

New Media Integration: Artistic Exploration of Phygital Technology in Russia's "Future Games" Postprint

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Abstract

On February 21, 2024, the inaugural "Games of the Future" was held in Kazan, the capital of the Republic of Tatarstan, Russia. [Objective] This study aims to explore the application of Phygital technology in the field of sports and evaluate its potential impact on the innovation and commercialization models of traditional sporting events. [Methods] By employing case study, data analysis, and field observation methods to analyze the inaugural "Games of the Future," this research investigates how Phygital technology integrates physical and digital elements, and how this integration influences audience engagement and the commercial potential of events. [Results] The study finds that the visual artistic effects and convenient interactivity of Phygital technology significantly enhance audience interaction and participation, and also reveals the tremendous potential of digital art in enhancing the appeal of sporting events and promoting the digital transformation of the sports industry. [Conclusion] The research results support the integration of Phygital technology and art as an effective tool for sports innovation, providing a new developmental pathway for the future development and integration of digital sports.

Full Text

Integrating New Media: An Artistic Exploration of Phygital Technology in Russia's "Future Games"

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Abstract: On February 21, 2024, the inaugural "Future Games" was held in Kazan, the capital of the Republic of Tatarstan, Russia. This study exam-

ines the application of Phygital technology in the sports domain and assesses its potential impact on innovation and commercialization models in traditional sporting events. Through case study analysis, data examination, and field observations of the inaugural “Future Games,” this research investigates how Phygital technology integrates physical and digital elements and how this integration influences audience engagement and the commercial potential of events. The findings reveal that the visual artistic effects and convenient interactivity of Phygital technology significantly enhance audience interaction and participation, while also demonstrating the immense potential of digital art in strengthening the appeal of sports events and driving digital transformation in the sports industry. The results support the integration of Phygital technology and art as an effective tool for sports innovation, offering new developmental pathways for future digital sports integration.

Keywords: Phygital; digital art; digital sports; industrial innovation; digital integration

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Against the backdrop of digital transformation, society and markets are undergoing profound changes that continuously evolve alongside technological advancements and consumer demands. Phygital technology, by uniquely merging the physical and digital worlds, offers an entirely new interactive experience. The term “Phygital” combines “Physical” and “Digital,” representing a trend and emerging concept considered a breakthrough innovation capable of reshaping customer and citizen experience journeys. First coined by Paul Palmier in 2013, the term gained popularity and became a hot topic in the discourse on digital-physical integration. As a product of this fusion, Phygital technology is demonstrating strong development trends across multiple fields with its unique charm and potential. Its core lies in creating seamless user experiences that enhance real-world interactivity and functionality through digital innovation. With continuous advancements in Internet of Things (IoT), Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR) technologies, Phygital development has introduced new forms of expression and interaction to both art and sports. It not only provides immersive experiences but also optimizes user experiences through data-driven decision-making, offering new perspectives and innovative ideas for the integration of art and technology that hold significant theoretical and practical value [1].

1. Phygital' s Artistic Expression

Phygital technology represents a cross-disciplinary artistic practice that creates an entirely new artistic language by combining physical and digital elements. This art form marks the fusion of traditional art and modern technology, breaking down conventional boundaries in artistic creation. It is not merely a visual revolution but also a multi-sensory experience encompassing touch and hearing, enabling artworks to be presented to audiences in a more comprehensive and three-dimensional manner [2]. Through Phygital, artists utilize advanced digital technologies such as AR, VR, 3D printing, and mapping to combine with physical spaces and materials, creating a novel mode of artistic expression. This new art form places strong emphasis on interactivity and participation among audiences, who are no longer passive observers but active participants in the creative process. Audiences can engage in secondary creation based on their own ideas, making decisions that influence the presentation of artworks and thereby creating personalized and dynamically changing artistic experiences. This interactivity not only enhances the appeal of artworks but also makes the creative process more open and inclusive.

Phygital art also carries profound socio-cultural significance. Through this form, artists explore the relationship between humans and technology in contemporary society, reflecting on the state of human life in the digital age. By combining digital technology with the real world, Phygital art not only demonstrates the aesthetic value of technology but also raises profound questions about the relationships between reality and virtuality, nature and artificiality, and the individual and society. This art form often prompts audiences to reflect on their roles in a rapidly evolving technological environment, thereby fostering deeper societal discussions about the impact of technological progress.

Another important characteristic is sustainability. Through the application of digital technology, artists can create artworks that require no physical materials or minimize their use, reducing consumption of natural resources and lessening the environmental impact of artistic creation. Simultaneously, the reproducibility and transmissibility of digital art enable artworks to transcend geographical boundaries, allowing audiences worldwide to appreciate and experience them, thus expanding the influence and reach of art. As an emerging art form full of potential, Phygital technology not only expands the scope of artistic expression but also provides audiences with a new sensory experience that revitalizes digital art, taking a solid step forward in the development of human art and enriching our spiritual world.

2. Conflict and Integration Between Traditional Sports and Phygital

2.1 Phygital' s Impact on Traditional Sports

Phygital technology' s development is particularly noteworthy, bringing multidimensional impacts that both innovate and challenge traditional sports. It transforms athletes' training methods by providing simulated environments and real-time data analysis to improve performance, while offering audiences entirely new viewing experiences that combine traditional sports competition with digital gaming to create novel forms of sports entertainment. For instance, through AR technology, audiences can see virtual data and information superimposed on the real world, enhancing both the spectator appeal and interactivity of competitions.

With the popularization of 5G networks, Phygital technology applications will become more rapid and widespread. High-speed data transmission capabilities make real-time interaction possible, enabling qualitative leaps in remote training, online competitions, and virtual viewing experiences. The development of cloud computing and big data technologies provides Phygital technology with powerful data processing capabilities, making personalized training plans, precise event analysis, and audience behavior prediction a reality. Against the backdrop of innovation-driven development, Phygital technology is gradually becoming a new engine for the transformation and upgrading of the sports industry. It can not only improve athletic efficiency but also expand the market boundaries of the sports industry, attracting more young consumers. As technology continues to mature and markets continue to expand, Phygital technology' s development in future sports fields will become more diversified and intelligent, bringing unprecedented new experiences to traditional sports [3].

In terms of business models, Phygital technology brings new commercial opportunities to the sports industry while providing audiences with novel viewing experiences. AR technology can display real-time data and analysis intuitively before audiences, while VR technology allows audiences to experience immersive viewing from home, such as in eSports and online fitness courses, providing new impetus for the diversified development of the sports industry. The application of Phygital technology not only improves the spectator appeal of competitions but also expands the audience base for sports events, exerting a revolutionary impact on the business models of the sports industry. By creating new revenue streams and market opportunities, it provides new growth points for sports organizations and enterprises [4].

2.2 Integration Models of Phygital and Traditional Sports

The integration model of Phygital technology and traditional sports is opening up a new sports experience that manifests not only at the technical level but also profoundly influences the evolution of sports culture. Competitive gamification and virtualization are two notable characteristics of this integration model,

jointly shaping the future of sports.

Competitive gamification refers to integrating elements of sports competition into digital games to create a new type of sports activity that is both competitive and entertaining. In this model, eSports has become a typical representative, combining traditional sports competition rules with digital platforms to enable matches in virtual environments. The rise of eSports has not only attracted a large number of young audiences but also brought new audience groups to traditional sports. Competitive gamification also promotes the combination of sports and technology, such as by simulating sports scenarios and athlete movements to provide athletes with training tools that improve their competitive levels [5].

Virtualization is another important application of Phygital technology in the sports field. By leveraging hardware development and technological popularization, AR and VR technologies are used to create simulated virtual sports spaces for audiences. In such environments, no longer limited by real space and location, audiences can wear VR devices to experience immersive viewing through visual effects. Virtualization not only brings richer viewing experiences to audiences but also provides more convenient training methods for athletes. Athletes can use VR technology for virtual training, conducting secret training of special intensity in independent spaces. For athletes in rehabilitation who often face the dilemma of being unable to participate in high-intensity training, the emergence of virtual training environments allows them to simulate real training scenarios by wearing VR devices, conducting various recovery trainings in a small space without worrying about additional physical burden during the rehabilitation period.

3. Application of Phygital in the “Future Games”

In the inaugural “Future Games,” a new large-scale innovative sports event, we can observe that the application of Phygital technology demonstrates its important role and profound influence in modern sports development. This new technology provides athletes with a new competitive platform by combining digital innovation with traditional sports, and brings audiences unprecedented immersive viewing experiences from both visual and experiential perspectives [6].

For audiences, the application of Phygital technology greatly enriches their viewing experience. VR technology enables audiences to see virtual data and information superimposed on the real world, including athletes’ real-time data, competition statistics, and historical records, which greatly increases the spectator appeal and interactivity of competitions. Audiences can participate in competition interaction through smartphones or other devices, and in some cases, their choices and interactions can directly influence the progress of competitions. On a broader level, the application of Phygital technology in the “Future Games” has had a profound impact on the sports industry. It not only promotes the

digital transformation of sports events but also provides new opportunities for sports marketing and sponsors. Through digital platforms, event organizers can more effectively promote events and attract global audience attention. Phygital technology also promotes the development of sports derivatives and the connectivity with smart devices, all of which bring new growth points to the sports industry. Driven by Phygital technology, our lifestyles and work methods have undergone profound changes, and as technology continues to advance and applications deepen, Phygital technology will continue to play its unique role in the sports field, driving the sports industry toward more intelligent and interactive development [7].

3.1 Immersive Viewing Experience

The application of Phygital technology brings audiences a new immersive viewing experience realized through AR and VR technology, which greatly expands the boundaries of traditional viewing. Through VR technology, audiences can wear headsets and be instantly transported to any corner of the competition venue, whether experiencing the tense atmosphere beside athletes or enjoying panoramic views from the stands, providing an unprecedented viewing method. This immersive experience makes audiences feel as if they are personally participating in the competition, sensing athletes' every breath and heartbeat, thereby greatly enhancing the tension and excitement of viewing [8].

AR technology injects rich digital content into audiences' real world, covering athletes' instant data, detailed competition statistics, historical event recreations, and even predictions for future matches. Through smartphones or other smart devices, audiences can intuitively experience the presentation of this information in the real world. For example, in a football match, audiences can watch the live game while tracking players' movement trajectories and passing success rates in real time. The instant updating of this data on the field not only enriches the viewing experience but also provides audiences with convenient pathways to deeply understand the competition.

Immersive viewing experience also means audiences can customize their experience according to their preferences. For example, they can lock cameras to follow specific athletes throughout the competition, choose to view the match from a referee' s perspective to gain in-depth understanding of the complexity and professionalism of decision-making, or even select a God' s-eye view to overlook the entire venue from above, gamifying and virtualizing the real arena to enjoy a macro perspective and global viewing experience. This personalized viewing experience allows different audiences to find their suitable viewing modes, greatly improving satisfaction and participation.

In the cooperation between the German Bundesliga and Amazon Web Services (AWS), the concept of immersive viewing experience has been unprecedentedly strengthened. The core of this experience lies in using advanced technology to seamlessly integrate real-time data analysis with the viewing process, thereby

providing fans with a new, deeply participatory way to enjoy football. Since 2020, the Bundesliga has been using AWS-supported match data to provide real-time competition analysis. This innovative initiative not only challenges traditional viewing models but also brings unprecedented experiences to fans. The three new “Bundesliga Match Facts” data analysis services launched by the Bundesliga—“Attacking Zones,” “Most Pressed Player,” and “Average Position Change Trends”—are all designed to enhance fans’ immersion and understanding of matches. By cleverly integrating data analysis with the viewing experience, the Bundesliga enables fans to more intuitively feel every subtle aspect of the competition. This innovative immersive experience not only brings fans closer to the matches but also provides them with a new perspective to understand and appreciate the charm of football [9].

The application of Phygital technology not only changes how audiences watch competitions but also has a profound impact on the dissemination and promotion of sports events. As technology continues to advance, we can anticipate that future sports events will place greater emphasis on immersive audience experiences, and Phygital technology will undoubtedly play a crucial role in this process.

3.2 Interactive Participation Mechanisms

Phygital technology not only enhances audience viewing experiences but also transforms them into active participants through innovative interactive participation mechanisms. This mechanism leverages the interactivity and real-time nature of digital platforms, allowing audiences to engage with competitions in various ways and greatly increasing their sense of participation and the appeal of events. Audiences can participate in event decision-making processes through online voting systems. For example, in some eSports or entertainment-oriented sports events, audiences can vote to determine player appearance orders, select specific competition events, or even influence the setting of competition rules. This direct interaction not only makes audiences feel their influence on events but also adds more uncertainty and fun to competitions.

Phygital technology provides audiences with new interaction methods and social pathways. Through social media and other online platforms, audiences can instantly express their opinions during matches, interact with other viewers, and even communicate directly with athletes. This interaction method not only promotes communication and connection among audiences but also more broadly facilitates the rapid dissemination of information media on the internet, thereby stimulating social discussions and increasing attention to relevant events. This interaction logic can also encourage audience participation through gamification. From early cathode-ray tube games to modern online games, the essence is communication and relaxation. Leveraging the rapid development of the digital economy era, online mini-games or applications related to competitions can be designed, allowing audiences to deeply participate while watching matches. By analyzing audience preferences and behaviors, big data models can be used

to accurately push competition information and viewing suggestions that match audience interests. Phygital technology provides refined interaction strategies that not only enhance audience satisfaction but also comprehensively meet the special needs of different types of audiences. This innovative approach not only provides audiences with more diversified entertainment choices but also can generate additional economic benefits by providing added value to events [10].

3.3 Personalized Experience Customization

The application of Phygital technology in the “Future Games” makes personalized experience customization possible. This customized service not only enhances audience satisfaction but also provides new impetus for the innovation and development of sports events. As technology continues to advance, we can expect future sports events to place greater emphasis on personalized audience needs, bringing richer and more personalized viewing experiences.

Personalized experience customization is reflected in the selection of viewing content. Phygital technology can identify audience interest points, such as their favorite sports, supported teams, or followed athletes. Based on this information, the system can automatically recommend relevant live broadcasts, highlight reels, athlete interviews, and other content to ensure audiences can promptly access information they are interested in. Audiences can also set viewing reminders according to their preferences to avoid missing any important moments.

Personalization is also reflected in the customization of viewing methods. Phygital technology allows audiences to choose different viewing modes based on their needs. For example, for audiences who want to deeply understand competitions, the system can provide detailed data analysis based on user habits, set up independent commentary channels for different regions and preferences, and provide suitable viewing methods for audiences. For audiences seeking entertainment, gamified modes can be introduced, relying on portable smart devices and real-time interaction methods to strengthen connections between audiences and advocate the concept of happy sports. Personalized experience customization also provides audiences with opportunities for close interaction with their idol athletes, giving everyone the chance to engage in in-depth communication with them. Through Phygital technology, audiences can ask questions to athletes and participate in online interviews in virtual spatial environments. This two-way interaction not only enhances audience participation but also makes sports events more aligned with audience needs and more humanistic, facilitating the dissemination of sports culture [11].

4. Promotion and Application Prospects of Phygital in Digital Sports

Phygital technology plays a pioneering role in the future development of digital sports, with particularly broad prospects for promotion and application in the

sports field. It is opening up a series of innovative models, indicating that the sports industry will usher in a profound transformation. As technology continues to advance and popularize, Phygital technology will reshape the landscape of sports at multiple levels, from competition proceedings to audience viewing experiences, all of which will undergo significant changes.

In terms of competitions, the intervention of Phygital technology will make matches more fair, efficient, and exciting. For example, through the use of high-precision sensors and real-time data analysis, audiences can make intuitive judgments while assisting referees in making more accurate decisions and reducing controversies. Phygital technology can also provide audiences with rich interactive experiences, such as allowing AR viewers to access exclusive content through mobile devices, like 3D models of players or interactive games, access real-time statistics, and overlay real-time data and statistical information on smart devices, enabling audiences to understand every detail of competitions more deeply, improving audience participation, and making the dissemination of sports events more extensive and in-depth.

For audience experience, the application of Phygital technology greatly enriches their viewing experiences, pushing the viewing methods of sports events toward more personalized and socialized directions. Audiences will be able to obtain immersive viewing experiences through AR and VR technology, interacting with virtual elements in the real world. The integration of social media and other online platforms will enable audiences to more easily share their viewing experiences, participate in event discussions, and even influence certain aspects of events, such as determining certain competition segments through online voting. In terms of commercialization, the application of Phygital technology will bring new business models and revenue sources to the sports industry. The rise of eSports is an obvious example—it not only attracts a large number of young audiences but also provides new marketing platforms for sponsors and advertisers. With further development of Phygital technology, the commercial value of sports events will be further enhanced, while also providing new impetus for innovation and development in the sports industry [12].

Phygital technology will provide new thinking paths and solutions for the commercialization process and innovative development of the sports industry, driving the industry toward greater intelligence and interactivity. In the future, the application and development of Phygital technology will present a continuously evolving trend, continuously leading and promoting intelligent and interactive innovation and transformation in the sports industry, injecting richer, more efficient, and interactive experiences into sports events and opening new pathways for the future development of the sports industry [13].

Through observing the successful hosting of Russia's inaugural "Future Games," we can see that as technology continues to innovate, the perceived value and enhanced experiences brought by Phygital technology integration fully demonstrate its practical value and future development potential. The sports model is moving in a new direction, and the rise and integration of digital sports will

trigger an unprecedented transformation in the future. Whether for athletes, event organizers, managers, or audiences, Phygital technology has brought unprecedented comprehensive experiences and interactions. Phygital technology will drive the commercialization and innovative development of the sports industry, leading it toward greater intelligence and interactivity, and injecting new vitality into the future development of the sports industry.

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Note: Figure translations are in progress. See original paper for figures.

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