

THE USE OF TECHNOLOGICAL INNOVATIONS IN SPORT

I. TURCU¹ G.B. BURCEA² D.L. DIACONESCU²
M. SHAAO² M.C.R BARBU² M.C. POPESCU²
A.A. TOHĂNEANU³

Abstract: *The sport and the athlete have inspired a lot of admiration among people. With the passing of the years and the improvement of knowledge about the human body and its capabilities, most believed that their abilities could not be improved. But with the advancement of modern technology, this has changed. The modern athlete uses all the help he can get; from specialized coaching to dieticians, to the best and latest technologies. The data gathered through technology is used to dissect the athlete's performance, identifying exactly where improvement is needed and where the focus is needed. In the paper "The use of technological innovations in sport" we make a presentation on how technology has taken over the sports field and produced numerous improvements in various equipments, how this technological development has affected the sports products market and a small analysis of the global sports equipment market.*

Key words: *technology, innovations, sport, performance.*

1. Introduction

It is absolutely obvious that technology has made possible some performances that, no further than 15 years ago, were very difficult to imagine. The equipment has constantly improved, but it is obvious that not only the equipment is responsible for the progress of the athletes. Training

style, nutrition, physical recoveries are all the basis of progress in almost all sports.

The fact that the IT field is currently evolving at an accelerated pace represents benefits of different types for the world of sports. First of all, the athletes' equipment is constantly improving due to the increased computing power of computer systems, which allow a better analysis of

¹ Department of "Motor Performance", *Transilvania* University of Braşov.

² Department of Theory and Methodology of Motor Activities, *University of Craiova*.

³ Department of Sports Medicine and Rehabilitation, *University of Craiova*.

physical factors such as aerodynamics, endurance or flexibility. Also, this ability to analyse every technical detail is successfully applied in statistics, positively influencing both their number and the accuracy of the results.

Moreover, the field of video editing has allowed an improvement of the experience of the spectators, both those on the spot and those who watch events from the comfort of their own home. Whether it is an edited promotional video such as the World Cup or the presentation of replays and supplementation with explanations using computer-generated images, information technology has become an almost mandatory component for this field.

Access to information is another aspect that contributes to the evolution of the world of sports. Whether we use a computer or a mobile phone, nowadays almost all the big competitions have advertising in the online environment. This is considered a positive influence in terms of the popularity of an event and the number of people interested in it.

2. Literature Review

2.1. How technology has changed sports

Regardless of the generation or country in which we live, technology has had an undeniable impact on our daily habits.

Evolution attracts evolution, and the pace at which new and new products in the field of technology and gadgets are launched is increasingly difficult to follow [1]. Beyond the launch of gadgets with personal assistant functions or self-driving cars, there is also the technology at our fingertips, which in just a few years has managed to greatly transform the way a

day goes. Here are some of the habits completely transformed by technology:

We live in an age in which digital technologies are evolving at a dizzying pace and in which we produce and consume more and more data. An already well-established phrase in IT vocabulary is that data is the new oil. In my opinion, the data is much more than that, they are a completely new fuel, which will never run out and which has an infinitely higher value than any other traditional fuel [4].

This value is given by the analysis of the information and moreover, by the actions taken as a result of the analysis. In football, as in any other sport, the technical staff must always be able to make the best starting team, both actively, analysing the parameters of the players in their own group and reactive, analysing the probable team of the opponent, as it turns out from monitoring previous games. Because even if from time to time exceptional results are obtained with limited means, overall and long-term, most trophies have been, are and will be won by those with access to the best boots, the most aerodynamic beans and more recently, the best software.

And software and tablets will be more and more present in the world of sports. In Germany, football coaches already have the right to use a tablet on the bench and we can assume that this will soon become widespread. Why is this important? Because high-performance athletes from all sports no longer come from the generation with the "key to the neck", but from the generation "with the phone in hand". The average age of athletes participating in the 2016 Summer Olympics in Rio de Janeiro was 27.2 years for boys and 26.3 for girls, the lowest

average being 22.6 years for girl's gymnastics, and the highest average of 37.8 years in equestrian sports. If we assume that we will encounter the same situation at next year's Tokyo Olympics, we will see that most athletes are born after 1990, so born directly into a digital world where device-mediated communication is becoming increasingly important.

Even for the previous generation, how many of us would rather write to someone instead of calling them, book a meal online at a restaurant than call or buy a book online instead of going to the bookstore? Extrapolating, if a coach manages to use technology to visually express his work philosophy, the impact will be even greater. As an example, one of the most used SAP SportsOne features by the German Football Federation is chat, through which coaches send players videos and tactical schemes analysed and created in the system for them to study at their own pace. Coaches therefore use means of communication specific to the generation to which their players belong.

Sports clubs and federations need to invest in specific data aggregators that centralize and monitor all data on all sports performance indicators from all sources (GPS, video, training, etc.). These data must of course be analysed in the sense of Business Intelligence, so that coaches and selectors have an overview of everything that happens to the team, the team or the entire country at the federation level, one click away.

The benefits of such a platform are many. On the business side, federations and clubs need to invest in CRM (Customer Relationship Manager) solutions. Because in order to be able to promote their product, in this case the

sport they manage or the performance in the competitions in which they participate, federations and clubs must first of all know who they are addressing: Who are the fans? Where are they from? How old are they? How often do they come to events?

What do you consume, how much do you consume, when do you consume? Who are potential sponsors? From which industries? How do we attract them?

Answering these questions is the surest way for a sports organization to improve its relationship with fans and sponsors, to provide them with personalized experiences, to create a strong community around the sport or club, and to generate new sources of income.

Clubs and federations must therefore invest in CRM solutions to centralize information about fans from various sources: ticketing, club or federation store, Social Media, etc. This database must then be used to communicate with fans and to generate marketing campaigns segmented according to their target audience. It is essential that federations and clubs constantly communicate with their fans and sponsors, not only during the competition calendar.

Because a better experience generates new income almost instantly. For example, an email campaign to invite those who bought a ticket to an event to order something in advance for food and drink generates 5 times more sales than normal, while knowing the routes of the movement of spectators to a sporting event allows the organizers to distribute their staff and volunteers in the areas most in need and to collaborate with local town halls for traffic management.

Sports clubs and federations now have only two options: to adapt to change, to

invest in technology and to become more competitive and visible to the general public, or to change nothing and disappear from the forefront [5]. Moreover: without investment in technology, sports clubs and federations will never be able to compete in the long run with those in first place in competitions.

In the end, victory will always belong to the one who knows best how to complement his work philosophy with new technologies.

2.2. Sports market and technology

The current markets for sports goods, services and information are characterized by rapid development and increased competition. Tens and hundreds of thousands of manufacturers, such as sports TV channels, radio stations, specialized websites, professional clubs, sports shops, sports facilities and fitness clubs, fight simultaneously with an intense fight for consumers, viewers, buyers and users of Internet [6]. The competitive relationship system also includes topics from related industries such as entertainment television, cinema, stage, circus, event tourism and other spheres of leisure activity [2].

Within the huge mass of companies in the sports and related industries, there is a continuous movement: some companies are improving their business positions, while others, on the contrary, are getting worse.

The central task of the management of each company or professional sports club is its successful work both in the short and long term, ensuring stable, profitable activities and maintaining its competitiveness at an adequate level. As

economic practice shows, this difficult and complex task can only be solved by taking into account the changes that take place in the external and internal environment of the company, following and analysing the innovations introduced by competitors. Otherwise, the company expects stagnation, which easily turns into a recession, with a gradual deterioration of financial and sports results. Moreover, this applies to both individual market entities and entire industries or the sports industry [15].

In professional sports, great importance is given to finding and revealing the talents of athletes. Competitors of all levels are closely monitored; the most capable and gifted specialists are considered, invited to elite schools and clubs [8]. Out of thousands of promising athletes, world-class results are usually achieved by a few dozen in any sport in a given country.

The competition for the right to play in the main team of the national team at the World Championships, European Championships or the Olympics is extremely high. This is where those athletes win, whose natural talent is multiplied by persistent daily training.

However, the skills and talents alone, even the most remarkable, are not enough to defeat a strong opponent. This requires the best methods of training, equipment, sports equipment. It also requires an analysis of all information about the best achievements of elite athletes, about new scientific developments in the field of sports medicine, physiology, biomechanics, pharmacology, psychology and management.

Technology and innovation are now an important part of our training routine, so

it's no wonder that they become decisive factors when it comes to choosing sports equipment. The development of sports technology in the last decade has become rapid. The continuous search for new solutions affects the field of clothing, equipment, outfits [3].

"Wonder shape" Today, this expression means not only that the athlete reaches the optimal level of his physical abilities, but also emphasizes the quality of the clothes in which he rests, trains and behaves. The legendary brands of sports equipment are in constant competition and strive to offer the best solution - clothing that will be a tandem of durability, ergonomics, and comfort for professional athletes and active sports enthusiasts.

For skiers in the United States, the legendary American company North Face did everything possible, spending 2 years creating over 60 innovative equipment. Canadian snowboarders at the recent Olympics played in the Coldgear high-tech infrared uniform developed by scientists at Under Armour. Such sportswear helps the athlete to maintain optimal body temperature on the eve of the competition and immediately at the start. Inside, this sports uniform is covered with a special layer of special ceramic, which forms an air layer that allows you to warm up in any given circumstance.

For many skiers, RECCO sportswear not only helps to achieve the best result, but also saves lives during extreme alpine skiing. The problem is that such clothes are not just equipment. It is a whole rescue system, equipped with sensors and reflectors, which allows even an unconscious athlete to give an SOS signal and announce search services about their location in the mountains.

The representatives of cross-country sports have already adopted innovative developments from Nike, which, in practice, and not in words, have proved that in sports, a priori, there are no and cannot be trifles. Hyper Adapt. This is the name of the technology that allows you to tie 3D printed sneakers to fit your foot. According to the manufacturer, the first to reach the finish line is the one who, with the help of innovative developments, will be able to do it with truly precision jewellery.

It's no secret that the best runners in the world run huge distances in marathons and half marathons in all weather conditions. In order not to hit the dirt on the face (in the most literal, not figurative sense of the word), they are helped by the best traction of the sneaker with the tread, made using Nike Anti-Clog Traction. The special material of the outsole provides reliable grip even when running on Russian roads, far from ideal. And to keep your foot comfortable even during The Comrades super marathon, which has been running for almost a century in the harsh climatic realities of South Africa, a special material - almost weightless - Nike Flyknit has been developed. Provides excellent ventilation, makes movement faster, less traumatic. Modern footwear prevents feet deformation which may translate into further body injuries [12].

Modern sport could not stay away from innovative implementations, scientific methods and developments. Consider this in the example of an innovative product used to achieve the effect of software automation of the sports process, including with administrative automation capabilities component of any autonomous sports organization - software "Alpha Sport".

This product is able to track and organize the process training of an athlete, to perform a qualitative analysis of the performance of the training task, provided that the coaching staff and participants in the sports process are themselves and, that is, athletes with the ability to achieve high plans and sports results. Adopting the methodology of control and analysis of big data, a modern innovative coach has the opportunity to plan and predict the future results of an athlete in competitions, to analyse the effectiveness of the training process in direct correlation with the training cycle and training process. As a result, the system allows coaching staff to have long sports calendars or event logs based on the individual training programs of a modern athlete. The innovative product has a saturation of photo and video capabilities by introducing medical control cards and including promoting workflow among members of the sports organization. The medical component of this "Alpha Sport" CAP is kept completely confidential reporting and storing the received data without making the information available to the public. It should be noted that the allocation of resources of interest to many is monitored, in which the control of inventory storage and various equipment of a sports organization is monitored.

Athlete Functional Monitoring Systems (GPSports-Alfa) - is an innovative hardware and software complex offered by Alfa Telecom, which helps an athlete and a coach in the process of training and overloading a person in extreme conditions and training for them. The device combines the achievements of modern innovative technologies and sport as a science, makes it possible for the

coach to understand and respond urgently to the fact that the athlete is under the critical task of the influence of the sports regime.

HOVR technology is the latest innovation from the American sporting goods giant Under Armour. The brand, the second in the field in the USA, after Nike, proposes a completely innovative element: the HOVR sole is made of composite foam, a platform that ensures an ideal combination between damping and energy return. Already becoming the third cushioning platform used by Under Armour, HOVR offers athletes not only support and stability, but also increased comfort. Another important component of HOVR technology is Energy Web, a special mesh that helps maintain the shape of the foam in the sole construction, improving the degree of shock absorption and energy return. Products with high technology contribute to strong brand development of their companies [13]. Innovation in sport leads to customer loyalty and sports brand awareness [7].

As we have already said, technology makes its presence felt in sports, and this is beneficial for everyone, especially when we talk about the big international competitions, which take place all over the world.

3. Analysis of the Global Sports Equipment Market

Sports equipment is the essential utility equipment for engaging in sports activities and the aid complies with the rules and regulations of a particular sport [9]. In addition, this equipment and clothing are essential elements that improve the performance of athletes.

The sports equipment industry is evolving rapidly due to the increasing adoption of emerging sports technologies and the latest trends among young people. The introduction of innovative products is the means by which producers can compete in the competitive market, attract new consumers and meet the requirements of existing consumers. In addition, an increase in the fan base of popular sporting events, such as the Olympic Games, Indian Premier League, FIFA and others, fuels the demand for sports equipment and clothing, which in turn drives the growth of the market. Moreover, an increase in the popularity of sports and fitness activities among young people is driving the overall growth of the market.

Rapid technological advances and continuous innovations in everything that involves sports equipment of all kinds that follow the preferences of consumers work in favour of the market [10].

The fact that people are increasingly aware of their general health, which is why they are moving towards sports activities, is the main reason that determines the growth of the market. Also, the constant improvements of the materials used for the manufacture of sports equipment contribute to the improvement of the product performance, thus increasing the adoption rate. For example, with advances in sensor technology, consumers are increasingly demanding equipment that can provide them with relevant performance information.

Currently, there are specific trends in the development of the market for sports goods - stopping high market growth rates, increasing competition, strengthening the position of large

international companies, developing sales in regional markets, changing the distribution system, creating market infrastructure, increasing interest in sports, of life. The main consumers of sports equipment and clothing belong to the "middle class".

Sensor technology has advanced to such an extent that it can be incorporated into a multitude of sports equipment, such as tennis rackets, golf clubs, rods and swimming goggles. These sensors are able to measure movement and record detailed biometric data, which can be analysed to determine problems from a swing, throw or hit performed by the athlete [11].

One of the latest trends in the industry is the combination of casual and athletic models for the development of sports equipment, which is ready to provide a significant boost to market growth. Increasing urbanization, improving living standards and increasing disposable income translate into a greater penchant for sports to ensure a healthy lifestyle [14].

As a segmentation criterion, that of the type of product, the market was divided into several categories, namely in ball games over the net, ball games, fitness / strength equipment, athletic training equipment and others. The ball games segment had the largest share in the market in 2019. This can be explained by the fact that ball games are the most watched worldwide, and the revenues brought by this segment are much higher than the rest of the segments.

The growing popularity of sporting events such as cricket, basketball and football is expected to be one of the key factors contributing to the growth of the segment.

After the ball games segment, it is expected that the fitness / strength equipment segment will see a substantial increase until 2025.

More and more people have begun to adopt healthier eating habits and exercise regularly to keep fit. In addition, increasing awareness of adopting healthy lifestyles, which involve optimal exercise, encourages clients to buy and engage in fitness / strength activities, which is expected to contribute to the demand for this segment in the forecast period.

In terms of distribution, the most used are specialty and sports stores that dominated the sports equipment market in 2019, with a share of just over 45%. The convenience offered by the distribution channel and its ability to acquire popular brands have completed the growth of this segment.

But online sales are also starting to gain momentum. The use of mobile phones and other electronic devices by consumers to browse and buy products online (including sports equipment) is increasing significantly. In response to this transition in the nature of consumer buying patterns, sports brands are now focusing on strengthening their presence in online retail.

They invest in e-commerce to make it easier for shoppers to shop online, providing easy-to-use and improved websites. Thus, the e-commerce industry is experiencing a rapid expansion, especially in terms of sales volume of equipment, which is expected to stimulate the growth of the segment.

The market in Europe and North America may see an increase in demand for sports equipment in the coming years. North America accounted for more than 35% of total market share in 2019.

Increasing consumer spending on sporting goods is helping the regional market gain momentum. Moreover, increasing health awareness among people and increasing the problem of obesity increases the demand for sports equipment in this region.

On the other hand, Asia Pacific is expected to emerge as the fastest growing region in the forecast period. In 2019, the countries of Asia Pacific recorded a rapid increase in sales of balls and fitness equipment. Moreover, the high demand in Australia can be attributed to the growing focus on sport.

In addition, the increase in disposable income and consumer spending in emerging markets such as India, China and the Middle East is expected to support the demand for sporting goods. These countries have also hosted a variety of sporting events and developed infrastructure to attract more people to participate in sports, subsequently triggering market growth.

In Romania, the sports equipment market is divided by specialized players, such as Hervis, Intersport and Decathlon, with mono brand stores - Adidas, Nike -, online stores and hypermarket chains.

Against the background of an increased appetite of Romanians for sports, new names continue to enter Romania, the number of specialized players doubling in the last 4-5 years.

Romanians spent in the 2019 announcement, almost 450 million Euros on bicycles, gym clothes and mountain equipment, the sports equipment market growing by 12.5% compared to 2018 and over 50% compared to 2017, according to the financial newspaper's calculations based on data provided by market research firm Euromonitor. The upward

trend is to be maintained until 2023, the Romanians' appetite for sports will bring the market to 560 million Euros, according to Euro monitor estimates, which show that the threshold of half a billion Euros will be exceeded in 2021.

4. Conclusions

It is absolutely obvious that technology has made possible some performances that, no further than 15 years ago, were very difficult to imagine. The equipment has constantly improved, but it is obvious that not only the equipment is responsible for the progress of the athletes. Training style, nutrition, physical recovery is all the basis of progress in almost all sports. The sports equipment industry is evolving rapidly due to the increasing adoption of emerging sports technologies and the latest trends among young people. The introduction of innovative products is the means by which producers can compete in the competitive market, attract new consumers and meet the requirements of existing consumers.

Rapid technological advances and continuous innovations in everything that involves sports equipment of all kinds that follow the preferences of consumers work in favour of the market.

The fact that people are increasingly aware of their general health, which is why they are moving towards sports activities is the main reason that determines the growth of the market. Also, the constant improvements of the materials used for the manufacture of sports equipment contribute to the improvement of the product performance, thus increasing the adoption rate.

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References

1. Bairner, A.: *Sport, Nationalism and Globalization: European and North American Perspectives*. Albany, State University of New York Press, 2001.
2. Barbu, M.: *Marketing in sport*. Craiova, Editura Universitaria, 2010.
3. Barbu, M.C.R., Turcu, I., Sandu, I.E., Diaconescu, D.L., Păsărin, L.D. and Popescu, M.C.: *The impact of technology on the definition of sport*. In: GYMNASIUM - Scientific Journal of Education, Sports and Health, 21(2), 2020.
4. Boyle, R., Haynes, R.: *Power Play – Sport, the Media and Popular Culture, 2nd edition*. Edinburgh, Edinburgh University Press, 2009.
5. Cave, A., Miller, A.: *Technology in sport: the speed of science*. In: The Telegraph, Augst, 25, 2015. Available on: <http://www.telegraph.co.uk/sponsored/business/business-sport-series/11814716/technologyin-sport.html>.
6. Collins, A., Flynn, A.: *Measuring the environmental sustainability of a major sporting event: a case study of the FA Cup Final*. In: Tourism Economics, 14(4), 2008, p. 751-768.
7. Florea D.L., Barbu C.M. and Barbu M.C. R.: *A model of fans' reaction to resurrected brands of sport organizations*. In: International Journal of Sports Marketing and Sponsorship, 19(2), 2018, p. 127-146.

8. Giampiccoli, A., Nauright, J.: *Beyond the reach of FIFA: football and community development in rural South Africa, towards a politics of inclusion and sustainability*. In: Soccer & Society, 20(2), 2019, p. 288-306.
9. Igel, L.: *Economics no longer the major factor for sports investment*. In: Sport Business Journal, April 10, 2017. Available on: www.sportsbusinessdaily.com/.
10. Klein, A.M.: *Growing the Game: The Globalization of Major League Baseball*. New Haven, CT: Yale University Press, 2006.
11. Nauright, J.: *Global games: culture, political economy and sport in the globalised world of the 21st century*. In: Third World Quarterly, 25(7), 2004, p. 1325-1336.
12. Nikšić, E., Rašidagić, F., Beganović, E. and Németh, Z.: *Examination of the differences in the representation of deformities of individual body parts in initial and final measuring*. In: Sport Science, 12(S1), p. 36-45, 2019.
13. Nistorescu, T., Barbu, C.M., Ploscaru, C.C.: *Brand – product interdependence*. In: Management & Marketing, 12(1), 2014, p. 7-13.
14. Phillips, E., Farrow, D., Ball, K., Helmer, R.: *Harnessing and understanding feedback technology in applied settings*. In: Sports Medicine, 43(10), 2013, p. 919-925.
15. Stroe, C.A., Barbu, M.: *Impactul sportului asupra economiei*. Craiova, Editura Universitaria, 2006.
16. www.alliedmarketresearch.com/sport-s-equipment-and-apparel-market. Accessed: 20-02-2021