

Navigating the Digital Transformation of Sports Industry in China Based on Experience of Sports and Competition Events in Developed Countries

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Abstract. Digital transformation is increasingly seen as a dynamic and enduring trend, offering unprecedented opportunities for growth and vitality within the sports industry. It brings new dimensions to engaging fans, sponsors, sports organizers, and enterprises by enhancing experiences in a participative sports paradigm. This research explores how digital transformation can revolutionize the sports sector, focusing on successful cases from developed countries such as Australia and Japan. These examples shed light on how digital tools like Artificial Intelligence (AI) and Non-Fungible Tokens (NFTs) are leveraged to enhance fan engagement, operational efficiency, and new revenue streams. By drawing insights from these global leaders, this study aims to identify both the opportunities and challenges faced by China's sports market, which currently stands at a critical juncture of digital reform and policy modernization. The goal is to unlock the potential of China's sports market, invigorate its landscape, and introduce greater flexibility in governance through digital transformation. The research objectives are twofold: firstly, to review successful cases of digital transformation in developed countries and the current challenges China faces in adopting these digital innovations, and secondly, to optimize and stimulate market vitality, fostering new paradigms within China's sports industry. This study aims to offer actionable insights and strategies to drive China's sports industry toward a more dynamic and sustainable future.

1 Introduction

1.1 Research background

In light of the momentum of digital and intelligence technologies to unlock unprecedented opportunities and rock the sports industry in a radical fashion, digital transformation is increasingly hailed as more a transformative reality than a buzzword of hype to benefit all industry players involved, ranging from fans drawn closer through interactive and customized experiences, to sponsors and organizers tapping the potential of new revenue streams through data sharing, commercialization and capitalization [1]. The integration of digital solutions and intelligence applications into the sports industry can boost the kinetic

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energy transformation in the sports industry, kick-starting the industrial development trend with digital innovation as the pulse and realizing the leap in sports industry development as a whole. Specifically, digital transformation tunes in with the trending culture of participative spectatorship, catering to the needs as well as the logic of the sports and competition consumption masses with the supply sides of the sports industry, including the event organizers, sponsors, and other key stakeholders [2]. Digital transformation serves to optimize the market resource allocation through technology innovation and presents new opportunities for sports-related businesses, platforms, and applications involved in the transformative digital economy at play.

Practically, the sports industry has been standing at the forefront of these emerging technologies at the drive of ever-increasing need that urges actors at the pan-sports industry level to adopt digital solutions, thus listing digital transformation as a top priority of over 80 percent of sports companies worldwide [2,3]. For example, GoPro spearheaded the move to enter the sports industry with its intelligent digital solution suitable for filming action sports, thus expanding its reach to millions of worldwide consumers learning and choosing its brand, especially when riding the tide of social media where both top YouTubers and grassroots vloggers flock to user-friendly software like theirs for video shooting [4]. The innovative digital transformation extends beyond the realm of social media when the introduction of the National Football League's (NFL) roadmap is in the limelight of enhancing the in-stadium experience, as stadium operators digitalize the sports competition avenue to more interactive, allowing spectators, the media and other sports event stakeholders (e.g., sponsors) to communicate and hence create value [5]. As an example of this added value creation, the San Francisco 49ers app allows fans to order drinks and food online, as well as communicate among the fans in real time, thus generating statistics that track the traffic pattern of the stadium, both inside and outside [6].

Inspired by the increasing adoption of digital transformation, most notably the successful case experiences in sports and competition events in developed countries, Chinese sports organizations and industry are rolling out the effort to embark on a digital overhaul to hopefully embed digital in all aspects of the sports business, in the hope of transforming people, processes and technology in general. In light of the present reality analyzed, China has been practically inspired and actively promoting cross-industry and cross-format adoption of digital transformation in the sports industry at the state governmental level. Under the Internet+ concept, "Internet + sports" has been considered as the guidebook to implement the digital transformation and modernization of China's sports and competition enterprises as well as the sports industry in the present-day digital momentum.

However, the implementation of digital transformation has never been a mission that is always destined to succeed. Despite the financial allures and state governmental policy incentives, many enterprises, sports companies in particular, have been reluctant or extra careful about entering the field [7]. In other cases, they encountered a bumpy journey of digital transformation because of the chaos associated with the radical changes caused in the organizations, the nature of uncertainty, and/or the lack of guarantee in the consequences to effectively justify the high costs of investments made for the implementation in the first place. Therefore, the research gap is captured in the lack of studies on the digital strategy to navigate the way of adopting digital transformation in China's sports industry. However, it is contended that strategy trumps technology in driving digital transformation, considering that business enterprises and government policymakers should shift their focus from a generic policy to a practical, specific, and actionable digital strategy that aligns effectively with the market logic as well as the business strategic goals to elicit the organizational capabilities and market actors' motives to executive the strategy.

1.2 Research framework

The aim of this research is to investigate the forefront of digital transformation developed and applied the sports industry paradigms, specifically focusing on the in-depth case analysis of successful experiences in the sports and competition events of developed countries. Based on a systematic review of existing literature and case studies, this research will unearth the status quo, opportunities, and successful cases of digital transformation within the sports industry of developed countries so as to identify the success factors and actionable digital strategies to optimize and unleash the sports market vitality within China's sports industry landscape. These strategies are expected to serve as pathways to facilitate digital transformation and industry upgrading within the context of the digital economy in China in support of bringing out the healthy and sustainable development of China's sports events and competition industry.

2 Successful case studies of digital transformation in developed countries

Going through digital transformation is not a mission to be taken lightly but rather a well-worthy consideration in light of the significant opportunities to tap for multiple sports industry stakeholders from varying tracks, including sports enterprises, state and government agencies, and cross-industry actors from media and digital technology. These opportunities tapped by successful cases of digital transformation practitioners can practically fall into 2 categories, providing valuable learning as well as potential guidance to navigate China's sports industry upgrading in the future.

One case in focus is captured by the implementation of artificial intelligence (AI) in Japanese sports and competition events, as the Suntory Sungoliath rugby team uses the DJI Inspire 1 aerial drones to analyze the games videotaped, thus personalizing and enhancing the training sessions tailored to athletes, broadening the content reach beyond traditional televised channel to digital media, while driving the fan experience of participative spectatorship. In its effort to integrate digital technologies into its training ground analysis, Suntory Sungoliath adopted a drone to shoot the athletes' movements from the optimal position and angle, which could have otherwise been difficult to monitor from a fixed position on the ground [8]. By allowing the coaches and team managers to have a more accurate and detailed flow analysis of the tactics to exactness, the AI-powered drones enable improved coaching and training and, hence, the optimal performance of athletes on the competition field.

Another case example of the successful digital transformation in the sports industry sheds limelight on the adoption of non-fungible tokens (NFTs) to generate new revenue. At the 2022 Australian Open Tennis Championship, the event organizers merged NFTs (e.g., NFT tennis balls) with the on-court action of the tennis tournament, thus realizing a creative twist on the generative digital artwork with the excitement and entertainment of the sports event. Specifically, for each of the NFT tennis balls, the metadata would be randomly generated and associated with the unique areas on the tennis court during the casting, corresponding to the point allocated by the owner, recorded and updated in real-time to this report for rewards by the owner [9]. In this regard, the combination of the first NFT tennis coinage drove the participative experience of tennis fans all around the globe in a digitally transformed fashion, spearheading a brand-new sports industry landscape where actors encompass athletes, live and broadcast audiences, ticket boxes, events peripherals as well as other things related to sports and competition events facilities, eventually a blueprint full of digital information and digital asset value.

3 Analysis of the problem

3.1 Leveraging opportunities from the digital transformation of sports events in developed countries

3.1.1 Drive the participative fan experience and broaden the content reach using AI

With the increased penetration of interactive digital technologies at the pan-industry level, the spectatorship trending in the sports industry is the shift towards a participative experience within the digital economy, as sports fans are seeking more than the game alone: they are increasingly craving the shareable, participative and personalized experience enabled and amplified by technologies, most notably AI. As showcased by Suntory Sungoliath Rugby using the DJI Inspire 1 aerial drones to shoot, track, and analyze the games, which hence captures the precise movements and passes of the athletes in real-time to enhance the viewing experience of rugby fans as well as allow for improvement in data-driven tactics and coaching sessions in the future. On the supply side of the sports and competition events market, the implementation of AI provides the audience with real-time access to player information on multiple channels, including televised and live-streaming platforms, which indicates more participative and immersive opportunities for spectatorship than sports events in the stadium. In addition, the introduction and implementation of auto-tracking surveillance drones in sports broadcasting enhances the excitement and immersive experience of the audience watching the competition since the increased number of cameras used allows them to enjoy the real-time thrill of the intense racing competition at the scene [2]. More importantly, viewers, especially the fans in sports competitions, now enjoy the enhanced, participative experience in light of their autonomy to choose following only the players they themselves adorn, thus defying the old paradigm of a commentary style of athlete broadcast when their gaze is restrictively directed to those who are favored by the on-stage cameras. As such, sports enterprises may tap the potential of advanced digital transformation technologies such as AI to grow stadium attendance by creating an intensely exciting and immersive viewing experience, increasing the participative engagement of the audience through multiple platforms - including both the broadcasting, live streaming, and in-stadium, by analyzing and leveraging the user data to tailor personalized viewing preferences and driving the fan experience in the sports and competition events.

3.1.2 Generate new revenue through NFTs

In the limelight of digital transformation and the emerging digital economy, a new paradigm of sports and event competition production, management, and consumption is on the rise, leveraging the momentum of blockchain technology to capture the shining prospects for NFT in the sports industry in developed countries. Cradled as yet another revolutionary force within the context of the digital economy, NFT breathes new life into the sports industry and, in the meantime, proposes new business models and economic formats, thereby inspiring China's sports and competition events operations and management with new approaches to modernization and digital transformation. In technical terms, an NFT is a set of time-stamped metadata stored on a blockchain with a unique focus on a particular digital content whose value is realized by creating an element of scarcity and anchoring the flow of the digital assets [10]. As such, the NFTs emerge with the potential to propose a brand-new paradigm for sports and entertainment organizers, sponsors, and audiences as well as to create, issue, store, transact, and use digital assets, thus driving a major shift in the operations management paradigm in the sports industry where fan experience is augmented, and more revenue

opportunities are unleashed in the metaverse. As a result, the sports industry will involve not only athletes, tickets, and event peripherals but also a world transformed to digitally increased asset value.

In the case of the NFT tennis balls of the 2022 Australian Open Tennis Championship, when the first NFT tennis coinage was combined with real-time tennis game data to enhance the fan experience in the participative game while resonating with collections - a key component of sports culture and consumption since Day 1 of this industry, Australia also has efforts to further exploring the yet uncharted territory of blockchain technology and digital transformation to drive more opportunities for new revenue generation with sports and competition events. Another example of NFTs as a new approach to generating revenue is through event tickets, as showcased by the issuance of digital tickets at the EURO-2020 in NFTs form for ticket collection value [11]. As such, compared to traditional sports collections, including mainly various medals and trophies, consumables, and other souvenirs (e.g., sports clothing) for major sports and competition events like the World Cup, the Formula 1, and the Olympic Games, NFTs incredibly unleash the possibilities of digital collections in the sports industry, expanding from tangible goods to digitalized works and artworks including videos, digital paintings and “before they were famous” trading cards [10]. These successful cases shed light on the potential of NFTs to bring new impetus to China’s adoption of digital transformation of the sports industry, reconsidering the shifting role of industry actors within the digital economy context where the boundaries between producers, creators, and informative consumers are blurred, engaging all to the sports consumer and collection market at the digital technology forefront and redefining the meaning of sports collection.

3.2 Challenges associated with the digital transformation undertaking in China’s sports industry

3.2.1 Ethical dilemmas in equality and data security

While AI technologies breathe new life into the realm of the sports and competition events industry in light of their intelligence support to athlete training and audience viewing experience, the ethical conundrums arise from the equality of access to forefront digital technologies, AI system bias, and privacy implications. For example, the fast advances in digital technologies crave the input of professionals with top talents in developing and applying AI into the sports industry, thereby empowering the digital transformation of China’s sports industry guaranteed at the technical level. However, the current shortage of access to either such talents or the most advanced AI technologies, disproportionately in Western countries companies’ possession, has been one of the bottlenecks holding back the AI-enabled digital transformation in China’s sports industry [12]. Bias in training data sets fed to AI systems is yet another concern when the AI systems unintentionally use the data (e.g., collected disproportionately high from Western country athletes) to reinforce pre-existing biases or limits to reduce the effectiveness of training menus tailored for Chinese athletes. Furthermore, while digital and AI technologies facilitate the dissemination of sports and competition events, the issue of privacy implications arises from data security when it becomes intrusive to gather, distribute, and use data on an athlete’s movements and performance in the sports competition [13]. For example, AI systems may use their analytics power to reveal personal information and physical excellence data that the athlete prefers to keep private, which could backfire even harder in the case scenarios of identity theft and other data breaches due to poor data storage and cyber security measures.

3.2.2 Digital governance and government supervision

While the latest advance in blockchain technology continues to amaze and imply benefits to the sports industry through the digital integration of NFT collectibles of the uniqueness, traceability, and tamper-proof-ness, which serves as an ideal enabler to digital sports content activation, participative spectatorship, and revenue generation diversification, the NFT application in China's sports industry is still in the research stage before the issue of digital governance, most notably the government supervision, is addressed. According to Wang and Shen, major problems relevant to the application of NFTs in China's sports industry arise from the government policies and the monitoring and supervision of government authorities, which shed light on the government's role in technological management when weighed against the autonomy and responsibilities of sports market actors, such as consumers, clubs and platforms, and sponsors and organizers [7]. Only when the Chinese government overcomes the established paradigm of thinking and centralized supervision, embracing the participative culture associated with decentralized blockchain technology and actively supporting the NFT integration can China's sports industry start the new chapter brought about by digital transformation.

4 Suggestions

4.1 Data quality, data security and industry vitality enhancement

In light of the prominent similarities between AI and the sports industry in terms of learning and simulation through data feeding and training, AI serves as a key momentum of digital transformation in China's sports and competition events industry to plan and formulate the competing strategies ahead based on data collected and analyzed from the past performances, including both the athletes themselves and their rivaling opponents, thus shifting towards data-driven strategy from the reliance on intuition or human experience. In terms of the data quality issues, it is suggested that priority is given to the completeness and accuracy of data collected and used in training AI algorithms critical to the success of AI-powered development of coaching and training menus for athletes. For example, to address common problems such as overfitting and bias, when the existing AI model unintentionally reinforces the limits or biases as a result of the pre-biased training data sets fed to the algorithms, it is suggested that the teams adopt cross-validation by dividing up the data into subgroups, thus adjusting the features of the fitting model to the ones most pertinent to the physical features of Chinese athletes. Meanwhile, to address concerns related to privacy and data security, teams may pay extra attention to their adoption of the most up-to-date, industry-best data collection and storage practices, staying in compliance with the legal regulations. It is suggested that both sports teams and the media partnered in the live streaming and sports broadcasting activities to strictly follow protocols in their collecting, storing, and sharing data, thus guarding against the sensitive data from being compromised.

4.2 Collaborative efforts between government supervision and platform technologies

Transformative digital technologies, most notably represented by blockchain and virtual reality (VR), are disrupting and even redefining the relationships of multiple actors between consumers, producers, and governing agencies at the pan-industry level. As the most recent development in blockchain technology, NFT has been hailed for its uniqueness in decentralized management, traceability, and tamper-proof-ness, thus enabling the

participative culture in the viewers' digital spectatorship as well as the content activation of digital sports producers, offering brand-new impetus for deepening the digital integration and VR transformation in China's sports industry. However, the adoption of NFT in China's sports industry is still in the infancy stage, considering the negative light cast and conservative attitudes held by the Chinese governments towards blockchain and other technologies that champion anonymity and decentralized management and governance, which raises concerns regarding money laundering business and criminal issues such as cyber fraud and deception.

5 Conclusions

To successfully embark on the journey of digital transformation sheds light on an in-depth understanding of the current status of China's sports industry, as well as a daring vision and transformative strategy in the future how technological advances, digital processes, and organizational and governing structures will need to work in joint hands to implement and stabilize the digital transformation. When multiple actors in the sports industry become comfortable and productive with the life of digital enterprising, sponsoring, and organizing, they will not only be drawn nearer to their fans but also enable more creative and customized viewing experiences in participative spectatorship and enhanced market vitality. As such, digital transformation is celebrated for its potential to boost the operational efficiency of China's sports organizers, coaching, and training, as well as improve fan experience and unlock new channels of revenue generation. However, the journey of digital transformation is never easy, in light of the challenges recognized, including the insufficient technological capabilities, a lack of top talents in digital sports industry transformation in China, and the conservative attitudes of Chinese governments towards such decentralized technologies as blockchain and NFTs.

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