January 2023

Sportsology
Group

2023 and Beyond for the Sports Industry

Professor Chris Brady
chris.brady@sportsologygroup.com

2023 and Beyond for the Sports Industry

Predictions concerning the future trends within the sports industry in 2023 tend to be highly focused on specific elements of the industry. However, one thing is absolutely clear – the overarching power of the development of the human/machine interface and the metaverse will infuse each and every one of those individual trends. The challenge across the industry is how best to manage the relationships between humans and machines and how best to employ the convergence of technologies provided by the metaverse?

The developments in processing power that now exist and will only grow will exponentially increase the opportunities to imagine, and more importantly, will implement new ways to employ technology in the sporting ecosystem. The limits now appear only to be the limits of human imagination, The machines are waiting for us to be ready.

Providing an indication of how ready the machines are is the fact that the next phase of development envisages an artificial intelligence foundation model that will be capable of carrying out calculations at a speed of 10^1 calculations per second. That is 100 million times faster than the average laptop or 10 times faster than the current record holder at the Oak Ridge National Laboratory in the United States which costs more than $600 m to acquire. The significance of this growth in power is that it will enable AI models to exponentially increase the number of "parameters"— the variables necessary for the machine to be able to learn and predict. Less than four years ago the largest number of parameters was 110 million; today's most advanced AI programs are 10,000 times larger, with over a trillion parameters. The next phase will deliver closer to 500 trillion parameters. However, perhaps the most important number is that in the past 18 months venture capitalists have invested $125bn into AI companies - and China has made AI a national priority.

By adding the anticipated convergence of AI approaches to the potential for the convergence of different disciplines, platforms and data sources such as gamification, esports, and video analyses, the resultant product will be able to provide more holistic explanations and solutions to hitherto impenetrable issues. What is a reality for 2023 is that every element of every business in the sporting industry will be affected by technological advances, some of which we do not even know about yet. So, in this technologically supercharged era what developments should ownership expect and prepare for?

---

1   The key feature of foundation models is their flexibility. They can be reassigned from one type of problem to another simply by of fine tuning. It will no longer be the insurmountable barrier it once was.

The Media Game

The most predictable trend of 2023 will be the constant chase for the best media offering for the best return on that investment. While content will always remain king, how it is produced, packaged, and delivered will remain the differentiator.

In 2023 the clarion call will be for audience segmentation so that sponsors can target groups whose secondary passion ties into the sponsor's products. Does your team have a group of fans who are also petrol heads? If so, sponsors from the automobile industry may be convinced to access that group through your club which effectively becomes the conduit through which the target audience is approached.

Conversely, your club may be the second passion and the first could be a passion for music. That becomes the route through which your club approaches that particular group. However, before anybody approaches anybody else the clubs are best positioned to do the segmentation. They should have the most relevant data.

Digital companies will experience solid growth with the integration of artificial intelligence (AI) into sports content. The cross-overs between products such as movies and games and the eventual merging of both mediums will be a huge benefit to the sports industry. As has been seen over the last decade, video games provide ideal source material for the movie/TV/streaming industry. With the industry expecting to be able to use motion capture technologies and gaming engines to recreate

sporting activity from different locations and deliver it to other different locations the economies of scale plus the reach make that development almost inevitable.

Already CBS and the NFL have collaborated and added Nickelodeon's AR effects into NFL games. Added to that will be potentially upgraded 3D content (don't hold your breath) and AI-generated commentaries all of which are designed to attract younger viewers. The evidence is that younger viewers do retain a strong attraction to all types of sports, but they do so through the consumption of bite-sized content from social media content. The continuing growth of 5G can only help with such developments.

The two graphics below were created 15 years ago to point out the future in the short term. We are nearly there with the first but still nowhere near the second.

In 2023 the sports media industry will be one for ownership to watch very carefully. As the NBA commissioner, Adam Silver has said,

> An ongoing technological revolution is now allowing for the fast-accelerating development of alternate video feeds, new forms of content distribution, and greatly enhanced means of personalization, each leading to seismic industry shifts and unprecedented opportunities for deeper fan engagement.
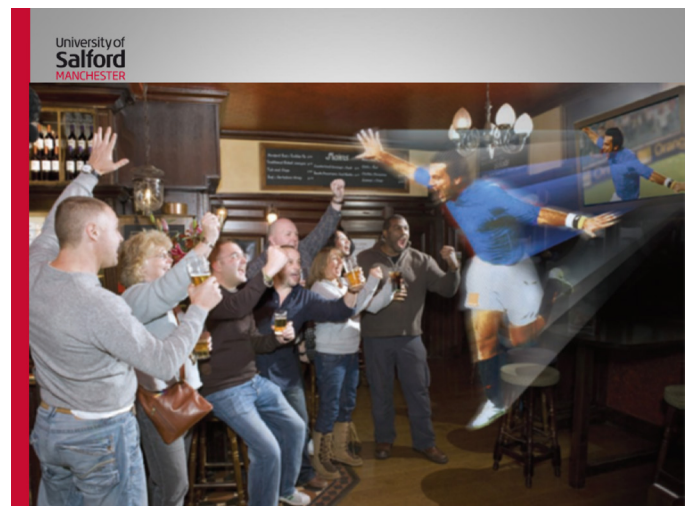
Stadiums are constantly evolving but 2023 could well see major advances in the design of stadia based on the increasing pressures of the 'experience economy'. Ownership will need to respond to safeguard revenue generation, fan satisfaction, and retention. VR/AR will be obligatory in order to enable the fans to enjoy the bespoke viewing experience they will expect and demand.

The need to interact with the fans, the public, and content consumers, in general, will only grow. The growth of this market accelerated in 2022 and will only continue to grow. *Spotify's* acquisition of *Betty Labs* the owners of *Locker Room*, a live audio app that enables fans to talk about sports in live virtual audio spaces was evidence of the potential seen by investors. Feeding off that type of interaction, companies like *Clubhouse,* which is an exclusive, invite-only audio app where subscribers are able to move around virtual rooms discussing their own particular passions, of which sport is a major player, are also growing. These types of new media models will either challenge the stadium experience, enhance it, or both.

Future stadia will need to be technologically up to date or even ahead of the Z, Alpha as well as any other future generations. Such technologies will include augmented and virtual realities, drones, robots, holograms, and many other AI-enabled technologies we have yet to imagine. Sporting organizations will need to invest heavily in technological infrastructure to future-proof stadia and retain the new fans they are courting.

Another phenomenon owners will encounter is that modern fans want to be able to get up and move around more comfortably without massive queuing problems. Sports organizations will be forced by that relatively small commercial reality to understand that even passionate fans want to be treated more like human beings, into changing the structure face of their stadia. They will need to get fewer fans to pay more money to balance the books and that can only be done by providing those fans with what they want.

The interaction between what happens inside the stadia and the fans who cannot attend in person will also be key in balancing the books as revenue streams organically alter and AI-enabled technology will be needed to bridge that divide.

As part of delivering greater convenience to the attendees from the moment they purchase their tickets (digitally, of course) to the moment they sit back down at home, the organization will need to stay in touch continuously (digitally, of course).

An obvious component of a great fan experience must also be the elimination of any fear for personal safety. Facial recognition, smart blockchain ticketing, and crowd control systems are just a few examples of how fans might feel safer in the future.

Modern generations see all retail outlets as social spaces with some particular form of product attached. For example, in the future, bookshops will no longer have coffee shops attached but there will be coffee shops that also sell books – or clothes, or sports attire. So too with stadia. They will gradually become meeting places that also sell sports, or concerts, or auctions, or education as the great lecture halls of our universities also empty into coffee shops (either physical or digital).

Ultimately there will be no distinction between the inside and outside of stadia in a digital sense. The interactions will be entirely seamless as the various components of the fan experience converge onto a single easily accessible platform driven not by what the producers want but by what the consumers tell the machines they want by their behaviors.

All of the above will be fighting for financial resources over the next 12 months.

The growth of environmental awareness and activism will be one of the most pervasive trends during 2023. The pressure to balance sustainability with profit maximization will be a challenge with which all businesses will have to contend and sports probably more than most. Huge sporting events such as the most recent Olympics and World Cup will have to up their game even more than they do at present. Zero carbon emissions will become obligatory.

The pressures to be sustainable will come from 'influencers', 'politicians', 'regulators', and most importantly 'consumers'. If sports want to really tap into the Gen Z and Gen Alpha demographics, they will not be able to resist the pressures from those generations, and their successors, for very long.

Influencers such as Marcus Rashford with his free school dinners campaign was a classic example of the pressure that can be applied by celebrities. In sport the standard position has always been to stay out of controversial issues but as far back as Tommie Smith and John Carlos at the 1968 Olympics with the famous raised, black-gloved fist during the playing of the US national anthem, proves that when sports stars do engage the effect can be seismic.

Kaepernick 'taking a knee' has reverberated around the world. Whatever an individual's view of his protest, the fact is that it has had an effect. As the *Black Lives Matter* movement erupted after the death of George Floyd, Kaepernick turned from being a pariah to a misunderstood hero that left the NFL establishment, including every individual club, embarrassed. The major leagues and each of their teams will need to pour money into their PR departments during 2023 as the voices of athletes are going to grow louder on the environmental horizon.

The list of players willing to voice their views will continue to grow around concerns for the environment and its sustainability. While celebrities are currently demonstrating their opinions by refusing to tour (as with the apartheid boycotts of the 1970s and 1980s) or simply voicing those opinions loudly, the effect will be the same – change or we will stop attending, watching, playing, or paying.

The consumers who will stop paying will do so as sustainability issues such as climate warming and depletion of resources become even louder. As that happens those consumers will insist that the products and services they consume must conform to the activist agendas. They will begin to resist those products and activities that do not conform to sustainability agendas

and embrace those that do.

As pressure grows it will eventually be heard in the halls of power. ***Politicians*** will seek favor by jumping on the environmental bandwagon. Indeed, an increasing number of governments have already committed to carbon neutrality by 2050. Skeptics may believe that when they see it but whether or not it is achieved sports regulators/federations will not be able to avoid government regulation and will need to be more active in regulating their members to reduce their ecological footprint, partly forced by sponsors pushing them into it.

Formula One, for example, is a sport that recognizes its vulnerability and has targeted 2025 as the year by which all Grand Prix will be carbon neutral. According to their official sources they intend to,

> *Wipe out the carbon footprint by developing synthetic fuel and making logistics and travel as efficient as possible while ensuring offices, facilities and factories are powered by renewable energy and eliminating single-use plastic. Anything that cannot be eliminated will be offset*

Other organizations such as the Sacramento Kings are already leading the way. The Sacramento stadium, now 6 years old, supplies 100% of its power needs and it was an exemplar from the day the stadium was completed with 99 percent of demolition materials recycled, still a record. Forest Green FC in the UK is another exemplar. Globally regarded as one of the greenest clubs on the planet. It was the first carbon-neutral football club with an organic pitch irrigated with rainwater, green energy, and sustainability in everything it does.

However, the Forest Green story also raises awareness of the obstacles that lay in wait for green campaigners regarding how much can be achieved and how quickly. Forest Green submitted its planning application in 2017 and ground has yet to be broken. Despite the prospect of the new stadium delivering around £150m to the local economy annually and generating a projected £2m per year in business rates, there is considerable local resistance to the project. Ironically, one of the challenges is that the stadium would be built on 'green belt' land. Not very green the challenge claims with some justification. Also, there are concerns about car parking, traffic congestion, and noise among other things. All of this for a stadium with a capacity of only 5000 for a team in the fourth tier of professional football in a town with a population of less than 6000. Change is rarely welcomed with unanimous acceptance.

Since recognition that the consumer is the key to the acceptance of any changes, or resistance to those changes, significant changes need to be addressed. Fans, like influencers, want to be heard and smart businesses need to let them have their say – and to listen. This is especially true in football in the UK where the world's wealthiest football clubs play in the world's wealthiest football league.

Clubs are about to face a significant challenge if (probably when)the UK government passes a bill based on the recommendations from its own fan-led review of football governance which was published over a year ago amid much acclaim from the fan community. The report's supporters which stated that the review represented an "unprecedented opportunity" to reform the game. The Premier League was much less excited by the central recommendation of an independent regulator which the government has accepted. However, despite that acceptance, the government has yet to publish a white paper that would spell out just how such a regulator might work in law. Vested interests will, no doubt continue the fight throughout 2023.

Notwithstanding the British government's inertia, the rest of the sports world is recognizing the need to engage with fans in a much more interactive and individualized manner. It is possible around the world, and already in use, for fans to be able to vote, in a meaningful way, on such issues as coaching and player recruitment. It is inevitable that they will be able to become rights holders and shareholders with the status of any other

shareholder. The new owners of Manchester United, for example, may scrap the Glazers' special share/non-voting share arrangement.

Technologically, VR (Virtual Reality) and AR (Augmented Reality) will enable fans to follow their favorite sports in virtual environments. Gen Z and Gen Alpha like to share, are inextricably connected to technology, and are used to making their own decisions. Although sports fans want a one-of-a-kind, sensory live experiences (being there) that can't be automated or replicated and technology can't replace that, it can enhance it. If the fan cannot attend, and that means 99% of any team's fan base, the experience can be customized and delivered digitally to more fans around the world with AI-driven personalization, which will meet the demand of younger audiences that love and consume short-form content.

The experience economy can, therefore, also exist digitally as a premium economy class product close to the first-class experience of, *'I was there'*. Event-based OTT/linear TV sports packages, as opposed to period-based packages, will grow as long-term commitments requiring multiple subscriptions, will fade. Modern audiences simply want all platforms and experiences to be available in a single (cyber)space and would be prepared to pay a premium for the privilege. Whether it's called Web 3.0 or the Metaverse, convergence is king.

The Players

The commercial power of the players will only increase as more and more younger fans identify with the individual as much as, or even more than, with a team. This is the price of franchise sports. If you make the sport an entertainment and separate it from the identification with the community, you damage the loyalty. The individual will take on more roles, as social influencers, such as Marcus Rashford, a young, black, working-class Manchester United footballer who took on the British government and won, over free school meals for underprivileged kids.

Players will become ambassadors for the causes in which they believe. Their voices, once muted, will become increasingly loud and their negotiating leverage with their clubs and with the brands around those clubs will become increasingly powerful. This, in turn, will usher in a new type of coach, coaches who may still be martinets on the field but benevolent uncles/aunts when the play stops. Ideologues will give way to pragmatists who enable the players to engage in the decisions that affect them.

For their part, players will have to accept even more disciplined routines around their personal performance levels, fitness, and general health. Nutritional, fitness, and strengthening regimes will become more data-driven as a consequence of advances in technology, bio-medical science, and neuroscience. Mental health will also be less stigmatized and the psychological aspects of the game for both individuals and teams become even more important.

Players will have to accept the increase in 'legal' drug taking and the replacement of damaged body parts by artificial and/or non-human replacements. The acceptance of technologically engineered humans will continue its inevitable journey in 2023 and every year thereafter. The gap between the artificial, the augmented and the natural will narrow year on year.

Last, but by no means least, NIL College athletes will suddenly light up the eyes of player agent businesses as they gain greater self-determination and begin to exercise that determination. The new NIL world will become an industry in itself.

The ethical dilemmas that ownership will be forced to confront will be difficult and, on occasion, costly, as lawsuits proliferate while humans come to terms with the new reality. Will it be legal, for example, to replace an injured natural body part with a better artificial one such as with the blade runners? The total replacement of the anterior cruciate ligament (ACL) by animal ligaments with perhaps 10x the strength is already possible. What about an animal lung with twice the capacity? Will genetic enhancements be allowed to prevent injuries?

Will neuro-training and even neuro-coaching be allowed if Elon Musk's brain implants become commonplace as neurological treatments in the non-sporting sector?

Athletes will be walking a tightrope. At present, there is a repulsion against the concept of engineered human beings but that will dissipate as the techniques seep into everyday life. How will they be resisted if they are accepted by the mainstream population? Artificial intelligence models are already better diagnosticians than humans and AI-driven robots will soon replace surgeons. Might we one day see the Olympics and Paralympics merge?

However, as is currently being discovered on a regular basis, AI programs can, as they get closer to human intelligence, mirror the human frailty of cognitive bias. In sport, such AI-biased programs can be catastrophic. For example, in a biased scouting system, or a biased performance-evaluation system for players, a bias that unfairly under-weights (or over-weights) the contributions of one player to the team can have devastating repercussions for the players, their teammates, and their team. The only way around this is to increase the understanding of coaches and analysts in AI/ML models and then interpret decisions made in a glass-box manner to minimize negative consequences.

The Game

Within the game itself, technology is now able to measure virtually every movement. The availability of such data concerning the measurement of almost every physical movement will eventually impact coaching, strategizing, and training. The understanding of what makes players great and what makes great players may also change. Data and the resultant information may point to new characteristics (like neurological reflexes) and may identify suitable sports for individuals not dependent on 'experts' intuition.

Other technologies such as Zwift, which enables riders to hook up their standalone training bikes to their computers or apps, are just the beginning of technology-enhanced performance measurement which will enable initial scouting of potentially competitive cyclists. For the players the lazy language of, '*it's only a slump, it happens to all players'* will be replaced by data that will identify exactly what is the problem by allowing players to relive their own performances via VR [virtual reality] machines and interact with coaches viewing the same data in order to engage with the machines as they learn.

In 2023 players will begin to receive real-time information about the game in which they are playing such as about their opponents, their coach, and even the spectators. Their sports apparel will become wearable technology, sensor-heavy, amassing data on everything that can be imagined. This will also provide clubs with the commercial opportunity to sell and/or sponsor such apparel.

In 2023 the consumers of sport will also benefit from being able to experience/participate in games by utilizing the full array of sensory inputs from the available technology. VR will allow real-time interaction with the game that is being watched.

'Real' performance *within* the games themselves will also be advanced as a consequence of the development of AI-driven technology. In the short term, there will be advances in multi-agent systems through automated decision-making and performance tools. Ultimately, and 2023 might be the year, Sportsology Group envisages the development of a fully-fledged *'automated video assistant coach'* (AVAC)) that can be used in real matches, in real-time.

The AVAC will enable coaches, analysts, and players to analyze games, and make tactical choices, in real-time

during matches (e.g., in set-play situations). In individual sports such as athletics, it could advise on tactics during middle-and long-distance races in much the same way as it does currently with cycling racers. Such an approach clearly positions itself in a coaching **assistant** role, the proposer not the decision maker.

It is our belief that the most valuable route for sports analytics lies in the under-explored intersection of statistical learning, computer vision, and game theory (see Figure below). We argue that a domain combining these research fields is likely to establish significant progress in football analytics in the future, will be mutually beneficial for AI and football analytics in particular, but could also easily be adopted by other sports.[2]

A successful AVAC would help the players by analyzing their individual play for weaknesses and strengths which can then be eradicated or improved. Prior to a game, an AVAC could evaluate and propose strategies targeted at the opponents of the day. It could do so within a few minutes after the submission of team sheets.

An AVAC system would also have the ability to automatically sift and label huge quantities of video streams, enabling broadcasters and spectators alike to retrieve key moments and those moments could even be packaged and sold as crypto tokens to possibly offset some of the cost of the systems.

A more detailed exploration of these concepts can be found at - Tuyls, Karl & Omidshafiei, Shayegan et al. (2020). Game Plan: What AI can do for Football, and What Football can do for AI. Figure 8 is taken from that paper. https://deepmind.com/research/publications/Game-Plan-What-AI-can-do-for-Football-and-What-Football-can-do-for-AI also, Journal of Artificial Intelligence Research 71 (2021) 41-88.

Women's Sport
(non-male, LGBT+, trans etc.)

Women's sports will increase in popularity, gay and transgender taboos will be buried. One of the few ways to grow sports, both from a fan and a participant angle, is to grow women's sports. After all, global participation of women in several popular sports is still significantly lower than that of men. Additionally, from a marketing brand perspective, equality will remain a major theme.

Expect salaries of women to increase on the back of female athletes becoming major influencers and role models for (younger) fans. However, as long as the gap in popularity of women's sports exist, this salary gap is unlikely to be bridged in the near future. GenZ and Gen Alpha won't accept anything other than gender equality and they will exert considerable pressure on clubs. Leagues and federations to bring about the changes considered to be necessary.

However, equality will not be easily achieved. Women's sport will not progress without more financial support. For example, the W Series motorsport 2022 season was abandoned after the money ran out halfway through the series. Australia's Super Netball league, a high-profile women's competition, has lost money over the past two seasons. The NWSL, the professional women's soccer league in the US, will move in with its stable mate, the MLS, to generate much-needed attention when it goes to market in 2023.

Established media companies won't offer enough money, though, pushing the league towards Apple where it will be packaged with the MLS. Apple will be particularly attracted by the fact that it can buy all NWSL rights — domestic and international — as part of that package and future-proof itself in the event of a significant uptake of the NWSL. The newly open NIL space will also provide an avenue for women to make a worthwhile profession of team sports.

One of the ethical issues that cannot be avoided in 2023 will be the relationship between women's sports and transsexual athletes. One example of how complex that issue will be regards the potential recent isolation of a specific gene that can enhance the way in which testosterone works on power and endurance. If that is proved to be the case, then how would that influence the debate around the testosterone-depressing drugs that athletes such as Caster Semenya are required to take?

If she has the gene and the testosterone was, therefore, natural why would she be required to depress that naturally existing performance enhancer? Would we have to take a few inches off all basketball players because they are naturally better than shorter athletes or disqualify Seb Coe who apparently has an unnaturally large lung capacity? Also, where would AI-enabled interventions such as brain implants be discussed alongside debates about transgender athletes competing against 'natural' men/women? Would AI-enabled athletes also be designated as 'unnatural'?

The inclusion of New Zealand's Laurel Hubbard, a weightlifter born male but who has transgendered to female, in their Olympic team to compete in Tokyo, reignited the trans debate about advantageous legacies from male pre-puberty effects. This was even though she and the New Zealand Olympic committee had abided by the relevant rules. Imagine a future in which she is required to chemically depress her testosterone level but is then permitted to increase it by electronic implants acting in some currently unforeseen way on the recently isolated gene. In such a future, the current debates surrounding transgender athletes will be nothing compared to those concerned with human augmentation and enhancement using machines.

Many sports federations have hardened their stances on the participation of transsexuals (born male) in 'female' sports. The debate will heat up even further in 2023.

The Numbers Game

There is an industry growing around the provision of captured data and the analysis of that data either by outsourced or in-house providers. In 2022 the global sports analytics market was valued at more than a million dollars and is predicted to have a CAGR of 18.6% between 2023-2028.

One challenge to that growth in 2023 may be the democratization of data. If media companies are buying data as part of their deals with leagues and clubs and then releasing that data to their fans as part of the upgrading of their engagement with the consumer, then what is to stop the proliferation of amateur (but very smart) people reworking and repurposing that data?

The companies currently supplying wearable data collection devices may also be at the mercy of such democratization although the majority of their revenues derive from the general public's heightened awareness of wellness aids.

The market for sports analytics has shown remarkable growth in recent years but that may slow down in 2023 as the buyers ask questions of the cost/benefits of such analysis in bespoke situations such as single clubs. The NHL, for example, has decided that all data will be shared equally with all teams in their competition, more as a competitive balance solution than an equality-driven decision.

Another reason that may limit the growth of the sector might be an ignorance of its value. Some of which may be a failure of users to fully commit to its use within famously conservative environments such as the coaches' dens. Such ignorance of the benefits of analytics allied to the cost implications of analytics products, especially the staffing costs will certainly act as breaks on the growth of the global sports analytics market.

Another challenge for the industry is how to engage with sports other than the obvious football, cricket, hockey, basketball, and American football. At present football (soccer), accounts for the majority of the total market share. It is expected to witness the highest CAGR growth in 2023 and subsequent years. Football appears to be the sport that has taken to analytics most enthusiastically and its global reach makes it very attractive to the vendors.

All elite teams have adopted analytics solutions to some extent although their usage of that information is varied and largely unmeasured in terms of ROI. Away from the professional sporting arena, the opportunity for increased revenue lies mostly in the growth of the wellness market and the parallel growth of wearable health technology. Also, the increasing reliance that team managers/coaches place on quantitative information, especially in real-time, for performance enhancement, player recruitment, and strategy will drive further growth.

eSports/gamification/serious games/sportification

TheSportificationofthegamesindustrywillcontinuetogrow in 2023. Sportification is the way in which informal activities areturnedintorecognizedsports.Whatoncetookdecades for this to occur, as when kicking a ball about gradually turned into soccer, rugby, and football, can now literally take months. The original definition of Sportification[3] which included such essential criteria as equality, specialization, rationalization, bureaucracy, quantification, and records nowincludescommercialization,medialization,andspeed of the process.

Understanding these criteria, it is easy to envisage the emergence of numerous new sports as access to VR/AR/AI technology is democratized. For example, current e-games will be transformed into e-sports and e-sports into sports. Add to this development the growth of gamification and serious games and the boundaries between these activities will become increasingly blurred and eventually disappear.

As games are sportified so the opportunities will open for e-athletes (amateur and professional) to become live participants in their own favorite e-games. Gen Z will be easy converts and their generational successors will be Sportified natives. Traditional sports will need to respond to survive.

E-sports is well on the way to becoming completely sportified and will probably gain Olympic status in time for the 2028 games at the latest. The lobbying is already underway and will increase in 2023. Although E-sports tends to be seen as the preserve of Gen Z and Gen Alpha andthosegenerationsthatwillfollowthemwillbereplaced by future generations and also the retirees who will feed the sport in the same way that the middle-aged currently support sports through their TV/streaming subscriptions.

Because e-sports can be played anywhere, with anybody the sport is accessible to an almost infinite market. With revenue from players, viewers, sponsorships, and broadcasting, in its various forms, growing exponentially it seems likely that they will overtake even the NFL sooner rather than later. An early example of the way in which e and 'real' sports will develop can be seen with HADO the augmented reality sport which is a hybrid of physical and technological activities within an augmented reality environment.

However, perhaps the most important aspect of the games industry is that it provides the crucible in which to test theories about all types of games. In so doing it returns us full circle to the publication of von Neumann and Morgenstern's *Theory of Games and Economic Behavior* in 1944. In the past year AI models have beaten the best *Bridge* players in the world and the best players of *Stratego* a strategy board game with more possible game scenarios than *Chess*, *Go*, or *Poker*. What is so important about these apparently trivial achievements is that *Bridge, Poker, Stratego* rely on bluffing, deception, and incomplete knowledge to win (or lose). To win at Stratego the AI model was observed bluffing with weaker pieces and sacrificing important pieces to gain information about the opponent's set-up and strategy in order to win.

Similarly, a French AI model (NooK) - beat eight world champion players at bridge. So what? Well, as Professor Stephen Muggleton, an expert in machine learning believes,

> What we've seen represents a fundamentally important advance in the state of artificial intelligence systems.

Véronique Ventos, one of NukkAI's co-founders (so maybe slightly biased) calls NooK a, *"new generation AI"* because it explains its decisions as it goes along. *"In bridge, you can't play if you don't explain,"* she says.

When interviewed about the significance of games to the development of AI, Demis Hassabis (DeepMind's founder and CEO) stated that,

> What's amazing to me is that this thesis that I had when I started DeepMind (2010) — build AI, prove it on games, then when we've done that, to use it on these difficult scientific problems — seems to be working[4] [emphasis added].

As to the gambling industry, another symbiotic element of the sports business, the arrival of AI and especially the blockchain will turn traditional betting business models upside down! The role of the bookmaker will fade away and a new peer-to-peer betting system will have developed with more transparency and lower costs. New technology will allow for real-time and bespoke betting in the stadium and anywhere else. You want to fabricate a bet with your friend in the stadium - done!

---

3   Guttmann, Allen. (2004). From Ritual to Record: The Nature of Modern Sports New York: Columbia University Press

4   https://www.nature.com/articles/d41586-020-03348-4

Other gambling entities, like Sportradar, have already partnered with the NBA. In August 2022, Sportradar announced the launch of Virtual NBA, a new virtual sports betting experience that provides gambling operators with 3,000 simulated NBA games every day — further advances in AI will make these simulations even more compelling for fans. Keep a lookout for new simulations in 2023. The virtual games aim to boost betting engagement within the global fan base, which is estimated at more than 2bn people.

All of the above points to continuing growth for all of these interconnected business sectors throughout 2023 and certainly beyond.

The Medical Game

The value of being able to accurately predict and therefore prevent injuries to players is obvious. The losses attributable to missed playing days in sport run into billions. In the English Premier League, for example, the results of research carried out in 2020[5] show that there was a clear relationship between the number of days out due to injuries and the difference between a team's final position and their expected position when adjusted for overall squad value.

The researchers also calculated that,

> *Approximately 136 days out due to injury causes a team the loss of one league point, and that approximately 271 days out due to injury costs a team one place in the table.*

This, in turn, is calculated to cost an EPL team close to £50m as a result of injury-related decline in performance per season. A team relegated by just one point will lose in excess of $100m in broadcasting income – off the bottom line! In the National Hockey League (NHL), injuries have been estimated to cost the league in excess of $200m in missed player time every year, with concussion alone costing close to $50m a year.

2023 will be the year in which resistance to the value of technology in the prevention, diagnosis, treatment, and rehabilitation of injuries will decline. The human aversion to 'not being in control' will be overcome with the greater acceptance of ML (machine learning) and robotics by Gen Alpha players, coaches, and ownership.

For example, ML will transform orthopedics in particular and sports medicine in general. However, for that to happen it will be necessary for surgeons to gain sufficient familiarity with AI and ML concepts and view them as opportunities to fully engage in the development of the human/machine relationship and in doing so, enable its responsible deployment

Other technological advances, such as the replacement of damaged body parts with augmented, synthetic, or even non-human parts, will also gather growing acceptance. There is, of course, a natural resistance to the concept of using animal parts to replace human parts. That has not stopped 30 years of experimentation into the potential for transplanting modified pig hearts into humans.

Indeed, 2022 has seen the first Xenotransplantation — the process of implanting an organ from one animal species to another — of a genetically modified pig's heart into a 57-year-old man. The man died 61 days later. Bear in mind that after the first human heart transplant operation in 1967, the patient only lasted 18 days. The second patient, operated on only two weeks after the first, lasted 18 months. Who is to say where such medical advances will end but one clear beneficiary must surely be the sports industry.

Of course, the ethical debates around such augmentation will always exist. Would taking ligaments, tissue, etc. from animals to increase strength, be considered as 'technology doping'? The athletes' view is unsurprising; Lindsey Vonn, the US skier whose career was ended prematurely, has said that if it were permitted, she wouldn't be retired now, and she would have consented in a nanosecond.

The other route to solving sports-specific issues may lie in the existence and growing use of Digital Twins (DTs). A digital twin is a virtual duplicate of a physical product or person. That person may or may not exist in the present and/or may or may not exist in the future. What is important is that the use of DTs can lead to innovative ways to perform time-consuming tasks more speedily.

Might DTs, for example, enable the life span of NFL players (currently averaging between 53-59 years dependent upon position played) to be extended? Interestingly, the largest cause of death for NFL players was heart disease and not neurodegenerative disease Of the 517 players surveyed, 498 died of heart disease and 39 from brain disease.

DTs provide a way of experimenting without endangering the human twin. It enables the virtual twin to self-analyze performance and test the results in rapid time. This, in turn, will enable federations, leagues, player associations, and governments to rapidly test solutions and make real-time adjustments to sports leagues, clubs, and player associations to create safer environments.

Ethical considerations will be key to the takeup of the DT model. What if, for example, a digital twin predicts a falloff in performance? Will players be discarded who might have had longer careers? Also, in a Netflix special on the *Future of Sport,* Professor Rayvon Fouche of Purdue University asked key questions such as,

---

5   https://bmjopensem.bmj.com/content/6/1/e000675

If we are allowed to replace tendons with new technologies that allow you to run even harder without pulling a hamstring, not rip your body apart, we're asking people to rethink what the human body is.

and, when we think about the game itself,

If we push too far down the technoscientific pathway do we lose the connection to the historical past; and it ends up becoming something different? Sport is about the human narrative. If suddenly it becomes less about that narrative... that changes the game.

It is also important that governments prioritize ethical considerations with regard to how data is collected, managed, and used. Highly sensitive information will be collected to create digital twins. Contributors need to be certain that such data is secure, an area where blockchain will have a role to play.

Research into the implementation of AI in sports medicine indicates that predicting injury risk, for example, would benefit hugely from AI enhancement. However, implementation of AI-based tools will need sports medicine specialists to acquire a solid working knowledge of the strengths, limitations, and applications of such tools. Only then will the potential to automate tasks and improve data-driven insights be fully realized.

Predominantly, research has centered on the physiological, but it is beginning to explore the neuroscientific also. While physical attributes are a major differentiator between the world's best athletes and the rest of us, it is becoming clear that the brain probably plays as big a part. When we kick or throw a ball the neurological activity that lies behind the physical event is still unclear. How much data do our eyes process, how do we store and retrieve memories, what is autonomic and what is somatic?

The commercial potential of answering such questions has already spawned a nascent ecosystem of organizations trying to use this new neuroscientific knowledge attempting to engage with the sports industry.

Maximizing growth
of elite sporting organizations

Sportsology Group specializes in providing premium knowledge, insight, strategic advisory and operational support to franchise owners, global leagues and federations, and Institutional Investors driving success and accelerating transformation. We help empower sports organizations to create and own their future.

Sportsology
Group

New York
110 East 25th Street
New York
NY 10010

Los Angeles
304 S Broadway
Los Angeles
CA 90013

London
37-41 Mortimer Street
London
W1T 3JH

sportsologygroup.com | info@sportsologygroup.com