

Virtual Anchors in the Metaverse: Exploring the Future of Live Broadcasting in the Digital Age

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Abstract. As the barrier to entry for live content production diminishes, virtual anchors, employing avatars to engage with audiences, have gained significant traction. The global VTuber market has seen consistent growth, projected to be a dominant force with the Metaverse's increasing prominence. The paper investigates the rise of virtual anchors in the live broadcast industry amidst the rapid expansion of the Internet, examines the operational models, profit methods, and connections between virtual anchors and the Metaverse. It employs data from research and case studies and literature review to explore the potential of virtual live broadcasting. While virtual anchors present advantages like non-stop live broadcasting, they face authenticity and real-time interaction challenges. Integrating virtual live broadcasting with the Metaverse offers unique opportunities for deeper audience engagement and diversified revenue streams. However, ensuring user privacy and addressing authenticity concerns are crucial. The paper concludes by emphasizing responsible growth and innovation to unleash the full potential of virtual live broadcasting within the dynamic realm of the Metaverse.

Keywords: Virtual Anchors, Virtual Live Broadcasting, Metaverse.

1. Introduction

The rapid expansion of the Internet has given rise to various industries, with the live broadcast industry being one of the prominent beneficiaries. However, with the increasing number of individuals entering this industry, the barrier to entry for live content production has significantly diminished, resulting in a high turnover rate among live broadcast anchors. In response to this phenomenon, a new type of anchor known as virtual anchors has emerged on the internet. These virtual anchors employ avatars to engage in live broadcasts and interact with audiences on video platforms, gaining significant traction over the past five years. The virtual anchor market has experienced consistent growth, with the global VTuber (Virtual YouTuber) market estimated at USD 2188.32 million, projecting a compound annual growth rate of 35.03% during the forecasted years [1]. As the Metaverse gains prominence, virtual live broadcasting has attracted greater attention. The unique operational formats and revenue models associated with this form of broadcasting have captivated numerous investors and followers. This research aims to explore whether virtual live broadcasting can emerge as the dominant form of live broadcasting in the future, particularly within the context of the Metaverse's influential impact. It further investigates potential changes in the existing operational models due to the development of the Metaverse and new technologies. Additionally, the research examines the prospects of expanding or transforming profit methods in the future development of virtual live broadcasting.

This research paper focuses on the promotion of virtual anchors within industry culture, their operational and profit models, and their connection with the Metaverse. To address the research objectives outlined in the introduction, an extensive review of existing literature, academic papers, industry reports, and relevant publications will be conducted to gain a comprehensive understanding of the virtual anchor market, the evolution of live broadcasting, the emergence of the Metaverse, and related technological advancements. This information will be analyzed and synthesized to identify research gaps and establish a theoretical framework.

The paper will incorporate relevant case studies of successful virtual anchors or virtual live broadcasting platforms to provide practical insights and examples. These case studies will analyze

their operational models, revenue streams, technological implementations, and user engagement strategies to understand the factors contributing to their success and the challenges they face. This analysis will assess the advantages and disadvantages of virtual live broadcasting compared to traditional methods.

By employing these research methodologies, this paper aims to shed light on the prospects and implications of virtual live broadcasting within the dynamic landscape of the Metaverse, contributing to the broader understanding of the evolving media and entertainment industry.

2. Organization of the Text

2.1. An Overview of the Virtual Anchor Industry

2.1.1. Definition and origin of virtual anchor

In essence, a virtual anchor, referred to as a Virtual YouTuber or VTuber for short, is an artificially generated character that uses speech synthesis and animation technology to actively participate in live broadcasts, singing, interactions, and diverse activities on Internet media platforms, with YouTube being the primary platform at its inception. These virtual anchors are distinct entities possessing distinct personalities, images, and characteristics, facilitating their practical engagement with their audiences. Notably, specific virtual anchors have recently achieved celebrity-like status, attracting a massive following of fans. Virtual anchors have gained widespread popularity in Japan and are gradually establishing themselves in the Chinese media landscape [2].

The operation of a virtual anchor revolves around one or more Live 2D or 3D images driven by a motion capture "middle-man" actor. Meticulously, creators craft the virtual anchor's character image by meticulously devising background stories, experiences, and appearance descriptions. Regarding visuals, the production costs and technical barriers for Live 2D virtual anchors are relatively low, resulting in a flat effect. On the other hand, 3D virtual idols present more dynamic and lifelike performances, with superior visual effects, but demand higher production costs [3].

When shaping virtual anchors, creators often align their appearance, body proportions, and clothing styles with current fashion trends or the preferences of specific audience segments. This approach ensures that virtual anchors appeal to their target audience and remain relevant in their engagement with viewers.

2.1.2. History and technical development of virtual anchors

Before 2011, the advancement of computer technology paved the way for the widespread adoption of various related technologies, such as computer graphics and network streaming media. This, in turn, gave rise to online communities and the flourishing of subcultures like Japanese idol culture, virtual idol culture, and webcasting, which formed the essential technical and cultural groundwork for the emergence of virtual UP masters.

Between 2011 and November 2016, motion capture technology gained popularity, leading to the utilization of avatars as intellectual property (IP) or personalized representations. Furthermore, the concept of cross-media was extensively developed during this period. Numerous individuals and projects embraced avatars to engage in various activities, resulting in further exploration and promotion of their concepts and operating models. YouTube and Bilibili experienced rapid growth as video platforms, particularly in the User Generated Content (UGC) mode.

Post-2014, China's perception of Japan underwent gradual warming, creating technical and cultural readiness for the advent of virtual UP masters. As of 2017, the number of virtual anchors skyrocketed in Japan and China, South Korea, and other regions. The virtual anchors' imagery became increasingly diverse, encompassing girls, animals, and robots. Moreover, their manifestations extended beyond webcasts and animations, encompassing virtual concerts and other innovative forms.

Since 2019, the number of virtual anchors has reached its pinnacle, branching into various fields, including gaming, news, entertainment, and education. The modes of expression for virtual anchors

have also expanded dramatically, incorporating novel content formats incorporating AR/VR technology alongside traditional webcasts and animations [2].

2.1.3. Construction of virtual live broadcast room and operation of virtual anchor

Virtual anchor, operates by capturing real-time movements and expressions of real individuals through specialized software, enabling synchronization between the virtual image and the person's actions. Consequently, the live content presented by the virtual anchor represents a stylized two-dimensional rendition of real-time actions. Creating a virtual anchor image involves three essential stages: "drawing, splitting, and modeling" [4].

The first step -is "Stand-up painting," which entails crafting character images with transparent or solid-color backgrounds. This stage establishes the fundamental visual elements of the virtual character, including facial features, hairstyles, and attire. "Splitting," as the second step, involves the meticulous disassembly of each part of the avatar image. The finer the disassembly, the more fluid and lifelike the avatar's subtle movements become during motion. The "modeling" step is of utmost importance to ensure the virtual character flawlessly replicates the expressions and movements of real individuals through motion capture.

However, completing the modeling process is the initial step in introducing the virtual anchor. To achieve live broadcasts that seamlessly integrate the VUP's movements with its avatar, additional processing and debugging are required, utilizing specialized live broadcast software.

Currently, widely used motion and facial expression capture software in the market include VTB, Acfun face capture assistant, Bilibili live with plug-ins, and Prpr live software on the Steam platform [4]. After modeling, the motion and facial expression data are compressed and imported into the software. Through careful debugging, it is ensured that the camera effectively captures the movements and expressions of the person on the scene, allowing the avatar to move in real-time synchronization with the person's actions. Once this seamless synchronization is achieved, the live broadcast can commence.

2.2. Operation and Profit Analysis of the Virtual Anchor Industry

2.2.1. Audience analysis of virtual anchors

Based on the data from the questionnaire survey titled "Analysis of Consumption Behavior in the Virtual Idol Industry," the profiles of virtual idol audience groups can be summarized as follows: predominantly young people with middle-to-high-income levels, consisting of numerous new users with strong inclinations towards consumption [5]. A statistical examination of virtual idol consumer preferences reveals that virtual idol audiences prefer dynamic attention and tend to engage with live broadcasts, birthday party social media, and other interactive formats. When it comes to social media platforms, virtual idol audiences show a preference for platforms like Bilibili and Shake Music. Virtual idol audiences primarily employ social media interaction, voting, and purchasing peripherals to support virtual idols.

Statistical analysis further reveals the reasons behind the need for more enthusiasm from potential virtual idol audiences. The primary reasons for their disinterest in virtual idols include aesthetic non-conformity, concerns over chaotic fan circles, and relatively smaller audience sizes than traditional idols.

Based on the structural equation model analysis, it is evident that ability perception and image construction positively impact information perception [5]. Moreover, capital support also positively influences both information perception and image construction. Furthermore, the study reveals that ability perception, information perception, image construction, and capital support all positively shape consumption intentions among virtual idol audiences (see Table 1). These findings highlight the significance of all four factors in fostering the willingness of virtual idol audiences to engage in consumption activities.

Table 1. Model regression coefficients table

Factor	Variable	Coefficient	Standard Estimate	Standard Error	
Ability Perception	Information Perception	0.712	0.716	0.052	12.758
Image Construction	Information Perception	0.310	0.264	0.048	6.757
Capital Support	Image Construction	0.852	1.000	0.106	7.979
Capital Support	Consumption Willingness	0.524	0.358	0.060	8.687
Image Construction	Consumption Willingness	0.911	0.657	0.070	12.686
Ability Perception	Consumption Willingness	0.658	0.987	0.077	8.436
Information perception	Consumption Willingness	0.686	0.991	0.078	8.436
Capital Support	Consumption Willingness	0.664	0.989	0.077	8.436

2.2.2. Commercial value and profit model of virtual anchors

From an application standpoint, virtual humans serve diverse fields, such as film and television, media, gaming, finance, cultural tourism, education, medical care, and retail [6]. They find relevance in specific scenarios like virtual Internet celebrities, virtual concerts, virtual brand spokespersons, virtual idols, film and television production, star avatar virtual idols, live streaming, virtual meetings, virtual exhibitions, company business assistance, academic research, and virtual tour guides, among others.

The monetization methods employed by virtual individuals primarily include live streaming rewards or goods, commercial performances, brand endorsements, and appearances in film and television variety shows [7].

Through live broadcast rewards or deliveries, virtual anchors earn income by receiving fees and virtual gift rewards during their live broadcasts. The commercial value of virtual anchors has become increasingly evident, especially due to their capacity to conduct live broadcasts all the time. Commercial performances present another lucrative avenue, with virtual idols generating income from virtual concerts and music singles. These concerts can take place both online and offline, with offline events relying on sponsorships from advertisers and ticket sales, while online events garner revenue from ticket fees and live broadcast tipping fees. Brand endorsements offer avatars the opportunity to promote companies and expand their market presence. Celebrity avatars earn income through IP authorization fees and product endorsement fees. Virtual online celebrity KOLs collaborate with skincare, beauty makeup, and fashion companies to secure brand endorsement fees. Avatars contribute entertainment value to variety shows and films and television works by actively participating in their recordings. This application is widespread, featuring digital singer Qiu Ling in the first domestic satellite TV virtual variety show "2060," the red-armored warrior in "Assassination of Novelists" [6,7].

2.2.3. Competitive landscape of virtual anchors

Due to its easily accessible entry point and straightforward technical requirements, the virtual anchor industry has experienced a significant influx of participants, intensifying the competition within the market. Consequently, virtual anchors have a notable income polarization, with the top-ranking, well-known ones amassing the most earnings. In contrast, lower-ranked virtual anchors need help generating profits and may even resort to spending money to maintain their fan base and visibility.

Furthermore, the existing sharing system on live broadcast platforms, coupled with unfavorable contractual arrangements by companies, creates a challenging environment for lesser-known anchors, hindering their potential for growth in the industry. Regarding market competition, the domestic and foreign virtual digital human market landscape is still in its developmental stages, featuring relatively high industry concentration. A significant gap exists between domestic and foreign competition in specific market segments. Foreign countries excel in appearance details, preset templates, and supporting systems, giving them a considerable advantage.

In other markets, foreign users predominantly employ consultant/assistant virtual digital humans for emotional support, customer care, and applications for creating virtual digital humans. However,

these fields are less extensively developed in China, where domestic players prioritize scenarios like virtual customer service and increasingly focus on virtual live broadcasts [7].

2.3. Forecast of the Development Prospect of the Virtual Anchor Industry

2.3.1. Limitations of virtual anchors

Despite garnering attention from numerous new groups, virtual anchors can also serve as complementary elements in developing the Metaverse. Nonetheless, when compared to natural anchors, virtual anchors still possess several limitations. These shortcomings are often evident in their live broadcast approach, which can be perceived as blunt, mechanical, and less interactive than their human counterparts. Moreover, virtual anchors lack the flexibility of human beings in responding to emergencies or unexpected situations, making it highly probable for live broadcasts to be suspended or terminated [9].

Additionally, creating virtual human anchors requires significant investment in technology and operation, with subsequent maintenance costs also being relatively high. Furthermore, virtual anchors may need help to directly try out the products themselves in scenarios where product promotion is involved, a capability easily achievable for real people [8].

As a result, while virtual anchors have advantages, they still face considerable challenges that must be addressed to reach the same level of performance and versatility as human anchors.

2.3.2. Estimation of the development potential of the virtual anchor market

Amidst the digital age's arrival, the virtual idol industry is experiencing remarkable growth, captivating an expanding community of young enthusiasts. Leading entertainment companies continually push technological and image design boundaries. Simultaneously, within the Metaverse realm, the emergence of exclusive virtual identities has become a new trend in the entertainment market. The virtual idol industry holds vast developmental potential but grapples with pressing challenges concerning technology, content output, and management [3,5].

To seize the industry's possibilities, technology companies can explore harnessing the Metaverse platform to foster genuine interaction between audiences and virtual characters, surmounting dimensional barriers and providing enriched user experiences. In envisioning the future of virtual idols, image design should cater to diverse audience preferences, aligning the image closely with public aesthetics. Moreover, enhancing real-time and authentic interactive communication, encompassing diverse styles of songs and dances becomes pivotal in satisfying consumer demands and consistently delivering top-tier content [5].

Currently, the fan economy remains the primary monetization avenue for virtual idols. Hence, efforts must focus on converting more users into ardent fans and boosting fan consumption. This can be accomplished by leveraging media channels such as film and television works, social media, magazines, and books to propagate the virtual idol culture to potential users within the traditional idol audience group. Additionally, elevating the virtual idol image to resonate with real people, fostering robust fan engagement, and increasing exposure will expand the audience base.

With the post-1990 and post-2000 generations in the two-dimensional field attaining greater independent spending capacity, virtual idols find enhanced opportunities for traffic realization and content development, encompassing virtual idol IP and peripheral products [3]. To flourish, image development and content creation must align with evolving trends and changing times, perpetually attracting traffic and elevating monetization levels.

2.3.3. Future development risks of the virtual anchor industry

Virtual idols are increasingly gaining prominence, driven by their aspiration to expand the market and gain wider consumer acceptance beyond entertainment purposes. Major media outlets are introducing virtual hosts and virtual spokespersons focusing on social service. However, the technology underpinning virtual idols is still relatively immature. In the future, the virtual idol industry has the potential to evolve toward providing social services while enhancing related technologies to offer users a superior experience.

As the virtual idol industry develops and live broadcast technology improves, more individuals and companies enter the virtual idol domain, leading to a surge of virtual idols and anchors in the market. However, the absence of a standardized management system has resulted in a somewhat chaotic marketplace. Recent incidents, like the case of the A-SOUL YUEHUA virtual idol group under YUEHUA Company, have sparked intense discussions about striking a balance between "virtual" and "idol" [5]. It is crucial to avoid mindlessly pursuing profit and exploitation under the guise of idols.

The virtual idol industry is expected to mature in the coming years, gradually leading to standardized industry management, which will foster better regulation and stability within the market, facilitating responsible and sustainable growth.

3. Suggestion

Virtual anchors and their companies must adopt strategic approaches to thrive in the rapidly evolving landscape of virtual live broadcasting and the Metaverse. Firstly, investing in cutting-edge motion capture and animation technology is crucial to enhance the avatars' realism and overall user experience. Secondly, prioritizing audience engagement through interactive and real-time interactions will foster strong fan communities and increase loyalty. Diversifying revenue streams beyond traditional live broadcasting rewards is essential; virtual concerts, brand endorsements, and product promotions within the Metaverse offer additional income sources [10]. Collaborating with brands for endorsements and promotions can expand the virtual anchor's reach and commercial value. Continuous improvement in image quality, diverse content creation, and exploration of emerging trends will ensure the virtual anchor's lasting appeal to the audience. Addressing authenticity concerns through transparency and protecting user privacy is paramount to building trust and credibility. Emphasizing responsible growth and avoiding exploitative practices will lead to long-term success and a positive industry reputation. Lastly, staying innovative and continuously exploring new content formats can keep the virtual anchor relevant, exciting, and ahead of the competition. Standardizing industry management will foster stability and a healthy competitive landscape, enabling the virtual anchor industry to flourish while delivering captivating and immersive experiences to its audience [6].

4. Conclusion

The virtual idol industry is experiencing significant growth as it taps into the opportunities presented by the digital age and the rising popularity of live broadcast platforms. With the emergence of virtual anchors, the landscape of live content production is transforming rapidly. This research has delved into the dynamics of the virtual anchor market, exploring its potential dominance in the future, particularly within the context of the Metaverse's influence.

The journey of virtual anchors began in earnest around 2011, gaining momentum as motion capture technology and cross-media concepts developed. Since then, the number of virtual anchors has soared, leading to various virtual identities and forms of expression. The construction of virtual live broadcast rooms and the operation of virtual anchors involves a meticulous process of character design and motion capture to achieve seamless real-time interactions with audiences.

Despite the potential of virtual anchors, there are limitations to address. They may need more flexibility and responsiveness of human anchors during live broadcasts, and the initial investment and maintenance costs for virtual anchor technology can be substantial. However, the Metaverse is an evolving concept that envisions a virtual, interconnected space where users can interact, communicate, and engage in various activities. As it gains momentum, the Metaverse presents unique opportunities for the virtual anchor industry. With the ability to create virtual identities and spaces, the Metaverse allows for deeper and more immersive interactions between virtual anchors and their audiences.

Virtual live broadcasting can become a central component of the Metaverse, providing users with a seamless and engaging experience in a virtual environment.

The virtual anchor market holds immense potential, particularly as the Metaverse gains traction. Integrating virtual live broadcasting with the Metaverse platform could lead to groundbreaking user experiences, fostering deeper engagement between virtual characters and audiences. Moreover, catering to diverse audience preferences and consistently delivering high-quality content will ensure virtual idols' sustained growth. The findings of this paper can benefit content creators, media companies, investors, and policymakers in the entertainment and technology sectors, enabling them to make informed decisions and capitalize on the transformative potential of virtual live broadcasting.

Moreover, the Metaverse opens up new avenues for monetization in the virtual anchor industry. With a virtual ecosystem that seamlessly integrates content creation, social interactions, and commerce, virtual anchors can explore diverse revenue streams. The Metaverse platform can enable virtual anchors to engage in virtual concerts, brand endorsements, and product promotions, providing them with additional sources of income beyond traditional live broadcasting rewards.

The limitations encountered in this paper, like in any research, do not diminish the validity of the employed research methods or the author's credibility. While considerable effort was invested in delivering a comprehensive analysis, it is essential to recognize that certain factors, such as the industry's rapid evolution and the dynamic nature of the Metaverse landscape, may necessitate further investigation and updates in the future.

In conclusion, this paper offers practical guidance to virtual anchor companies and content creators looking to thrive in a highly competitive market. By emphasizing responsible growth, innovation, and audience engagement, virtual anchors can build trust, loyalty, and sustainable revenue streams. The virtual anchor industry has entered an exciting phase of development, poised to make a lasting impact on the entertainment landscape. With ongoing advancements in technology and a deeper understanding of audience preferences, virtual live broadcasting has the potential to revolutionize the way people consume and interact with content. The continued exploration of the Metaverse's possibilities and the pursuit of innovative approaches to engagement and monetization will be instrumental in shaping the future of virtual idols.

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