Chapter 1

Revolutionizing Sport - How Technology is Changing the Sports Industry?

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Abstract

This review aims to assess the impact of technology on the sports industry. Technology has played an increasingly important role in the sports industry over the last decade, modernizing the on-field experience for players, teams and leagues. For example, developments such as Video Assistant Referee (VAR) technology have revolutionized the way football games are decided and played, and game footage, telematics and heat maps have led to major advances in player performance management. However, these technology-led advances have largely remained confined to the playing field and the experience of sports fans has improved little in recent years. As technology continues to evolve rapidly, sports clubs now have a unique opportunity to reach their fans faster and easier than ever before, expanding their global reach and appeal. Overall, it is clear that wherever technology and sports intersect in the future, if technology and data are used in the right way, it will lead to great improvements for sports clubs, leagues, organizations, and most importantly, fans.

Introduction

Sport is a unique industry in that it is arguably the least predictable business in the world (Smith & Westerbeek, 2007). It is almost impossible to predict which team or athlete will win, how athletes will perform, which athletes will be subject to transfer or season-ending injury (Rea & Lavallee, 2015). These factors influence the demands of fans. This means that many sports teams may struggle to keep up with changing fan needs (Collins et

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al., 2016). However, as technology changes, clubs are now able to keep up with new trends and produce multiple pieces of fan equipment at the same time. This enables teams to meet fan demand and capitalize on emerging opportunities (Goodwin, 2004). For example, thanks to the work of top technology teams around the world, Fanatics was able to meet the huge increase in demand caused by the transfers of Lionel Messi and Cristiano Ronaldo to Paris St Germain (PSG) and Manchester United respectively in 2021.

Advances in technology attract the attention of the sports industry just as they attract the attention of other industries (Brannagan et al., 2022). Sport has always been at the forefront of technological adoption (Catalin et al., 2023). The global sports technology market is expected to reach a value of USD 40 billion by 2026. It is clear to see how technology is revolutionizing the way we play and experience sports. From advanced analytics and data visualization to assessment tools and streaming services, technology has changed the way we interact with and understand sport (Williamson, 2016).

One of the most significant changes technologies has brought to sport is the use of advanced analytics and data visualization (Watson, 2014). Teams and organizations can now collect and analyze massive amounts of data on everything from athlete performance to team strategy (Rein & Memmert, 2016). We don't need to be a professional athlete to access sports technology. Companies such as Whoop, which has received more than $400 million in total funding, offer wearables to track athletes' daily sleep, rest, and effort every hour of every day.

The adoption of technology is not limited to improving athletes' performance. Technology has changed the way fans interact and enjoy their favorite sport (Kassing & Sanderson, 2010). Esports is one arena that has pioneered the use of technology to connect with fans. Augmented Reality has been heavily featured in League of Legends or Counterstrike championship matches, with fans experiencing immersive action (Cranmer et al., 2021). One of the sports synonymous with the adoption of technology is F1. F1 cars undergo repeated tests every year to reduce friction and increase speed (Jenkins & Floyd, 2001). The cars have also become increasingly lighter while improving the efficiency of the engine. The current V6 F1 engine produces 26% more power than the 2013 V8 engines (Piancastelli et al. 2018). The cars have the advantage of utilizing the latest advances in fluid mechanics. F1 cars are built to be aerodynamically balanced and force the cars as low to the tarmac as possible. F1 has embraced technology in every aspect of the sport, from logistics to video production (Codling, 2017).

How is technology changing sport?

Thanks to technological advances, athletes can now participate in sports that are both safer and more competitive. You can now participate in Ice Hockey, Soccer, Basketball, and many other sports with confidence knowing that technology is here to help you. So, whether you work in the sports industry or are a die-hard fan, your experience is far ahead of what it was years ago thanks to technological advancements (Billings & Ruihley, 2013).

Every aspect of our existence is slowly but steadily changing due to technological advancements (Ahad et al., 2020). From the way we travel to how we take care of our health and how we have fun, technology affects our behavior and experiences in a variety of ways. People can now access information faster, communicate more directly and efficiently, and develop ideas as the world changes dramatically. From healthcare to government, education, business and sport, technology affects every aspect of life and every sector (Verma & Gustafsson, 2020). Although often not obvious, technology has had a significant impact on sport. The industry has seen an increase in interest and revenue as many organizations are now simpler and faster (Patel et al., 2020).

Technology has had a significant impact on sport in terms of improving athlete performance over time (Adesida et al., 2019). The art of keeping track of time is becoming increasingly complex. Technology allows runners, cyclists, swimmers, cyclists, and other athletes to compare their results to field norms, allowing athletes to make predictions on how to improve their performance (Neptune et al., 2009). Advanced simulations are now accessible for almost every discipline, making training and skills development much easier than before. For professionals and beginners alike, everything from a Formula 1 simulator to a stationary bike that simulates open road conditions (excluding weather) is accessible (Davenne et al., 2012).

Hawkeye, a computer system that displays the trajectory of a cricket ball, was first used in cricket in 2001. Hawkeye produces a variety of statistical analyses, including ball speed, wicket-taking, and the trajectory of the ball after bounce. In tennis, Hawkeye is now used to determine whether a shot is in or out. In addition, Hawkeye's analysis of sports performance has significantly increased audience understanding and engagement (Singh & Dureja, 2012).

Thanks to technological advances, sport is considered more inclusive than ever before. Whereas before viewers could only watch the match on a few networks, today there are many possibilities. There are also live broadcasts

and replays. When we missed a big match or event, it meant having to wait until the next day to see the results in the newspaper or hear about it from friends. Media outlets covering sporting events now use technology to deliver information faster than ever before (Otto et al., 2011). News and updates are sent to smartphones as soon as they are available. Moreover, social media offers opportunities that were previously unimaginable.

How can technology bring athletes and teams to a global audience?

Emerging technology has revolutionized fan access to clubs and athletes, opening up local teams and athletes to global fan bases. Today, fans of an athlete or club can be found in every corner of the world. As technology continues to connect athletes with new fans, athletes and clubs need to take into account different fan preferences and cultural norms. For example, what appeals to a fan in India may not be what appeals to a US-based fan, which means that clubs need to carefully consider their messaging and offerings for each market. Technology gives teams access to advanced digital analytics that allow them to study and predict fan attitudes and tastes. This allows clubs to tailor their messaging and product offerings to different fan bases around the world. At the same time, fans feel that their preferred product is catered for by the teams. This can also be achieved by working with partners who understand the needs of international sports organizations and their fans (Mastromartino & Zhang, 2020).

What can we see in the future?

There will continue to be untapped potential for technology to enrich the sports fan experience in the coming years. In terms of what this might look like, the possibilities are almost endless. There are a variety of ways in which sports teams can blend physical and digital channels to enhance the fan experience in new and exciting ways. For example, there is a good chance that in the future we will see match-going fans having regular access to exclusive in-game promotions and deals or being able to order their favorite player's jersey by scanning the QR code on their seat for a special discount (Sturm, 2020).

Advantages and Disadvantages of Using Technology in Sports

Technology brings benefits as well as disadvantages to sport. Sometimes technology needs to be integrated and improved to be fully effective. Despite these integrations and improvements, problems arise over time (Bressanelli et al., 2019).

Table 1. Advantages and Disadvantages of the Use of Technology in Sport for Athletes

Advantages	Disadvantages
Better performance- marginal gains make a difference	Violates confidentiality
Better medical care results in fewer injuries or faster recovery from injury	Blurs the lines between personal and professional time
Feedback from coaches is more focused, objective, and helpful	Availability and cost - playing sports and success exclusive to wealthy people and countries
Enhanced kit is more comfortable, more efficient, and safer	Encourages athletes and coaches to cheat or engage in unfair practices
Part of a team, not isolated	Focuses on winning, not athletic effort

Table 2. Advantages and Disadvantages of the Use of Technology in Sport for Officials

Advantages	Disadvantages
Supports a team approach, so there is less pressure on individuals	Slows down the game
Information can be easily and quickly shared and stored over time	Not available at all competition levels
Decisions and scoring are more reliable and accurate	Don't trust people's judgment anymore
Trust and confidence in authorities is growing	undermines respect for the knowledge and expertise of officials
	It undermines honesty, integrity, and the spirit of fair play

Table 3. Advantages and Disadvantages of the Use of Technology in Sports for Spectators

Advantages	Disadvantages
More interested in sports	Distracts from the real game
More information about rules, players, etc.	Reduces atmosphere at live events
Have a direct connection with athletes	Reduces interest in grassroots activities not supported by technology
	Increases audience/broadcaster costs
	Enables trolls to attack individual athletes

Table 4. Advantages and Disadvantages of the Use of Technology for Sport in Sport in General

Advantages	Disadvantages
Increases participation	Reduces the intensity of physical activity
Promotes new and alternative opportunities	Reduces emotional well-being from escaping digital pressures/routines
Supports fewer rich sports to promote themselves	Increases cost to sport and participants
Provides more coverage and revenue	Sponsors more interested in technology than sports or athletes
Attraction adds	
Improves safety	

Different Types of Technology in Sports Today

Accessibility: The total number of athletes competing in the 2020 Paralympic Games in Tokyo was 4403. The integration of technology with prosthetics has given countless athletes a second chance at life. The application of technology in sports allows athletes to compete in international competitions once again. The global prosthetics market is expected to reach a market worth US$ 8.6 billion by 2028. Organizations such as Ossur are leading the market in research and development to enable athletes to realize their dreams. These companies are striving to reduce the weight of prostheses and improve athletes' performance (Yashio et al., 2021).

Referees and Technology: Referees must consider many factors before making their decisions as they influence the outcome of a match and the entire tournament. The introduction of the video assistant referee (VAR) has made their job easier. VAR consists of a series of camera systems placed around the pitch to provide real-time feedback to the referee. The use of VAR in football has helped improve the accuracy of match decisions from 82% to 94% in 1 year. During the 2018 World Cup, the application of VAR in matches increased the correct referee decision from 95% to 99.32%. In addition, hawk-eye technology (DRS) is used in some sports (Volleyball, Tennis, Cricket, etc.). It is a technological system with the same logic as the VAR system. With DRS, players from both teams can challenge the decision made by the referee and ask for a review from the third referee (Zglinski, 2022).

Virtual Reality Technology (VR) in Sport: The COVID-19-induced curfew has forced organizations and athletes to think and implement out-

of-the-box training routines. One such new technology is Virtual Reality (VR). VR technology simulates a 3D representation of the real world where operators can add immersive details such as other players and even entire stadiums filled with the roar of fans. This sector is expected to be worth US$56.7 billion by 2026. VR is being used effectively in contact sports such as American football and Rugby. Due to the nature of these sports, the risk of developing chronic brain diseases increases as head injuries are repeated. One way to reduce this risk factor is to use VR during training sessions. VR allows athletes to understand strategies by simulating real-life field training. During the 2018 Winter Olympics, the US ski team was unable to train on the slopes of Pyeongchang. They trained and trained in VR on a digitally recreated terrain of the course. The US team silenced critics of the training method and won 1 gold, 2 silver and 1 bronze medal in various events. This result provided conclusive evidence of the validity of using VR to train athletes and improve their performance (Buhalis et al., 2023).

Fitness and Nutrition: 45% of all households in India have wearable devices. The sensors in these devices track everything from your blood pressure to your body temperature and heart rate (Wan et al., 2018). The sensors in wearables measure data and process and generate data in real time. The global wearable technology market is expected to reach US$62 billion by 2025. Sports teams around the world are integrating this technology into existing training programs to improve team performance and reduce athlete injuries. Wearables help athletes better understand fatigue and reduce the likelihood of serious injury. Teams using wearable technology saw an 88% reduction in soft tissue damage compared to the previous year. Nutrition is an integral part of fitness. Sports professionals push their bodies to absolute limits and have higher nutritional demands than normal people (Brito et al., 2012). Usually, elite athletes consume around 2000-6000 calories every day. Athletes also need supplements that help them meet their nutritional requirements. Sports teams use devices that catalog various energy expenditure parameters, such as body Bugg, to track and meet athletes' daily calorie requirements. These devices use data generated from various sensors to calculate the total calories consumed and suggest improvements to the athlete's diet. These devices leverage the computing power of machine learning algorithms to gain actionable insights into the athlete's dietary health. Devices such as Body Bugg communicate with web applications such as MyFitnessPal, qualori king, eDiet to create a diet plan that targets and refines the calorie and supplement requirements of individual athletes. These supplements include protein and vitamin supplements and minerals

such as Magnesium, Iron and Sodium. Supplements alone account for 50% of the US$40 billion global sports nutrition market (Telessy, 2019).

Stat-Tracking and Analytics: Keeping track of player statistics is a challenging task when done manually. However, technology has made it possible to keep track of stats that even humans can't measure. An example of this is SportVU, which is a system that tracks everything that's happening in the basketball court, such as where the ball is going and the movement of the players (Acuna, 2020). Technology has granted us access to an ocean of data which fans, players, and most especially coaching staff, can benefit from. With analytics data, teams can now make more refined adjustments and coaching staff no longer have to rely on pure intuition and skill when devising a game plan. Sports teams can now utilize math in improving their play, exploiting their opponents, and getting ahead of the competition (Correia et al., 2019).

Injury Prevention and Rehabilitation: The likelihood of getting injured is one of the hard truths of every sport. Athletes risk their bodies and their well-being not just for the entertainment of sports fans, but also for the glory of winning, and we can't blame them. Playing at the highest levels requires exerting the most effort, and an injury is a possible consequence of this intense commitment to competition. Thankfully, technology has made it possible to avoid injuries across various sports. For example, there are high-tech mouth guards which use sensors and determine whether impact is serious or negligible so that collisions which may seem normal but are actually threatening can be detected and acted upon. Furthermore, technology has made it possible to rehabilitate injuries better, such as through the use of digital modeling, which allows for the finding of a source of injuries to body parts such as the elbow and the arm, so that proper treatment may be effected as soon as possible (Bachynski & Goldberg, 2014).

Ticket Purchases: Back then, watching your favorite team live can become an ordeal before you even get in the stadium. Ticket lines are always a hassle and it's not even guaranteed that you get the seat that you want. Nowadays, tickets can be purchased online either directly from the league or the team you follow or from ticket-selling websites. With this technology, you won't have to worry about waiting in line for nothing and you can even pick which seat you want (Guschwan, 2016).

High Definition: Not everyone can afford tickets to live games, but it doesn't mean that they shouldn't enjoy watching their favorite sport. Today, everything is in high definition, and sitting at home watching the game on

your TV, your computer, or your phone is almost like watching the game in real life with how clear the action (Heller & Bar-Zeev, 2021).

Sports Video Games: It's not uncommon for fans to wonder what it feels like to play at such a high level as their favorite players since professional athletes can sometimes seem to have superhuman abilities. Although there isn't any technology yet that will actually put fans in the players' shoes, fans can at least simulate their favorite sport and play as their favorite team in video games, allowing for a unique and immersive sports experience. Video games can even serve as a gateway for players to become fans of a sport they didn't use to follow (Rehman et al., 2023). Someone who's clueless about basketball can play a game of NBA 2K with a friend and realize how thrilling the game can be, and before you know it, he's filling his closet with his hometown team's jerseys.

Conclusion

As technology and our approach to sport will always be connected, more innovative and lighter shoes, jerseys, balls, and bats will emerge. But let's not forget that sport is still about celebrating human achievement and victory over self and others. No matter how sophisticated our technology becomes, it is human beings who will continue to lift, run, and jump, whether or not our bodies are wrapped in high-tech products.

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