The Transformational Role of Technology in Sports Events

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Book chapter: The Transformational Role of Technology in Sports Events

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This is a pre-print version of the article. Please cite as follows:

Glebova, E., Gerke, A., Book, R. (2023). The Transformational Role of Technology in Sports Events. In: Basu, B., Desbordes, M., Sarkar, S. (eds) Sports Management in an Uncertain Environment . Sports Economics, Management and Policy, vol 21. Springer, Singapore. https://doi.org/10.1007/978-981-19-7010-8_8

The Transformational Role of Technology in Sports Events

Abstract

The rapid uptake of various technological products and services transforms many fields of human life, including the sports industry. In the current chapter we discuss the process of technological transformation in sports for different stakeholders, and the role of particular innovations in this ongoing phenomenon. It extends the literature on the intersection of sport management and technology, followed by vivid cutting-edge examples from the field. In greater detail, we explain how and why new technology innovations are disseminated and used, affecting sports training, performance, judging, and spectating. Consequently, it reshapes tools, and strategies for event and sport management, bringing, on one hand, uncertainty and ambiguity, but, on the other hand, new marketing and management opportunities for all stakeholders. However, to use these opportunities and to turn them into an advantage, sport management professionals have to profoundly understand the nature, trajectory, and impact of the current technology-centered transformation in the industry. In this chapter we define and describe all these constructs, providing a deep explanation of the transformational role of technology in sports events and the sports ecosystem in general. It is addressed to a wide range of readers: students, scholars, sports, and technology professionals. Complementary, we define the perspective directions and agenda for future research.

Keywords: sport event, technology, transformation, security, fan engagement, broadcasting, connected stadium, sustainable sport

1. Introduction

The use of technological applications is now widespread across the world by all sports fans, teams, brands, associations, coaches, and athletes and the adoption of these tools to gain a 'competitive advantage' is an increasingly important feature of sports (Giblin et al., 2016). Nowadays technologies are ready to offer to all stakeholders new ways to manage and experience sports events.

Many digital, technical, and social aspects of today's sports marketing environment have served as a contextual frame for this chapter on the emergence of new mobile applications (apps), the Internet of things, (IoT), Immersive technologies (XR), 5G, hardware and software, which demonstrates the emergence of new forms of sports marketing, management and consumption.

The current chapter focuses on the drastic role of technology in modern sports events, explaining in detail different aspects of impact, contributing to understanding how technologies change and will change sports events.

1.1. As a result of this chapter, the readers will:

- Understand the nature, trajectory, and roles of technologies in sport events
- Be aware of developing issues and trends that affect the present and future technologies deployment in sports entertainment
- Appreciate factors that contribute to transforming and enhancing sports performance, analytics, and spectating
- Recognize the importance of technologies' wide dissemination and their effect on event management
- Recognize the need for research, data analysis, and accountability when planning, deploying, and managing technologies in spectators' experiences (SSCX)
- Understand how sports events are transforming through technology
- Comprehend the importance of emerging technologies in terms of nowadays sports
- Foresee the future research and development paths and directions

2. Theoretical background and key constructs

Recent academic research focuses mostly on the intersection of technologies and sports performance and exercising, but the understanding of the role of technologies in sports spectacle and event management attracts attention as well (Glebova & Desfontaine, 2020; Glebova & Desbordes, 2021b).

There is a large array of technological innovations and tools available to fans, brands, coaches, and sports performers. This paired with the increased desire to collect and process information rapidly and at minimum cost to the user leads towards the growth of technologically highly sophisticated products. Hence, fundamental transformations happen in sports ecosystems, more specifically in the interactions of the provider with the user.

The role of technologies in the sports ecosystem is constantly growing, including for events at all levels and scales. Glebova and Desbordes (2021b) see technology as the main driver of improving the customer experiences of sports spectators. Moreover, technologies change the way how sports events are organized and managed (Rai, 2011). At the same time, with the influx of technologies being adapted to the sport, there is a critical need in addressing the issues arising from the integration of these innovations (Mallen, 2019).

Technology was defined as the most dramatic change and a "Game Changer" in the service field (Ostrom et al., 2015). Merriam Webster Dictionary simply defines technology as

1a: the practical application of knowledge especially in a particular problem

b: a capability is given by the practical application of knowledge

2: a manner of accomplishing a task, especially using technical processes, methods, or knowledge

3: the specialized aspects of a particular field of endeavor

According to Rotolo (2015), all emerging technologies share five key attributes: radical novelty, relatively fast growth, coherence, prominent impact, uncertainty, and ambiguity. Thus, all technologies we discuss in the current chapter may be considered emerging.

The theoretical construct "technology" is unclear in literature and sometimes it is used misleadingly. Often "technology" conveys "technology-based products/services". For this chapter, it seems to be important, because technology is a manner of accomplishing a task, but a technological product/service is a product/service based on this technology. For example, AI is a technology, but an AI-based service robot is a technological product, the Internet is a technology, but a mobile phone connected to the internet is a technology-based product (Glebova & Desbordes, 2021a).

In order to define the nature, courses, and impact of technologies in sports, Glebova and Desbordes (2021a) have developed a typology of technology innovations in sports, based on the three aspects: context, consumer, innovation nature. Furthermore, it explains the circle (evolution continuum) of the interrelation of sport technology innovation and cultural aspects of the sport, embracing the key elements: cultural perspectives of sports business, ecosystem, innovation, and sport technology innovations.

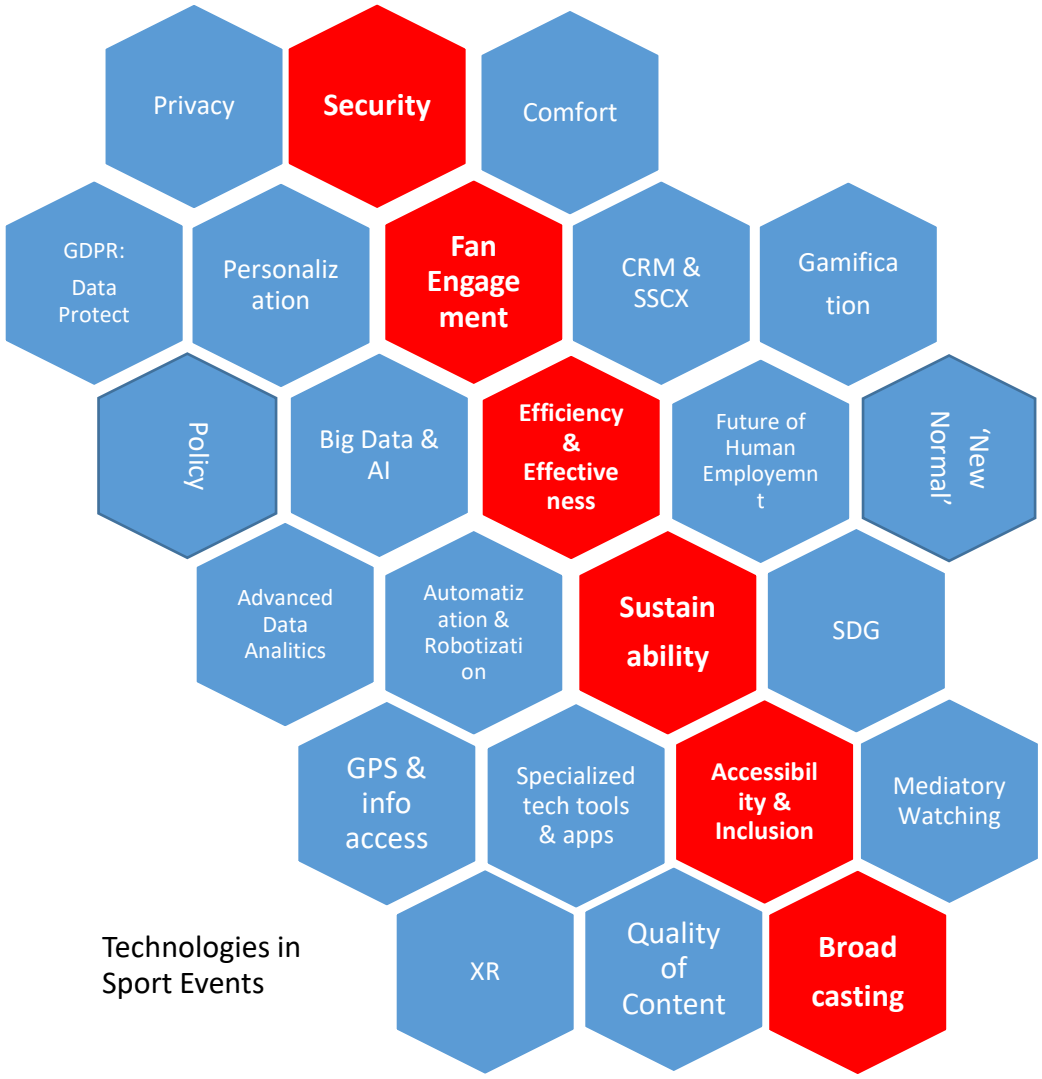
All sports events are different in many terms. Gammon (2012) distinguishes the following types of sports events: (1) special, (2) mega, (3) hallmark, (4) sports heritage, (5) parades and festivals, (6) small scale/community. Any kind of sports event involves a number of stakeholders (a person or entity with an interest or concern related to a particular event or business process; Glebova & Desbordes, 2021b). In a sporting event, typically, there are key stakeholders (Table): spectators/ fans, athletes/ teams, sports organizations, sponsors, sports brands, employees/ volunteers, among others. The development and roles of stakeholder relationships through three phases in the development and

delivery: pre-event, event time, and post-event (Kristiansen et al., 2021). Each stakeholder has its own role(s), often overlapping. For example, there are a few stakeholders, who can be defined as a consumer in the framework of a sporting event. Notably, Shank (2005) stated that the sports industry seeks to satisfy the needs of three distinct types of consumers: spectators, participants, and sponsors.

3. Technologies in sports events

Different technologies play different roles in sporting events for different stakeholders. Subsequently, to define a role of a particular technology in modern sport event management, the function of technology and its impact from the stakeholders' perspective matters (Friedman & Miles, 2002). Particularly, the transformation can be seen in terms of security, fan engagement, efficiency and effectiveness of resources use and allocation, sustainability, accessibility and inclusion, and sport video broadcasting (Figure 1; Figure 3).

Figure 1: Technologies in sport events in the contemporary context



Technologies in Sport Events

3.1. Security

It is difficult to underestimate the importance of security and safety in sporting events at all levels. Security includes a complicated, specialized, long-term preparation process and planning, involving all stakeholders directly or indirectly. Nowadays, with digital technologies, many security tasks become simplified and automatized. However, it also raises new issues: ethics and cyber security.

The majority of the modern security technologies are based on data: camera surveillance, identification, profiling, and analytics involving pieces of personal data. On one hand, it can be seen as a powerful tool for security management and control, but on the other hand, it is not in compliance with legislation in terms of data collection and proceeding (David & Kirkhope, 2004; Quach et al., 2022). By way of illustration, in France, the president of the CNIL (fr: Commission nationale de l'informatique et des libertés[1]) has issued a warning to the sport society which was assessing the use of a system of facial recognition in order to automatically identify people subjected to commercial prohibition into the stadium (CNIL, 2021). This system aims to detect lost objects, recognize people subjected to commercial ban into the stadium, among other security purposes. The technology is based on biometric data processing, precisely physical or biological human characteristics (for example, DNA, footprints, hand contour). Sure enough, according to the General Data Protection Regulation (GDPR) and the Data Protection Act, any collection and management of human personal data are forbidden. Thus, the implementation of facial recognition and other personal identity technologies by sports associations are illegal without special legislative disposals or a regulation.

3.2. Fan engagement

Fan engagement is the process of delivering an end-to-end customer experience (throughout the duration of the customer–product interaction, re-entering at various touchpoints) to a sport spectating audiences at all stages of their customer journey (before, during, and after an event). Beyond sport events, fan engagement involves all types of fans' networking and communications. It is often confused or mixed up with ‘involvement’, which implies ‘doing to’, whilst ‘engagement’ means ‘doing with’ (Harrigan et al., 2018).

By leveraging the new technological innovations in data analytics, sport managers can enhance the emotional experience and take fan engagement to exciting new levels. Today, it seems difficult to make an exhaustive list to outline the full vast multiplicity of various technologies integrated with the sports industry: big Data, Immersive technologies, the Internet of things (IoT), Blockchain, Social Media, Mobile applications (apps), Service robots, Digital assistants, Artificial intelligence (AI), among others. All these technologies (and technology-based products and services) are often linked to each other, overlapping in terms of nature, deployment, and usage. That’s why in today's sports marketing context technologies should be considered holistically, inseparable one from another. The proliferation and infusion of rapidly advancing technologies has attracted much attention from both research and industry, and fundamentally changed the way customers and the service field communicate and interact in the following points:

- Interactive and engaging ways to deliver experiences
- Delivering “smooth” experiences becomes easier for sport management professionals
- Easily accessible information, anytime from anywhere
- Improving the quality of content
- Personalization

[1] The CNIL is an independent French administrative regulatory body whose mission is to ensure that data privacy law is applied to the collection, storage, and use of personal data: https://www.cnil.fr/en/cnils-missions

- Transformation of the social aspect of fandom in terms of an opportunity to virtually reach people at a physical distance
- Sports spectating becomes more and more inclusive, embracing female fans, kids, disabled people

Principally, the advancements in data collection and analysis lead to a personalization of experiences.

Today we observe an unprecedented growth of immersive technologies (common abbreviation: XR for eXtended Reality) development, particularly, virtual reality (VR), augmented reality (AR), mixed reality (MR), and immersive environments (IE). Immersive can be seen as the main tool or as a supplementary channel to enhance SSCX and deliver a piece of information to an end-user. For example, the Minnesota Vikings museum invites sports fans to experience virtual competitions with professional players through VR. Indeed, it illustrates a trend of gamification of fan experiences as a part of the engagement strategy.

In the framework of IoT and internet coverage technology helps fans to buy tickets, find their seats, check toilets' availability, find parking, and order food, making X more comfortable. However, the term "Connected Stadium" is not embracing technology or infrastructure only. For example, Postmates is the exclusive on-demand food delivery partner of the Yankees Stadium. Implementation of this concept means that food and beverage choice is no longer limited by an in-stadium offer. A fan may choose and order any restaurant they want and order delivery right to the stadium. Obviously, Food and Beverage (F&B) is an essential part of the basic in-stadium experience (Parry et al., 2017). And Posmates illustrates the smart and simple solution to a complicated problem. By the way, as a part of technological transformation, the evolution of additional in-stadium services opens many questions. For example, how it may impact stadium attendance, in-stadium sales, customer satisfaction? Nowadays, this question does not have any univocal single answer, it always depends on a particular case.

The majority of technological advances in terms of user experiences (UX) are integrated through mobile apps, consolidating all user data. Smartphones have taken over the traditional laptops and tablets, and are becoming more and more versatile in terms of usage (Glebova & Desfontaine, 2020; Zandt, 2022). Accordingly, the mobile app industry is evolving and uptake all possible fields of life and activity, for example, reservations, gaming, gambling, paying bills, ordering tickets, communications, broadcastings, search, and leisure time. Consumers' use of mobile applications (apps) poses multiple challenges for research in consumer behavior (e.g., ….) and companies have seen them as a new way to communicate with customers. The sports industry and event management have been benefiting from this development. Nowadays, athletes, sports teams, and organizations employ App Marketing (i.e., development and management of marketing campaigns that communicate with fans at every stage of their customer journey;(Lee, 2018; Guo et al, 2019; Glebova & Desfontaine, 2020)) which is showing great marketing results (Sung, 2021).

In terms of sports events, a mobile application is a multi-purpose technology-based product. It is supposed to connect a customer with absolutely all aspects of the event. For example, in terms of safety, through a mobile application, stadium visitors can anonymously report safety concerns, suspicious activity, and unattended packages directly to the stadium's security officials. Thus, it is a way to seek medical assistance, find informational support in critical moments, check parking and toilet availabitlity in real time. Fans are also able to interact with security officials through two-way communications and send photos, videos, and audio to provide specific details. The mobile application essentially allows fans in the venue to be the eyes and ears for security.

An application can also be used to enter the stadium with mobile tickets, order in-seat F&B delivery, order merchandise express pickup and watch instant replays, follow analytics, and do shopping (e.g. fans memorabilia). As such, not only is the mobile application helping to improve the venue security, but it also helps to improve the fan experience.

Events, brands, organizations, venues are developing their mobile app(s) because it's the "place" for all services and customer interactions. Access to all information and services is structured in a single system, easily accessible for consumers. For example, a sport event may include its mobile stores as an online-commerce option in an app. It would help offer an inclusive mobile experience for fans, allowing users to buy club memorabilia through their mobile devices. From all these points of view, mobile apps are versatile powerful marketing tools for sports managers and a useful information source for fans as well.

Social media and communication platforms expand fan experience in the direction of social interactions and information exchange. It is a root of numerous forms of nowadays social media influence at an intersection with sport events: fans' online communities, formation of public opinion, user-generated content, influencer marketing, and CRM (customer relationship management), among others.

Customer relationship management (CRM) can be defined as the technology itself for establishing and maintaining relationships with current and potential customers. Undoubtedly, it involves plenty of technological tools, for example, digital communication, analytics software, algorithms, and communication techniques. Notably, it allows for building customer engagement and intimacy with behavior-based CRM with a featured mobile app front end (Jaysinghe, 2021). Furthermore, it is not only allowing for the building of data-driven marketing strategies and conducts enhanced interactions with customers but also puts forward efficiency and effectiveness.

3.3. Efficiency and effectiveness of resources use and allocation

Modern technologies allow managing events effectively and efficiently. Artificial Intelligence (AI) tools in sports are continuously emerging all over the industry, covering operations management, financial aspects, advanced performance analysis, and fan experience. Among these tools, there are sensors, wearables, and computer vision-powered cameras to collect data, whereas, natural language processing devices can leverage speech and text recognition to gather insights regarding the audiences. This volume of work is difficult, even impossible, to be done by a human employee. Thus, all these technological tools can be used for the optimization of costs and resources in sport event management to create forecast models, help stakeholders through their decision-making, and automatize operations and processes related to broadcasting and fan experience. However, replacing a human, AI raises ethical issues like, for example, unemployment.

Human work can be automatized for many functions, being replaced by AI, robots, and machines. Representing AI tools, Virtual assistant referees (VAR) have been used in football for years to provide slow-motion highlights to human umpires, but with the disadvantage of slowing down the game. The new algorithms are addressing this problem by improving VAR to be faster and more accurate in detecting game violations. Content creation can be the next example, since using machine learning and deep learning algorithms, broadcasters can automate numerous content creation functions, including camera position and zoom in on key field actions in real-time.

3.4. Sustainability

Generally speaking, sustainable sport events seek to reduce the sport's ecological footprint on the environment. How can sporting events be sustainable? Sustainable events are supposed to address

(entirely or partially) 17 of the United Nations Sustainable Development Goals (SDG), thus, they may embrace many overlapping components, for example, carbon awareness, low waste policy, innovative energy solutions. All the sustainable solutions for sport events are primarily based on technology. Event organizers, hosts, consumers, and suppliers share responsibility for implementing and communicating sustainable practices between all stakeholders and technological advancements help in this mission. For example, the Helsinki International Horse Show (the largest indoor sporting event in Finland) has taken part in zero-waste measures, since in 2021 it was fully maintained by electricity generated from horse manure[2].

The environmental ambitions of the Paris 2024 Olympic Games convey the commitment of the International Olympic Committee (IOC) to become a climate-positive organization by 2024 and further have solitary climate-positive Olympic Games in the future, from 2030 onwards (Figure 2).

Figure 2: Sustainability becomes central to the Olympic Movement's vision of "building a better world through sport" (Olympic Games 2024, official website, infographic)

[2] https://helsinkihorseshow.fi/en/event-information/jumps-green/ [last access: 01/04/2022]

SUSTAINABILITY AT THE IOC

A BETTER WORLD IS A MORE SUSTAINABLE WORLD

The IOC is strongly committed to helping the world address the climate crisis.

In 2014, it put sustainability at the heart of its reform programme, Olympic Agenda 2020.

THE IOC

- IS A CARBON-NEUTRAL ORGANIZATION
- ITS HEADQUARTERS, OLYMPIC HOUSE, IS ONE OF THE MOST SUSTAINABLE BUILDINGS IN THE WORLD
- HAS A HYDROGEN CAR FLEET AND ONE OF THE FIRST HYDROGEN STATIONS IN SWITZRLAND

AT THE OLYMPIC GAMES AND YOUTH OLYMPIC GAMES

LAUSANNE 2020

- ATHLETES, COACHES, STAFF AND MEDIA ARE USING PUBLIC TRANSPORT TO GET TO AND FROM EVENTS
- THE CAULDRON HOLDING THE FLAME IS POWERED BY ECO-FRIENDLY SWISS WOOD PELLETS
- NO NEW SPORT VENUES WERE BUILT FOR THE GAMES
- WINTER SPORTS ARE TAKING PLACE ON NATURAL ICE FOR THE FIRST TIME AT THE YOG
- 100 PER CENT OF THE TABLEWARE USED BY THE PARTICIPANTS IS SUSTAINABLE

TOKYO 2020

- THE AIM IS CARBON NEUTRALITY BY PRIORITISING RENEWABLE ENERGIES

BEIJING 2022

- WILL BE POWERED BY RENEWABLE ENERGY

PARIS 2024

- IS ON TRACK TO BECOMING CARBON NEUTRAL

AND WE COLLABORATE WITH OTHER ORGANISATIONS

- WE LAUNCHED THE SPORTS FOR CLIMATE ACTION FRAMEWORK WITH UN CLIMATE CHANGE
- AS PART OF THE UN CLEAN SEAS INITIATIVE, WE FIGHT PLASTIC POLLUTION

OLYMPIC.ORG

@OLYMPICS

Picture credit: https://olympics.com/ioc/news/the-ioc-and-the-olympic-games-addressing-climate-change [last access: 01/04/2022]

3.5. Accessibility and inclusion

With constant improvements in digital entertainment systems and internet connectivity occurring all the time, sport fans can build themselves a spectating experience that fits their preferred specifications without any limitations in time, place, or services. Sport is available to be watched in full digital clarity anytime from anywhere, bringing all sport fans to the "Global Stadium", embracing social media and OTT platforms ("Over The Top", any streaming service that delivers content over the internet). It makes the event accessible for a wide range of people, regardless of their physical location, age, social and financial status, health condition, and disabilities: everyone and everywhere can watch sports events by joining the stream/recording watching provided by modern technologies.

Also, connectivity gives more opportunities to disabled people to enjoy visiting a stadium: digital navigation, parking, and toilet accessibility real-time check, food delivery to a seat. Particularly, for inclusive and universal mobility, mobile applications like Evelity[3] guide people with disabilities through complex places of everyday life, including sport stadia, providing a step-by-step guidance like a pedestrian navigation, both indoors and outdoors. Evelity proposes routes and indications and user-friendly interfaces, customized for each profile (disabled or not).

3.6. Sport video broadcasting

Finding new and innovative ways to enhance the experience for absolutely all fans has taken on increased significance, hence, the improvement of spectating is one of the key roles of technology in sporting events. Indeed, technological applications are capable to improve broadcasting for all the stakeholders, including the production team. Notably, AI-powered automatical cameras allow youth sports to employ a high-quality broadcast without an expensive on-site production team. The computer vision is used to identify elements of the game (athlete, equipment, gate, etc), then, autonomously follow the performance, capturing the key moments. Moreover, the customized graphics and data analytics can also be automatically applied to the footage for spectators engagement. It illustrates how AI enables streaming and recording events from an automated camera system without any production team on the field.

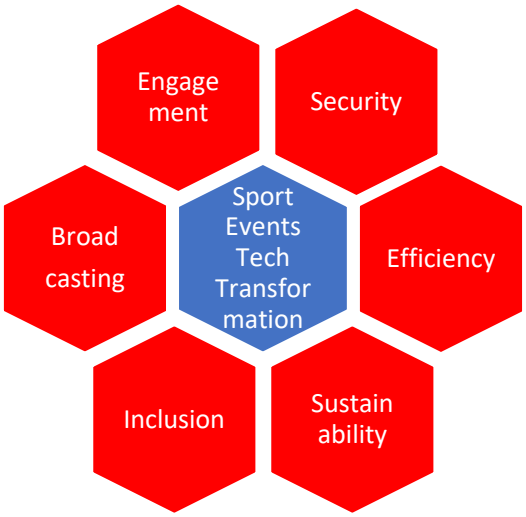
Emerging XR technology, for example, metaverse[4] promises an opportunity for fully immersive virtual experiences. In terms of sport events, it can be a feeling and experience of a physical presence in a stadium without being there. It opens absolutely new perspectives on sport spectating and it will definitely reshape and shift the sports economy. In this regard, nowadays XR seems to be one of the most interesting research paths and themes for further development at the intersection with the sports industry and event management.

4. Conclusion

As we described in this chapter, technologies can be seen as a key, tool, and catalyst for transforming sport events. Technologies of different types play a crucial role for all the stakeholders, in terms of security, fan engagement, efficiency and effectiveness of resources use and allocation, sustainability, accessibility and inclusion, sport video broadcasting (Figure 3).

Figure 3: Technological transformation of sport events

[3] https://www.evelity.com/en/ [last access: 01/04/2022]
[4] https://about.facebook.com/meta/ [last access: 01/04/2022]



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