difficult to establish a sense of trust by adopting a young and lively personality; for the trendy play category live broadcast for Generation Z, the use of a serious expert personality lacks appeal and cannot form a continuous emotional resonance. Overly focusing on the content design of product promotion makes emotional expression a marketing tool, which is difficult to match the emotional preferences of different consumer groups and cannot form a continuous sense of emotional presence.

Secondly, personalized interaction design, emotional depth, and customization are lacking — quantities of operation teams rely on fixed rhetorical templates, leading to mechanically repetitive interaction modes. It is impossible to adjust emotional expression according to consumer behavior. The operation team has insufficient professional ability and lacks relevant experience in emotional interaction design. The emotional expression in the script is often rigidly spliced with product introduction, lacking natural transition

and narrative, which seems utilitarian and insincere. A deeper problem is that the operation lacks the ability to dynamically adjust interaction strategies and emotional responses based on user real-time feedback and historical behavior data. The interaction is always a "one-to-many" broadcast mode, rather than a "one-to-one" dialogue mode. The use of the same welcome rhetoric can neither make old users feel exclusive, nor can it make new users feel guiding, and the interaction effect is greatly reduced, and the abrupt expression of emotional expression and product introduction in a few scripts further weakens the emotional authenticity.

Operational obstacles stem from systemic problems in strategic orientation, capability system and resource allocation. First, corporate operating goals are generally short-sighted. The assessment of virtual anchors is mostly focused on immediate conversion indicators, the number of viewers, click-through rate, and sales of the live broadcast, while insufficient attention is paid to long-term indicators related to the quality of emotional connection. To illustrate, emotional trust, user stickiness, and long-term repurchase rate. This KPI baton leads to the natural inclination of operating resources towards promotional activities that can quickly drive sales, ignoring the emotional content design and relationship maintenance that require long-term investment and patient cultivation, making the operating strategy run counter to the long-term goal of emotional connection. Second, the ability of emotional operation is insufficient. The operation team lacks the professional ability of virtual anchor personality shaping and emotional interaction script design, and it is difficult to effectively combine product information with emotional needs. They have not mastered the design method of continuous emotional involvement, nor do they have the skills to shape emotional authenticity. It is difficult to effectively combine product information with emotional needs. Most operation teams are transformed from traditional e-commerce operators, lack relevant experience in virtual subject interaction design, and do not consider the virtual characteristics and consumer cognitive differences. Third, the uneven distribution of resources exacerbates the imbalance of operations. Head platforms and brands can rely on sufficient funds and talents to form a professional emotional operation team responsible for virtual personality polishing, script refined design and data monitoring optimization; while small and medium-sized businesses are limited by funds and talents, and cannot carry out refined emotional operation, and mostly adopt templated scripts and homogeneous personalities, which further magnifies the negative impact of the lack of authenticity and insufficient emotional involvement.Fourth,an effective evaluation system for operational effects remains absent. Enterprises mostly evaluate operational effects based on indicators traffic and conversion and have not established evaluation indicators related to emotional connection, which cannot accurately perceive the effect of emotional connection, and it is difficult to optimize operational strategies in a targeted manner.

3.4.Core Obstacles and Causes Thinking Flow Chart

To present the obstacle configurations and interaction mechanisms of the technical, cognitive and operational dimensions of the system, this paper constructs the following thinking flowchart. This chart aims to condense the core representations and underlying causes at each level and reveal the element correlations and logical transmission paths among them, thereby providing a structured analysis framework for comprehensively grasping the obstacle spectrum of the emotional connection between virtual hosts and consumers.

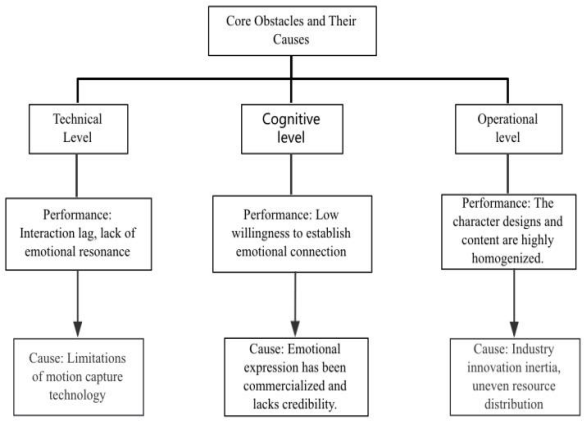

Fig.1. Core Obstacles and Causes Thinking Flow Chart

4.Construction of Optimization Path for Emotional Connection between Virtual Anchors and Consumers

In response to the three major obstacles of technology, cognition, and operation, combined with the requirements of quasi-social interaction theory for emotional resonance, an optimization path is constructed from the three dimensions

of technology upgrade, cognitive guidance, and operational innovation to help establish and deepen the emotional connection between virtual anchors and consumers. A multi-dimensional collaborative optimization framework is an effective paradigm for improving the emotional connection effect of virtual subjects.

4.1.Technical Upgrade Path

The lack of social presence is the core problem of the technology, it is necessary to strengthen the sense of immersion and naturalness through technological iteration. On the one hand, upgrade multi-modal perception and expression technology, introduce high-precision capture equipment and generative AI models, focus on optimizing micro-expression dynamic simulation algorithms, and build a multi-modal emotional database covering different scenarios and different emotional types to improve the accuracy and timeliness of emotional recognition, so that consumers can intuitively feel the instant feedback and emotional synchronization of virtual anchors. On the other hand, Virtual anchor design can integrate additional features — machine learning can enhance humorous expression, emotional care, and personalized voice templates to narrow the perceived human-machine distance. Anthropomorphism can significantly improve the emotional credibility of virtual characters and users' willingness to accept[11]. Build a multi-modal emotional database covering rich scenarios, diverse groups of people, and complex mixed emotions, dynamically generate matching emotional responses with personal style imprints, and achieve a leap from response to echo. Sort out the types of emotional appeals in different consumption scenarios, and reverse deduce the key technical parameter standards. To illustrate, interaction response speed and non-verbal cue transmission accuracy to ensure that technical optimization accurately matches emotional transmission needs. At the same time, expand the non-verbal cue database of facial micro-expressions and body movements, and enhance the collaborative improvement of emotional presence and cognitive presence.

Secondly, break through the bottleneck of core technologies. Aiming at the shortcomings of emotional computing and micro-expression capture, adopt the AIGC and emotional big data fusion training mode, relying on the mature algorithm framework in emotional interaction technology research, so that virtual anchors can dynamically adjust emotional response strategies according to consumers' tone and comment mood fluctuations to avoid templated expressions. Thirdly, optimize the cost supply model, draw on the application experience of technical modularization, and reduce the virtual development threshold for small and medium-sized businesses through open source algorithm integration and basic function standardization, and build a tiered technical solution from the basic version to the advanced version: the basic version covers core emotional interaction functions (simple emotion recognition, standardized emotional response, and basic non-verbal cue transmission) to meet the basic needs of small and medium-sized businesses; the advanced version provides personalized emotional interaction functions, Augmented Reality (AR) and Virtual Reality (VR) technologies can build more immersive interactive scenarios for virtual anchors, thereby strengthening consumers' sense of social presence when participating. For example, adding real-time dynamic feedback technology can make the emotional performance of virtual anchors closer to real people[12]. At the same time, reduce the technical access cost for small and medium-sized businesses to ensure that basic interactive realism can be achieved under different resource conditions.

4.2.Cognitive Guidance Path

The core of cognitive guidance is to transparentize virtual identities and build emotional real cognition to eliminate consumers' trust barriers. First, actively inform the virtual attributes and operating entities through opening introductions, interface annotations, to avoid cognitive confusion; at the same time, design sincere interaction scripts that are close to daily life, reduce rigid promotion rhetoric, and increase emotional listening, empathetic responses, and enhance the anthropomorphic personality of virtual anchors by adding humorous expressions, emotional care, and interactive micro-expressions. Research shows that the improvement of credibility can effectively enhance consumers' willingness to purchase and the intensity of emotional connection[10];based on the research conclusions in the field of human-computer interaction on the transparency and trust construction of virtual subjects, abandon the single identity notification mode and adopt a layered strategy of basic disclosure and in-depth interpretation: the basic layer clarifies its virtual attributes and core functions through the top announcement of the live

broadcast room and the 30-second self-introduction of the virtual opening to avoid consumers' excessive expectations of objective authenticity due to identity confusion. This transparent disclosure will not weaken emotional involvement but can enhance the perception of subjective authenticity through sincere communication and lay the foundation for emotional connection.

Secondly, build a precise matching system of group portraits, emotional needs, and scenario design to strengthen differentiated emotional involvement experiences. Design customized interactive scenarios for the cognitive characteristics and emotional appeals of different consumer groups: for example, for young consumer groups, create trendy companion-type interactive scenarios, combine hot topics to carry out relaxed emotional communication, and enhance the sense of companionship based on the theory of social presence; for middle-aged and elderly consumer groups, build professional assistant-type scenarios, reduce cognitive defense through clear information transmission and patient problem solving, and enhance emotional trust. For groups seeking professional advice, they should create a stable, reliable, and knowledgeable personality and provide logical and caring answers. Through precise matching, effectively penetrate cognitive defenses and establish emotional closeness. At the same time, incorporate low-pressure interaction principles into scenario design, allowing consumers to independently control the interaction rhythm and avoid excessive emotional guidance causing resistance. Build a trust endorsement system of industry norms, corporate self-discipline, and third-party supervision to break the cognitive prejudice caused by industry chaos. Carry out hierarchical evaluation of the authenticity of emotional expression and the accuracy of information transmission, introduce authoritative institutions to carry out virtual trust rating, and strengthen consumers' cognition of virtual reliability and sincerity through external endorsement to clear cognitive obstacles for the construction of social presence.

4.3.Operation Innovation Path

Operation innovation should be guided by enhancing social presence and balancing authenticity to create differentiated emotional resonance. First, deeply cultivate differentiated persona shaping to strengthen the sustainability and uniqueness of emotional involvement. Abandon the homogeneous label-based persona design and adopt the positioning logic of emotional pain point matching and personality trait segmentation: first, lock the core emotional appeals of the target group through user portrait analysis, and then design personality traits that are both recognizable and emotionally warm. To illustrate, creating a best friend-type beauty consultant for young female groups, combining professional answering ability and empathetic sharing attributes; create a technical house partner for male groups, and establish resonance with a rigorous, professional and interesting style. At the same time, design scenario-based interactive sessions, encourage user co-creation, naturally integrate brand value into the interaction, and realize the synergistic improvement of emotional resonance and brand recognition. Establish a management system for persona consistency, clarify the normative standards for the virtual anchor's language style, facial expressions, value propositions, and other core elements, and effectively enhance social presence.

Secondly, upgrade the interactive script design, weaken utilitarian perception, and enhance subjective authenticity. Construct a three-dimensional script framework encompassing scenario-specific, emotional, and personalized elements: at the scenario-specific level, break free from the constraints of a single promotional scenario and expand into diverse scenarios—product usage simulation, consumer pain point resonance, and industry knowledge popularization, adding a scenario of answering parenting questions for novice mothers in the maternal and infant product live broadcast, and enhance emotional substitution through real scenario restoration; at the emotional level, reduce rigid sales rhetoric and increase empathetic expressions,sharing the story behind product development, real user feedback, to weaken the mechanical sense driven by algorithms and alleviate the authenticity paradox through sincere narration; at the personalized level, establish a user tag system, accurately match script content according to users' consumption history, interaction preferences, emotional tendencies, and other dimensions, and explore the application of virtual anchors in emerging fields, to illustrate, education and medical care, serving as an interactive assistant for online courses or providing emotional support in mental health counseling. Multi-scenario not only expands the coverage of virtual anchor applications but also helps to deepen emotional connections with consumers in different fields[13]. Dynamic update mechanism, optimize

content every week based on hot topics and user feedback.

Thirdly, improve the assessment and resource allocation system to provide guarantee for long-term emotional operation. In terms of the assessment mechanism, establish a dual-oriented assessment system of emotional value and short-term transformation, and incorporate indicators. To illustrate, user stay time, emotional interaction frequency, emotional trust score, repurchase rate, and user recommendation willingness into the assessment to guide operational resources to emotional connection construction. In terms of resource allocation, build a hierarchical empowerment system: head platforms and brands can form professional emotional operation teams to be responsible for virtual persona polishing, script refined design, data monitoring and optimization, user emotional needs analysis; for small and medium-sized businesses, launch low-cost operation toolkits, including standardized emotional interaction templates, persona positioning tools, user tag management systems, script optimization guidelines, to reduce the threshold for refined operation. At the same time, establish an operation effect feedback closed loop, and regularly evaluate the emotional connection effect through user questionnaires, comment sentiment analysis, interaction data tracking, emotional trust evaluation, and other methods to form a closed-loop mechanism of data collection, effect analysis, strategy optimization, landing execution, and then re-evaluation to ensure that operation measures always fit the emotional needs of consumers and the goal of shaping authenticity, and dynamically adjust operation strategies.

In summary, technology upgrade is the basic guarantee for enhancing social presence, providing underlying support for natural interaction; cognitive guidance is the key to balancing real perception and helping to establish deep trust; operation innovation is the core path to deepen emotional resonance and strengthen connection stickiness. The three work together and advance together to fully solve the core obstacles, realize the harmonious unity of virtual identity and real emotion, promote the stable establishment and long-term deepening of emotional connection between virtual anchors and consumers, and ultimately achieve a win-win situation of commercial efficiency and humanistic care, leading the virtual anchor industry to a new stage of high-quality development with emotional value as the core.

Conclusions

Core Conclusions

This study systematically explores the core obstacles, causes, and optimization paths of emotional connection between virtual anchors and consumers. The core conclusions are as follows: First, the core obstacles to emotional connection between virtual anchors and consumers present a synergistic constraint of technology, cognition, and operation. Among them, the lack of presence maintenance and insufficient shaping of authenticity at the operational level are the key bottlenecks for the emotional connection to continue to deepen, specifically manifested in problems. To illustrate, homogenization of persona, utilitarian scripting, and short-sighted assessment, which are essentially that the operational strategies have not effectively matched the core guidance of the two major theories. Second, the optimization path at the operational level needs to build a three-dimensional long-term mechanism of persona cultivation, script upgrading, and system guarantee. It strengthens social presence through the differentiated persona shaping of emotional pain point matching, alleviates the authenticity paradox by upgrading the script with scenarios, emotions, and personalization, and provides guarantee for emotional operation by relying on dual-oriented assessment and hierarchical resource allocation. These three paths form synergy with technical and cognitive level optimization measures to jointly solve the emotional connection obstacles. It ensures that the operational measures are precisely directed to the core needs of emotional connection.

Research Limitations and Future Directions

This study still has several limitations: first, research primarily focuses on three dimensions — technology, cognition, and operation — and fails to fully consider how differences in emotional needs across consumer groups impact obstacle perception and optimization path adaptability; For example, the younger Generation Z and middle-aged and elderly groups have significant differences in the emotional perception threshold and interaction preferences of virtual anchors, which leads to the limited universality and precise adaptability of the research conclusions; Secondly, external environmental variables associated with policy supervision have not been considered.

At present, the relevant laws and regulations of the virtual live broadcast industry are still not sound, and the regulatory guidelines have not been refined, and policy orientation and regulatory requirements may directly affect the operational strategies of enterprises and then act on the emotional connection construction process. The existing research does not explore the potential impact of this external constraint on the emotional connection effect; Thirdly, the dynamic mechanism of emotional connection is not fully explored. The existing research focuses on the static obstacles and optimization paths of emotional connection and does not pay attention to the long-term dynamic change process of emotional connection from establishment, deepening to attenuation, and it is difficult to reveal the core influencing factors and stability laws of emotional connection in different stages.

Future research can carry out differentiated research on sub-groups, focusing on the emotional needs differences of different groups (teenagers, middle-aged and elderly), different industries (FMCG, durable goods) and different live broadcast modes; By expanding multi-scenario comparative research, explore the obstacle differences and adaptive optimization paths of virtual anchor emotional connection in different application scenarios, and explore the differentiated adaptation strategies of operational optimization paths to improve the scenario pertinence of research conclusions. Longitudinal tracking, case historical analysis and other methods can be used to explore the key influencing factors in different stages, the stability mechanism of emotional connection and repair strategies, so as to provide more forward-looking management insights.

In combination with the continuous development of AIGC and real-time interaction technologies, the operation mode of virtual anchors will usher in new changes, and explore generative AI's application in dynamic script generation and intelligent persona optimization, along with the balance mechanism between operational efficiency and emotional connection effects under technological empowerment. Proactively explore how these new technologies will reshape the possibilities and paradigms of emotional connection, for example, what new challenges and optimization opportunities will highly autonomous AI personalities and immersive holographic interaction bring. Through interdisciplinary research perspectives, deeply explore consumers' emotional cognitive mechanisms of virtual anchors, further enrich the theoretical connotation of operational optimization paths, and provide more comprehensive theoretical support for the deep construction of emotional connection between virtual anchors and consumers.

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