DOI: 10.17747/2618-947X-2021-2-184-189
JEL O32, L67, Z2
UDC 796.022

Application of innovative digital products in sports industry

I.V. Solntsev[1]
[1] Financial University under the Government of the Russian Federation (Moscow, Russia)

Abstract

This article considers innovative solutions used in sports industry. Taking into account the importance for the consumer in the context of pandemic restrictions, as well as the presence of a large number of modern technological cases, the author focuses on fitness sector. The innovative solutions discussed in the study can be classified as follows: mobile apps; sensors; virtual reality. The analysis allowed the author to highlight the pros and cons of digitalization, determine the development trends of fitness industry, the specifics of its financial model and competitiveness. Despite the importance of automation, the author emphasizes the high role of "living" labor, the importance of which can be studied in further developments.

Keywords: sport management, fitness management, sport innovation, fitness innovation, digital sport, digital fitness.

For citation:

Solntsev I.V. (2021). Application of innovative digital products in sports industry. *Strategic Decisions and Risk Management,* 12(2), 184-189. DOI: 10.17747/2618-947X-2021-2-184-189. (In Russ.)

Acknowledgements

The article was prepared on the basis of the research project "Mechanisms for supporting projects in the development of digital high-tech areas", carried out at the expense of budgetary funding within the framework of the state assignment of the Financial University in 2021.

1. INTRODUCTION

The sports industry is unique with regard to the diversification of the organization activities that form it: professional and amateur clubs, media, bookmakers, equipment manufacturers, fitness and ski resorts – they all make money from sports by offering their unique products and services. These areas have been markedly transformed by digital technologies. In today's world, the use of wearables, big data analytics, social media, sensor technology and virtual reality has revolutionized the way sports are conducted, analyzed and improved. With the help of modern technology professional and amateur athletes, as well as coaches, can collect and analyze any data, improve training methods, avoid injuries and improve skills. Fans receive all the necessary information, purchase club products and consume content through applications. The authors [Rathonyi et al., 2018] identify four macro-domains that demonstrate the connection between sports and informatics: sports performance, sports club, event management, and fan experience. The most popular technologies used in the sports industry include mobile applications, augmented and virtual reality, big data, and social networks.

The sports industry has suffered the start of pandemic restrictions very painfully. The product of most of its participants implies (or rather, implied) personal contact with the consumer, and the lack of such an opportunity led to the inability to generate cash flow. However, as often the case in any crisis, business difficulties have spurred a change in business model and the introduction of innovative solutions.

Among many players in the sports industry, fitness equipment manufacturers have been the most successful in terms of revenue growth. At the same time, the fitness industry itself in a very short time has ensured the

introduction of a number of innovative solutions that combine the creation of applications, the use of virtual reality technologies, detectors and sensors. Given the wide range of new digital products, this study will focus on the fitness industry, which is an important element of the sports industry.

2. DIGITAL FITNESS PRODUCTS

The first and most obvious response to the pandemic was the active development of online training, which required an appropriate technological platform [Johnson, 2021]. By itself, remote training is not a new product. However, under conditions of restrictions, on the one hand, they have become the only source of income for coaches, equipment manufacturers and clubs, and on the other hand, they have entered a new round of development, taking into account the possibilities of modern digital technologies.

One of the main areas of work is mobile fitness applications [Gowin et al., 2015; Depper, Howe, 2017], which several representatives of the sports industry began to develop at once[1,2]. Firstly, these are the largest manufacturers of sports equipment: Nike, Adidas, Under Armor. Moreover, each company simultaneously develops several applications at once. For example, Nike offers the Nike Training Club app which contains personalized training programs, nutritional advice, and expert advice. A narrower running direction - Nike Run Club - can be integrated into this application when users are offered a number of programs with audio accompaniment. They are given the opportunity to receive information about the pace, location, distance, climb, heart rate and jogging segments; there is an option to set goals and ways to achieve it, a social network containing photos, statuses, stickers and the ability to compete with other users, sneaker data regardless of the brand.

Similar functionality is offered by the Under Armor app line: all training statistics are packed into infographics, routes for jogging; walking and cycling are offered, communities are created that unite not only individual regions, but also countries. There is synchronization with Under Armor running shoes, as well as with smart Apple, Samsung, Garmin watches, etc.

Under Armor is currently the most active in developing the idea of smart shoes. In 2018, the company released an innovative line of HOVR, and in 2019 introduced the HOVR Infinite model with a sensor that transmits data via Bluetooth to a phone or watch. The sensor is installed in the right shoe, is not afraid of water, does not require recharging and is integrated with the official Under Armor applications, transmitting the following information: distance, pace, foot angle, step frequency. Guided by this data, the application gives recommendations during the training, suggests and corrects lesson plans. If you don't take your phone or watch out for a run, the data will be synchronized after the shoes are close by.

Nike only makes their smart shoes for basketball. Adapt BB sneakers are self-tightening and fixed on the foot (automatic lacing). Management is carried out through a smartphone or a button on the sole. The app remembers your training and resting positions and adjusts your running shoes automatically. In this case, the mechanism requires regular recharging on a special rug.

Gadget manufacturers form the second competitive segment in this market. On the app side, Apple has been the most successful with its Fitness+ app for iPhone, iPad, Apple TV, and Apple Watch. Device integration lets you merge metrics collected with your Apple Watch and all your media. Group training allows you to bring together up to 32 people and arrange a competition in individual disciplines.

Finally, fitness clubs offer their applications. At the same time, they allow not only to register for training and pay for services. Among the functionality is health monitoring, which allows you to control the main indicators in real time, the development of individual recommendations for a balanced diet, social network functions and the possibility of competing with other club clients or between clubs of the same network. This direction is described the works of [Benetoli et al., 2017; Goodyear et al., 2017; Lupton, 2017; 2020].

A separate segment is manufacturers of trackers that monitor various indicators in everyday life and when playing sports [Schmidt et al., 2015]. For example, the American company Fitbit, Inc. specializes in bracelets, smart watches and Wi-Fi scales. All products are synchronized via a laptop or smartphone with the cloud, which allows you to share data with friends, arrange competitions and receive analytics of various levels. Google believed in the success of the project, which bought the project for 2.1 billion USD.

A significant problem with online training has always been the lack of feedback on the correctness of the exercises. The developers of the Onyx Home Workout App tried to solve it, which monitors the accuracy and number of repetitions using motion sensors and a smartphone camera. In real time, you can adjust the training program depending on the capabilities of the person and get feedback. At the beginning of 2021, the application (technology) was bought out by the Indian company Cure.fit, which offers customers a similar set of services.

Parallel technologies are used in yoga applications. Pivot Yoga offers training clothes equipped with special sensors when artificial intelligence compares the position of the student's and teacher's body in space. Zenia uses computer vision: the position of the body in space is

[1] Kurov A. (2021) Digitalization, gamification, interactivity: digital fitness trends. URL: https://rb.ru/opinion/digital-fitness-trends/.
[2] Demidkina K. (2021). An unplowed field for investments: why projects in the field of online fitness took off and whether they are expected to roll back. URL: https://www.forbes.ru/karera-i-svoy-biznes/427971-nepahanoe-pole-dlya-vlozheniy-pochemu-vzleteli-proekty-v-sfere-onlayn.

recognized by the smartphone camera. You can train with a virtual instructor or join live classes.

Among the Russian fitness apps are Spotify, Fitstars and Welps, in which trainers post their workouts, and users can choose the ones they like for individual classes online, including via Zoom, WhatsApp, Telegram. Another WorkoutMe application allows you to plan and conduct workouts, as well as search for fitness partners around the world. The emphasis is on short sessions of one minute. In the corporate mode, the service makes it possible to create communities for employee training and reward the most active ones for sports achievements.

In fitness, their own marketplaces are also being created. Thus, the Fitmost application offers a single subscription for an affiliate program with several clubs, studios and centers. The user can choose a convenient time, location and type of training and pay for them with purchased points.

Domestic service Welltory helps to control health by analyzing heart rate received through wearable devices and processed by artificial intelligence. The application analyzes the level of stress and fatigue, helps to determine the optimal duration of sleep and choose the time for sports. The system works through a special heart monitor that clings to the ear and connects to a smartphone. Additionally, you need to put your finger on the camera of your smartphone.

However, training at home was primarily a necessary measure during the quarantine period. For most people, it is important not only to play sports, but also to communicate, and the functions of social networks cannot always replace live contact. At the same time, even the offline format is characterized by the monotony of the exercises performed, and new technologies make it possible to significantly diversify the exercises.

Many people come to fitness clubs with high motivation. However, initial enthusiasm is often limited to the first months. This is due to high membership fees, lack of time and the monotony of training [Rampf, 1999]. Information technology, computer games and virtual reality help to make training more fun and, therefore, attractive in the long term [Moritz, 2003].

One of the first companies to modify fitness equipment was the American Peloton. The main business idea that changed the company's business model was equipping simulators with interactive screens that allow online training and broadcasting of entertainment content. The company pioneered tech-based fitness and created streaming, which makes fitness fun, accessible, efficient and convenient, as well as built and strengthened social bonds that encourage consumers to be "the best version of themselves"[3]. The company positions itself at the intersection of fitness, technology and the media. The company's training library already contains several thousand original fitness and wellness programs. You can choose a program depending on the type of training, instructor, music genre, duration, equipment available, area of physical activity and level of difficulty. The income of the business is generated by the sale of simulators, as well as the recurring subscription income associated with them. In 2020, the revenue was 1,825.9 million USD, by 100% and 110% from 2019 and 2018. The company identifies the following factors that enhance its competitiveness and make the developed business model difficult to reproduce:

- production efficiency;
- original content;
- quality and safety of products;
- competitive price policy;
- market vision and innovative products;
- strength of sales and marketing strategies;
- brand awareness and reputation.

Another example of innovative fitness equipment is an interactive mirror for Mirror company trainings[4]. Its main advantage compared to Peloton equipment is its compactness. The width of the mirror is 56 cm, the height is 132 cm, and the thickness is only 3.5 cm. The technology itself works as follows: on the screen you can see a fitness instructor who is training and your own reflection, which allows you to work on improving your technique. Users receive personalized recommendations, can set specific goals and monitor their achievements. The mirror itself costs 1,495 USD, while the online training subscription costs 39 USD per month. The program includes strength and cardio training, yoga and barre training: a combination of ballet exercises, yoga and Pilates.

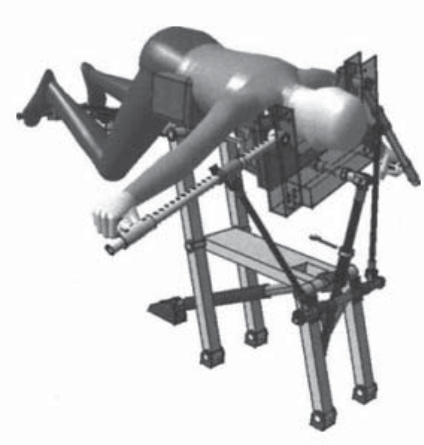
Today, more sophisticated technologies that use virtual reality are already applied. Interestingly, back in 2006, a concept with the simulator imitating flight was presented [Henneke et al., 2006]. Hand movements resembling a butterfly were chosen as training exercises. In this case, the user observes a flight simulation on a monitor or display mounted on the head. The adaptable resistance is provided by a mechanical and hydraulic system. Thus, the flight is perceived not only optically, but also tactilely.

The Munich-based startup Icaros GmbH proposed a similar project in 2015 – a simulator equipped with a VR helmet that allows you to simulate flying or swimming in a virtual race format. As seen in Fig. 1, the idea has changed somewhat, but the essence remains the same.

Martial arts uses HTC Vive technology - a virtual reality helmet that allows you to simulate a fighting ring. Thanks to the sensors on the helmet, you can fix the accuracy of the impact. The main limitation remains the measurement and transmission of the force of blows, which makes a live sparring partner indispensable. FitXR is developing boxing (no sparring, only punching) and dance training in virtual reality.

[3] Peloton Annual Report 2020. URL: https://investor.onepeloton.com/static-files/9595d9d3-9e56-40fe-bbce-07176ae274d6.
[4] Feldman E. (2020). iPhone in the world of fitness: how a former ballerina created a $ 300 million business on mirrors. URL: https://www.forbes.ru/biznes/401767-iphone-v-mire-fitnesa-kak-byvshaya-balerina-sozdala-biznes-v-300-mln-na-zerkalah.

Рис. 1. Эволюция тренажеров, имитирующих полет
Fig. 1. Evolution of flight simulators



Тренажер FlyGuy (2006)
Источник:
[Henneke et al., 2006].

Тренажер ICAROS Health (2021)
Источник: URL: https://www.icaros.com/products/.

The Russian company SkyTechSport releases a smart punching bag that analyzes the movements of a boxer, the position of the legs and body, predicts his actions and evades punches. This functionality is realized by infrared sensors, as well as motion sensors installed in columns next to the punch bag.

The same company has developed a ski and snowboard simulator that imitates sliding movements and recreates the mechanics of movement. The simulator is capable of providing several levels of overload, and to enhance the effect; it is equipped with a screen that provides the effect of being on a mountain slope.

Another innovative skiing technology is the Carv Digital Trainer. Through insoles equipped with touch sensors, the system analyzes every movement and corrects the actions of the skier with feedback. The kit also includes an accelerometer, a gyroscope and a magnetometer that provides information about the movement and position of the skis. The tracker serves as a power source for the sensors. It also analyzes data and provides wireless communication with a smartphone. Finally, you will need earphones and a special application for your smartphone to work. The system allows you to analyze not only descents, but also tricks. The user can select a particular lesson according to his level of skiing, Carv will analyze the descent and give recommendations to improve the technique. In this case, the system itself can determine the level of skating and offer the desired program. The system tracks the movements and position of the skis, the nature and degree of pressure on them. All the information about the slopes is stored in the cloud in a personal profile; it can be compared with the results of other skiers and sent to friends or a coach.

Life Fitness and VirZOOM combine virtual reality with exercise bikes, offering to combine training with the following game areas: tanks, cycling, pegasus, air combat, western, rally, kayak. A similar project is being implemented by Holofit: virtual reality glasses are integrated into bicycle, elliptical and rowing machines. The user can select 3D views based on real and fantasy locations in nature, underwater and in space. The Zwift project offers several virtual worlds for cycling and running marathons at once. For example, in the summer of 2020, at the height of the pandemic, the company organized the first virtual Tour De France.

Kaaya Tech is developing a line of special HoloSuit suits that combine virtual reality with detectors and motion sensors. One of the company's offerings includes a training suit: every time an incorrect movement is made, the corresponding body part receives tactile feedback, which is used to passively teach motor skills, thereby muscle memory through virtual simulation is activated. The user's movements are recorded and stored: a detailed analysis can be carried out after the workout is completed. The program also generates reports of varying complexity, gives recommendations for correcting errors. The company simulates workouts for a variety of sports, including golf, cricket, and baseball.

Another manufacturer of smart clothing, Athos, produces shorts, breeches and long-sleeved T-shirts from a special conductive synthetic fabric equipped with sensors. The kit includes a wearable module with an accelerometer. All collected information is transmitted to the smartphone via Bluetooth. Sensors are used to monitor muscle fibers, breathing and heart rate. Through them, the technique of performing exercises is controlled, overloads are prevented. Experts note that clothing provides a higher measurement accuracy than watches or bracelets.

3. CONCLUSION

As a result of the analysis, innovative trends in the development of the fitness industry can be formulated.

1. Digitization of training and displacement of a live coach. A digital coach helps to set the right goals, offers a plan for achieving them and a schedule that takes into account the individual characteristics of a person, and sets motivational factors.

2. The high role of big data. Modern training is no longer possible without detectors and sensors that are integrated with smartphones and allow you to prepare a variety of reports.

3. Gamification. The competitive element has always been at the heart of the sport. Today, even such simple disciplines as running or exercises on the horizontal bar can be diversified with elements of competition with friends or app partners, and thanks to virtual reality, make them as exciting as possible.

4. Change in the financial model and redistribution of the market. Any innovation requires funding. Most modern technologies allow fitness clubs to save on operating costs: some classes are transferred home, which saves on rent and exercise equipment; classes are conducted by robots, therefore, the most expensive item – wages – is reduced. However, such modernization requires significant capital investments. It can be assumed, that in the medium term only large players with the appropriate capabilities will remain on the market. The market share of small clubs will move to "home" fitness. At the same time, the share of servicing and repayment of loan obligations will increase in the composition of the costs of players who remain in business.

5. Increasing competition. The variety of technological solutions makes the consumer more and more demanding of the final product. The best results can be achieved by a company that offers its customers the maximum possible range of services. Very soon, just online training with a detailed report and recommendations based on the results will not be enough, you will need to use a whole set of sensors, offer several virtual training scenarios, organize competitions not only with other clubs in the network, but also in an international format. By analogy with the previous paragraph, this trend leaves few chances for small players, and the one who can consolidate the available technological and marketing capabilities as much as possible will win.

So, digitalization is seriously changing the landscape of the fitness industry, making its product more diverse and interactive, but also requres serious investments and a quick response to changes. The main challenge in these conditions may be the preservation of human labor. Robots will better and more accurately monitor the training process, offer a new training program, nutrition and treatment faster. They will be able to train at any time of the day or night for an unlimited number of clients, and will not make mistakes or show inattentive attitude. However, one should not underestimate the importance of live communication, the need for an individual approach, the experience of a professional trainer, taking into account psychological characteristics and the specifics of human motivation by a person. These aspects can be considered in more detail in future studies.

References

1. Benetoli A., Chen F.T., Aslani P. (2017). Consumer health-related activities on social media: Exploratory study. *Journal of Medical Internet Research*, 19(10): e352. URL: http://www.jmir.org/2017/10/e352/.
2. Depper A., Howe P.D. (2017). Are we fit yet? English adolescent girls' experiences of health and fitness apps. *Health Sociology Review*, 26(1): 98-112. DOI: 10.1080/14461242.2016.1196599.
3. Goodyear V., Kerner C., Quennerstedt M. (2017). Young people's uses of wearable healthy lifestyle technologies; surveillance, self-surveillance and resistance. *Sport, Education and Society*, 24(1): 1-14.
4. Gowin M., Cheney M., Gwin S., Wann T.F. (2015). Health and fitness app use in college students: A qualitative study. *American Journal of Health Education*, 46(4): 223-230.
5. Henneke C., Hoisl F., Schönberger S., Moritz E.F. (2006) Potentials of information technologies for innovation in fitness equipment - a case study. In: Moritz E.F., Haake S. (eds.). *The Engineering of Sport 6*. New York, NY, Springer. URL: https://doi.org/10.1007/978-0-387-45951-6_38.
6. Johnson P.A. (2021). Hidden in plain sight: The spatial and industrial logics of home fitness technologies. *New Review of Film and Television Studies*. DOI: 10.1080/17400309.2021.1960099.
7. Lupton D. (2017). *Digital health: Critical and crossdisciplinary perspectives*. London, Routledge.
8. Lupton D. (2020). Better understanding about what's going on': Young Australians' use of digital technologies for health and fitness. *Sport, Education and Society,* 25(1): 1-13. DOI: 10.1080/13573322.2018.1555661.
9. Moritz E.F. (2003). *The virtualization of fitness training*. München, Volvo Sports Design Forum.

10. Rampf J. (1999). *Drop-out und Bindung im Fitness-Sport: Gunstige und ungunstige Bedingungen fur Aktivitatcn im Fitness-Studio.* Sportwissenschaftliche Dissertationen und Habilitationen; Bd. 48. Hamburg, Czwalina.
11. Rathonyi G., Bácsné Bába É., Müller A., Rathonyi-Odor K. (2018). How digital technologies are changing sport. *Applied Studies in Agribusiness and Commerce*, 12(3-4), December. DOI: 10.22004/ag.econ.292396.
12. Schmidt B., Eichin R., Benchea S., Meurisch C. (2015). Fitness tracker or digital personal coach: How to personalize training. *UbiComp and ISWC 2015* - Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing and the Proceedings of the 2015 ACM International Symposium on Wearable Computers, 1063-1068.

About the author

Ilya V. Solntsev
Doctor of economic sciences, head management and marketing in Sports Department of Financial University under the Government of the Russian Federation (Moscow, Russia). Orcid: 0000-0001-9562-8535, ResearcherID: C-5644-2013, Scopus Author ID: 56976343300, SPIN-код: 2618-0770, AuthorID: 683561.
Research interests: sport economics, sport management, finance and investments in sports, development strategies for sport entities.
Ilia.solntsev@gmail.com

The article was submitted on 12.10.2021; revised on 1.11.2021 and accepted for publication on 10.11.2021. The authors read and approved the final version of the manuscript.