

International Journal of Computer Science and Mobile Computing



A Monthly Journal of Computer Science and Information Technology

ISSN 2320-088X

IMPACT FACTOR: 6.017

IJCSMC, Vol. 7, Issue. 11, November 2018, pg.261 – 271

The Impacting Technology on the Wide World of Sports

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Abstract: We are currently witnessing an acceleration of technological advancement hitherto unseen in the history of humanity. The most rapid and profound changes to our way of life are unfolding in ways which, only a couple of decades ago, would have seemed utterly implausible. The internet changed everything. The way we conduct business, the way we interact socially, the way we shop and the way we spend our leisure time have all been radically altered by the digitalization of society. Indeed, how we follow and take part in Sport has also been radically altered by the same process which has caused such a transformation across the rest of how we live our lives. The consumption practices have changed and the participatory practices have evolved along with them. Technology has acted to pull down the barrier between the athletes and the fans and bring them closer together. It has also engendered new possibilities for athletes to become noticed. Although there are numerous ways in which technology and sport will interact to change the way people conduct and interact with sport, We are however on the cusp of a new and fundamentally revolutionary integration of new technologies which will alter—not just the way we consumed sport but also how sport has the chance to positively augment our existence. The convergence of block chain with AI and wearable sports technology has the ability to enable the discovery of potential new sports stars in the most underdeveloped regions in the world.

1. Introduction

Let ask some important questions:

1. What are the issues which currently block the discovery of sports stars in the most underdeveloped regions of the world?
2. Why is it that some regions are able to produce sports stars whereas others are not?

These questions, although different, are linked. The first way to answer them is to consider the structural problems which exist at the heart of the international sport. It is more likely than not that the sports stars which have the highest chance of success are the ones which have the access to the best facilities. This—as a prerequisite—means that the highest chance for success a sports person has usually stemmed from the fact that they have had the best access to the best facilities, which generally translates to athletes from more economically developed countries. There is also a large level of corruption in the academy system. To put it simply the players who need the attention the most are the ones who are left behind by the proliferation of kickbacks and embezzlement which is rife amongst most sporting bodies worldwide. This blocks the chances of many of the aspiring athletes across the developing world. The heavy reliance on technology may be attributed to the inherent desire to gain an advantage over the opposition in elite and competitive sports, in order to provide additional information that can be fed back to coaches and/or athletes. Technology has been philosophically defined as any physical instrument(s) that can be used for problem solving (Soltanzadeh, 2015). Based on this definition, the use of technology is not new to sport, nor does it purely suggest the use of expensive gold standard measurement tools. Rather, it suggests technology involves a moving scale from low cost and easy to use measurement tools (e.g. goniometer, hand held camera) up to expensive and sophisticated systems (e.g. isokinetic dynamometers or three dimensional motion systems). Because of the large array of tools available to coaches and applied sport scientists, this choice, paired with the increased desire to collect and process information rapidly and at minimum cost to the user, may increase the chances of selecting the fad option, rather than an appropriate tool. A number of technology in sport reviews have previously been published (e.g. a systematic review of global positioning systems (GPS) and micro-technology sensors in team sports, Cummins, Orr, O'Connor & West, 2013; a review of vision-based motion analysis in sport, Barris & Button, 2008; video use in coaching, Wilson, 2008; integrated technologies such as GPS, accelerometer and heart rate monitors in team sport, Dellaserra, Gao, & Ransdell, 2014). In differentiating from previous reviews, our aim with this manuscript is to provide an overview of some of the new sport technologies available, and open up the debate of how the use of technology can improve or impair performance. Sports today use increasingly complex technologies to enhance performance. We have seen some considerable leaps forward in sporting performance as a direct result of technology either used during competition or in training, but the big question is which technology has had the biggest impact on its respective sport?, we have listed the top 5 technologies that have had a profound effect on sports.

1.1 Video Technology

Several sports have adopted in-game video analysis and video refereeing. This includes rugby, the NFL, tennis and even soccer (to a lesser extent). It has meant that decisions can be made quickly and accurately, allowing correct decisions to be made in more instances as these games become increasingly fair. Many believe that this has taken some of the fun out of sport, but the truth is that it simply makes it fairer and creates a situation where players know that should they break a rule, they are far more likely to be caught. Having several cameras around a pitch has also had a major effect on the way that players are analyzed after competition across almost every sport. The ability to look at a performance on a screen and make judgements on it has allowed coaches and analysts to look at individual elements of a performance and make decisions based on what they can see. This is then filtered into the training regimes of the athlete, allowing for better performances and better chances of success.

1.2 Portable Sensors

Cycling used to be very much a sport of feel and arbitrary judgement, riding a certain distance or climbing up a particular hill so many times was enough to prepare people for a race. Along came heart rate monitors and people could train within particular heart rate zones, but this was still only analyzing what the effort was doing to the body, rather than what the effort was doing for the actual performance. When power meters came along, it allowed cyclists to train in accordance with how much power they were pushing through the pedals. Having the ability to train at a consistent level with the readings appearing on a screen in the handlebars meant that consistent power could be achieved, something that is vital in the modern day peloton. *Team Sky* may not have been the first team to use power meters, but the way they utilized them changed the way that every professional team trains and has totally changed the landscape of cycling from a sport based on feelings to arguably the most number intensive sport in the world. Similarly, we can see the use of GPS sensors that have allowed rugby, football and soccer coaches to see exactly where a player is at any point during a match, then look at their movements and see how these can be changed to improve the athlete. These kinds of sensors are also constantly evolving and getting smaller, making even more impact on performance whilst being able to pick up the most minute information. It has been predicted that soon they will be embeddable within everyday clothing, allowing for complex measurements to be taken constantly and improving analysis even further.

1.3 Drug Testing & WADA

Not strictly an individual technology, but more a collection of technologies that has changed almost every sport in the world. Until 1999 there had been small scale and uncoordinated drug tests across individual sports, but these were fairly easily bypassed and in many sports drug abuse to improve performance was endemic. Since then, WADA (World Anti Doping Agency) has helped to push forward the use of drug testing technologies to help fight the use of performance enhancing drugs in sport. This has levelled the playing field in many sports and helped to weed out some of the biggest drugs cheats in world sport, from Lance Armstrong to Dwayne Chambers. It has given faith in performances back to the athletes too. Before when an outstanding individual performance occurred it was treated with a degree of suspicion, today thanks to this technology, people may have doubts, but athletes can point to reliable drugs testing to show that it is a clean result.

1.4 Aero and Hydrodynamics

When elite athletes in sports that require speed and stamina perform in competition, they need to be able to do so with minimum resistance and this has been recognized across several sports today. From the materials used in swimming costumes through to the curves on a Formula 1 car, the understanding of aero and hydrodynamics has allowed the performance of athletes to minimize air resistance and increase speed. The use of aerodynamics as a decider between winning and losing was shown emphatically in the 1989 Tour de France final time trial where Greg LeMond sat in second place 50 seconds behind Laurent Fignon. He adopted aerodynamic handlebars and helmet whilst Fignon did not. LeMond eventually beat Fignon by 58 seconds, winning the three week event by only 8 seconds. Later analysis through wind tunnel data showed that the use of the bars alone gained LeMond 1 minute and the helmet 16 seconds. Essentially if Fignon had adopted this new technology, he would have won the event.

1.5 Data Analytics

Having the ability to analyze millions of data points has meant that sports teams and athletes can look at the tiniest successes or failures within any performance and either recreate or remove particular conditions. It has meant that everything that an athlete does can be interconnected and assessed to divide a performance into its individual elements, rather than as a simple whole. It has been the basis of the current obsession with marginal gains that coaches are interested in. The idea behind this being that if they can find a 0.1% improvement in any part of a performance, then this will give them a slight advantage, but if they can find this number in several areas then they can add up to a significant improvement. It was this philosophy that led the British Olympic team to much success during the past 3 Olympics. This philosophy is only made possible through the use of data analytics as it allows for the tiniest details of an athletic performance to be studied, seeing where small improvements can be made and how athletes can improve their chances of success.



Figure 1: Data Analytics

2. Developments in data feedback

Historically, coaches would observe and then relay information; he or she would provide feedback gathered from visual observation of an athlete's skill, relying solely on his or her ability to perceive changes in movement and interpret the results. Today, many coaches are challenged

with a wealth of options relating to the selection of a feedback mode; he or she must decide which is the most appropriate per individual case (visual, auditory, haptic, multimodal), in order to ultimately improve performance. Consequently, the mode and schedule of feedback are crucial elements requiring consideration for improving sports performance. Augmented feedback, that is feedback provided by an external source, is generally believed to effectively enhance motor learning (Sigrist, Rauter, Riener, & Wolf, 2013). New technologies have made it possible for applied sports scientists and coaches to extract this information from performances and relay this information to athletes at a rapid rate. One leading example relating to the speed at which feedback could be returned to athletes involves the production of ClipCoach (Sheffield Hallam University, UK). ClipCoach was developed prior to the London Olympics in 2012 as part of an innovation project partnered with Olympic sports. The system uses a series of machine vision video cameras and force plates to record the motion of the diver. High-speed video feedback of the dive is available to the coach and athlete immediately post dive, allowing both slow motion review and dive comparisons to be made. The ClipCoach system drastically changed the way in which feedback was provided to Great Britain's divers. The timing of when feedback is provided is a key concept within motor learning. Feedback can be classified according to the time point of its provision, with concurrent feedback being provided during skill execution, while terminal feedback is provided after skill execution (Magill, 2007). One of the major trends in sports technology has been centred on real-time applications and devices that have the ability to provide athletes, coaches or scientists access to immediate data. The scheduling of augmented feedback is perhaps one of the most studied aspects of feedback, yet understanding the intricacies of scheduling feedback is a challenging task confounded by task complexity, skill level and salience of task intrinsic feedback (Magill & Anderson, 2012). Coaches are increasingly calling for sport scientists to deliver real-time feedback, however, given the relatively new nature of these concurrent methods, knowledge surrounding the effects of this mode and the optimum schedule of real-time feedback may still be required.

3. Technology and the training environment

The process of preparing students and training them on the use of computers and the development of modern technology on which they depend will contribute to the preparation of the future teacher and the educational curricula that help students to increase their experience and enable them to use technology in daily life in dealing with the problems they face in order to overcome the shortcomings of the old teaching method and the traditional lecture. Intelligent system builds on knowledge and learning to achieve the goal of the educational process. With the advent of the educational process a new turn and the emergence of technological innovations to the field of education to change many of the concepts and methods that we were dealing with teaching, planning and curriculum design, and perhaps the greatest impact of these innovations emerged after the Internet has become a feature of daily life in many countries of the world, The influence of other means, such as educational radio, television, satellite, educational, computer-aided learning, and CD-Room educational discs, has also emerged. The Internet is one of the technologies that can be used in public education in general. Ellsworth (1994) points to the importance of the Internet, saying it is very gratifying for educators to use the Internet, which provides many opportunities for teachers and students alike in a fun way. Watson "(1994) that

modern means of communication is one of the most important tools used in teaching. Another area that technology has influenced sports performance is training and strategy. There are many examples that stretch across a number of sub-disciplines of sports science (e.g. GPS technology informing strength and conditioning; kinematic analysis and biomechanical intervention; game analysis and data analytics informing tactical decision making programs). This section will focus on the simulated training environment. Changes to the standard training environment to include simulation of “game like” scenarios via augmented reality have become increasingly more feasible through progressive technology. The purpose of simulation and virtual environments is to aid training. It allows a supplementary training environment, where those needing additional work or injured players who cannot fully train, are provided with the opportunity to improve perceptual cognitive and perceptual motor ability. Examples of these tools include video-based decision making tools, virtual reality environments and simulated batting environments. Video-based decision making tools can be cost effective for teams and allow the coaches to use any game vision they have and select the most desirable options (e.g. above real time training, Lorains, Ball, & MacMahon, 2013), providing a high degree of flexibility to suit any team. Tools such as the Elite Decisions and Elite Recall iPad applications (Decision Science, Shepparton, Australia), used by a number of Australian football and Rugby League teams provides the option for team athletes to undertake this form of training in any location. More advanced virtual reality environments allow athletes to be fully immersed in an interactive environment. This type of technology has been highly adopted by teams in the National Football League to supplement traditional practice methods, where the utilisation of virtual reality allows players to train without high physical impact loads, which may otherwise be faced if running through particular ‘plays’ during training. For example, the Minnesota Viking’s used virtual reality to train their young quarterback. The process allowed the coach to be immersed in the same environment as the quarterback in order to point out correct reads and indicate mistakes. Other teams such as the Tampa Bay Buccaneers have used virtual reality to trial their offensive formations against the defensive formations of upcoming opponents (Bennett, 2015). . ProBatter (ProBatter Sports, Connecticut, USA) provides yet another example of how technology has influenced training environment in sports such as baseball, softball and cricket. ProBatter provides athletes with the opportunity to work on perceptual motor ability, by pairing a projected high definition video of a pitch with a projected ball. The paired video of the pitcher with the ball projection provides more information than the ball flight of the pitching machine alone. This technology attempts to provide important spatial and temporal information components of the pitch, allowing the coupling of perception-action. The simulator can throw the majority of pitching combinations, making the training tool diverse, and allowing players to train up skills without placing additional load on other players. While such technologies have been widely adopted in training scenarios, understanding the limitations regarding their effective use is paramount. The ProBatter system for instance is limited in the fact that release always occurs in the same position, which is not true of real world pitching movement. In addition, Mann, Farrow, Shuttleworth, and Hopwood (2009) showed that viewing perspective is an important consideration when examining perceptual-cognitive decision making skill, with decision making superior when viewing an aerial perspective compared to a “player” perspective, raising questions about appropriate viewing perspectives. Further, considerations

include ‘action fidelity’, that is, ensuring that the task adequately captures the dynamic nature of sport (Mann, Williams, Ward, & Janelle, 2007). Research has shown that baseball players may rely on different perception-action coupling when facing a pitcher and swinging a bat compared to watching a video and pressing a button – a task used in laboratory settings (Mann et al., 2007). Additional research in baseball has shown players to use visual, tactile and auditory feedback when adjusting their swing. Some of the aforementioned technologies may remove available feedback, and again limit the effectiveness of training with such devices (Gray, 2009). Such research highlights the need to critically evaluate how such technologies are used in applied settings to ensure the task being trained is representative of the actual task.

4. Considerations for the use of technology in sport

The importance of education technology, the education sector has witnessed a great leap in the present century. The education scientific mechanisms have developed very rapidly, exploiting the development of technology. The productivity of education has increased. It has become more enjoyable, the student has become more interactive and more creative. And your goal is to find and provide effective means to help students learn more easily. Modern teaching methods include computers, CD-ROMs, the Internet as the sea of information and a great educational tool, and audio-visual media. The impact of technology in education, even if the importance of technology in the field of education is mentioned, is that this importance is increasing year after year because of the speed of change and development in various fields. The importance of technology in education is as follows: Technology plays the role of mentor, and change from the old method of explanation and traditional teaching methods. modern educational tool such as computers and other technology means many programs and functions in the field of education stimulates the discovery of new talent and Developing mental abilities in various subjects. For example, the Internet has opened a new window to help students participate in school activities and share information. Technology provides a rich source of information that both the teacher and the student need. The Internet has become a vast sea of information, such as encyclopaedias, dictionaries, maps and other sources of information that are difficult to obtain by traditional methods of research. In his search for information on a particular topic, the Internet takes only hours (or minutes) to get that information easily without strain. Technology intervention in the processing of scientific material received The students have become imperative, as well as their professional training, which they use and try to make them a means to the student after graduating from school as a mentor. The public or private labor market has become a foregone conclusion for practicing their work with very advanced technological means and the disappearance of traditional methods. Coming to the labor market experience and a great future. Technology in all its advanced means can radically change the educational level of the teacher and how to develop his personal abilities in the explanation and urge him to give a greater opportunity and easier to understand and receive the student of the scientific material, and this in turn will reflect on the development of intellectual capacity and intellectual student, in addition to refining his talents and enjoyment of the study materials. Applications in Educational Technology Educational technology has evolved in the past few years, until it has come to open schools without books or even papers, and schools and universities have been competing to minimize the use of paper and pencils. Distance learning, the student can learn from his home

without having to go to the classroom, but receives his lesson via a computer connected to the Internet. The teacher begins the lesson by broadcasting audio and video to his students, and students can interact with their teacher in the same way. , The student can solve his homework and deliver it through the Internet, and the process of repair automatically without the need for the teacher to repair it manually, and this facilitates the process of solving the homework and make it more enjoyable. Books are redundant many schools and universities have replaced traditional books with laptops and tablet computers in the education process. This allows for the replacement of multiple books with one tablet (or notebook), reducing the burden of carrying books on the back. The technology has and will continue to have an impact on sport. What remains in contention is the extent at which scientists, coaches and athletes can appropriately use and understand new technologies. When working with elite athletes, small changes most often need to be made in a relatively short amount of time. Thus, three key factors may play a role in the effectiveness of a new technology, a) validity and reliability of the data, b) meaningful data, and c) processing speed. Typically, the outputs from technical systems such as forceplates, isokinetic dynamometers and three-dimensional motion capture systems, seen as the gold-standard equipment, can be data rich and very comprehensive. There is merit in using these methods in order to collect valid and reliable data, and extract in-depth, meaningful information. These systems, however, are often limited in their use because of requiring a great period of preparation, processing and analysis time. Nonetheless, systems that become used in standard practice (e.g. forceplate use in swimming and athletics at Australian Institute of Sport, Tor, Pease, & Ball, 2015) may become highly automated and close to real-time through the streamlining of data processing and standardised procedures. The limitations of gold-standard equipment (cost, environmental restrictions, specific training required, see Figure 1) are likely factors that drive new commercial devices and applications to be made available for purchase. Unfortunately, not all devices are found to provide valid and reliable data *Sensoria: A Journal of Mind, Brain & Culture* and thus, if the rate at which technology is adopted exceeds the rate of validation, then scientists, coaches and athletes are at risk of using technology that has not been appropriately tested. Feedback or training interventions based on invalid and unreliable data may then be detrimental to performance. Whether looking to implement changes toward short or long term goals, meaningful information is required in order for sports scientists and coaches to make informed decisions that affect the performance of his or her athletes. Thus, the ease at which information rich datasets can now be collected can be problematic if analysts are not focussed in their analysis. There is a risk that coaches, and more importantly athletes will become overloaded with the amount of information presented, which could be detrimental to learning or performance. ‘Paralysis by analysis’ or ‘choking’ is common outcome that results from conscious control of a movement that is typically automated, which is quite possibly brought about by an overabundance of information and continual monitoring (Ehrlenspiel, 2001). Furthermore, technology has shown great potential for monitoring performance in sport, but it can only be effective if the individual athlete is aware of the performance goal and if he or she perceives the need to carry out corrections to technique or training (Liebermann *et al.*, 2002). Finally, there is a trade-off between the usefulness of data to monitor and improve overall performance and duration of analysis when working with elite athletes. During competition, in order for athletes to implement any changes, there is a limited time to provide meaningful

information. This necessitates the need for advanced tools with faster processing speeds such as the example of the ClipCoach system. With the myriad of technology available that can be used to affect sport performances in both competition and training setting, we believe it is paramount for the sport scientist and coach to determine the goals and practical outcomes of using new technology. With new gadgets, widgets and applications being made available to the consumer market at a rapid rate, it is easy to get caught up in the “latest craze” without considering the practicality of the systems used or output delivered. We encourage our applied colleagues to consider the potential benefits against any consequences or unknowns, prior to employing any new tool and before diving head first into purchasing unvalidated high-tech products.

5. Conclusions

The future sports starts will be the first in history to be so closely scrutinized and we see that this had the potential to bring the best stars to the fore. We envisage a future which is so radically different to the reality we have today. Lives are about to be changed. Technological applications The dynamic analysis is a real translation of the scientific discoveries of the movement of technology, whether in devices, tools, methods of research and the use of theories, laws and sciences related to the activity of the human body to provide sufficient capacity to achieve the best educational and training opportunities for those involved in this process, Such as:

- A) Kinovea program, gait analysis program,
- B) The device of recording the electrical activity of the muscle (EMG)
- C) Force measurement platforms (FORCE PLATFORM)
- D) Foot sensors (foot plates)

Theories of Scientific Research The scientific research system differed as a result of the cognitive breakthroughs and the tremendous progress in the technological advancements and the ability to innovate in the development of software programs, the abundance of research, the multiplicity of results and the many laws that serve the scientific research system, including:

- A- Scientific research ethics
- B - Methods of modern scientific research
- C - Intellectual freedom of the researcher until proven truth, consistency and objectivity of the research transactions
- D - Use of electronic offices and websites for research, whether (Dactuarah - Masters)
- E - Interconnection of the pillars of scientific research (statistics science - construction and measurement methods of measurement).

Technological applications There has been nothing wrong with the development of technological innovations such as the development of innovations in sports devices and electronic inventions, the development of electronic programs and the development of educational software that serves the educational process and development in the techniques of e-learning, including distance

learning, Virtual classrooms, e-schools in many educational institutions advocated by international accreditations and under the total quality system.

In the field of injuries and sports the most areas that benefited from the field of technological development through progress in the invention of sports devices that help to detect sports injuries and work to identify the degree of injury and locate and work on re-congratulations again, and take advantage of what is known as technological engineering In the manufacture of sports equipment and training or rehabilitation in the field of injuries, including many: -

- 1 - The use of Robot in the determination of sports injuries
- 2 - Producing micro smart chips to control the sugar of patients and players to determine the nutrients
3. Video capture (to identify places of injury that cannot be determined in the normal way)
4. Smart dressings (dressings that protect against serious complications that may be associated with the seizure of bacteria and declare the need for antibiotics)
5. Smart Shirt (invented in the state of Georgia in the United States by monitoring vital activities and monitoring the injury and determine the duration of hospitalization and the duration of rehabilitation
- 6 - The treatment of obesity - the technology of electronic photography

Of the knowledge in any field or any institution or company or university or college must be recruited through the organizational structure of the educational institution is the administrative department of sports is an important sections of the institutions through which the organizational strategies and plans of operation of the college or institution to seek the development system and technological innovations In the department of management to the continuous development through the use of access databases to know the data of players and coaches and Adrien and the number of sports statistics and the championship and the use of sports calendar Execl in the organization of tournaments and sports forums at the level of the shop Or international. In the end, the use of technology and the use of educational media and e-learning is useful in the modernization and development of the system, whether educational, training, and administrative or research.

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