

Tomasz Seweryniak

University School of Physical Education in Wrocław

e-mail: tomasz.seweryniak@awf.wroc.pl

**THE APPLICATION OF COMPUTER
AND ELECTRONIC TOOLS DURING
A SPORTS SPECTACLE IN VOLLEYBALL
ON THE EXAMPLE OF PLUSLIGA**

Summary: The paper concerns the sports product created during men's volleyball matches in the Polish professional league (PlusLiga). The objectives of the article are: analysis of the use of computer and electronic tools in a sports product creation process and provide practical guidelines concerning their use in men's volleyball in order to increase the attractiveness of a sports spectacle. To achieve the goals, documentation analysis and observations were used. The results show a fairly wide range of use of such tools during the games. Additionally, owing to computer science and electronic technologies, it is possible to continue the development of the product offered by PlusLiga.

Keywords: professional sport, volleyball, sports spectacle, computer tools, electronic tools.

DOI: 10.15611/ie.2014.4.03

1. Introduction

Sport is an area of life really interesting to people who look for a possibility to meet their various needs. Among them we will find entertainment, a need to compete, a need to belong, as well as many aspects of health. Professional sport is an extremely popular area, which for a certain group of customers (fans) is a form of entertainment and a source of emotions, while for other groups it may be a form of professional activity (athletes, coaches, judges) or a business (e.g. the media, people responsible for the sports infrastructure, suppliers of sports equipment and facilities). Professional sport is defined as "an area of social life in which the process of creation, promotion and distribution of the product through the effective use of sport's values, and particularly public image of sport are formally implemented" [Panfil, *Strukturalizowanie...*]. Amongst the most important issues in professional sports are the processes of creation, distribution and consumption of a specific product, referred to as a sports product. A sports product is defined by A. Sosgórnik [1999] as "any goods, any service, any person, any place or any idea having important attributes,

Table 1. Sports product structure

Sports product elements	Value criteria of sports products
Trademark, club emblem	<ul style="list-style-type: none"> • public perception • prevalence
Sport spectacle	<ul style="list-style-type: none"> • aesthetics and functionality of the sports infrastructure • media coverage form • sport rules
Sport team	<ul style="list-style-type: none"> • team play level (team effects) • game style (media attractiveness)
Professional players	<ul style="list-style-type: none"> • players' level of play (individual effects) • players position (players profile) • behavior style (media attractiveness)
Sport	<ul style="list-style-type: none"> • global and local popularity • amount of funds involved

Source: [Panfil 2004, p. 41].

and which meets the needs and requirements of the consumer in terms of sports, fitness and recreation” (see Table 1).

A sports spectacle is an event during which parts of the sports product are created (individual score, team score), while its consumption is realized by fans. This is a situation where you can most fully assess the sports product quality, taking into account all its components. The level of sports performance affects the rank of the contest, rules of the game, the aesthetics and functionality of the physical space in which they take place, the emotional climate created during the match and the form of media coverage [Panfil, *Zarządzanie...*]. The process of creating a sports product is supported, as in the case of other products, through various computer and electronic tools [Perechuda et al. 2011]. The product is a matter of prime importance in professional sports. The professionalization of sport has the longest history in case of the most popular disciplines, including the team sport games. The professional volleyball league has been present in Poland since 2000, when the Office of Physical Culture and Sports of Poland gave the Professional League of Volleyball (PLPS) a license to conduct professional competitions in men's volleyball. The work of athletes and coaches combined with the effort of institutions involved in the development of these competitions resulted in a rapid increase in the quality of the product offered by PLPS (nowadays referred to as PlusLiga – after its strategic sponsor). Currently, PlusLiga is considered, alongside the Russian and Italian leagues, to be one of the best leagues in the world [*O nas*] and the attendance during matches is stable and high [*Frekwencja...*]. According to the study of Polish Internet users conducted by Pentagon Research [*Raport Sport 2013*], volleyball is the second most popular sports discipline among the respondents. PlusLiga matches rank third in terms of popularity when it comes to the volleyball competitions (about 71% of positive choices), being preceded only by matches of the Men's Polish National Team (about 88% of positive choices) and Women's National Team (about 81% of

positive choices). There are numerous scientific publications that describe the use of IT tools and electronic equipment in the sport, with particular emphasis being put on professional sport. During a sports spectacle in different disciplines, they are used primarily to monitor the activities of athletes [O'Donoghue 2006; Dellaserra et al. 2013; Silva et al. 2013; Kristan et al., 2005], enriching the range and quality of information provided to viewers [Pingali et al. 2002; Yoshida et al. 2013] and enhancing the task for judges [Owens et al. 2003; Guizzo 2005; Solomon et al. 2011]. The analysis of selected elements of a sports product, with a particular focus on the PlusLiga sport spectacle, along with observations of sporting events in other sports, offers ample opportunities to improve the product created, offered and consumed during PlusLiga matches. Significant progress can be made here through the use of information technology and electronic tools. This paper will present solutions currently applicable in PlusLiga in this area as well as solutions that can further enhance the attractiveness of a sports spectacle.

2. Purpose, methods and the research material

The author has two goals:

- to analyze the use of the computer and electronic tools during men's volleyball matches on the example of PlusLiga,
- to present practical guidelines concerning the use of computer and electronic tools to raise further the attractiveness of a PlusLiga sports spectacle.

Methods used include a document analysis and observations. The research material comprises documents created by the competition organizer, national and international sport management organizations, manufacturers of computer tools and electronic equipment used during the events and results of observations.

Table 2. Sports spectacle participants

Group of participants	Typical activity or task	Group symbol
1	2	3
The audience watching the game in a sports hall	<ol style="list-style-type: none"> 1. Watching the game live at the hall 2. Supporting the teams 3. Creating spectacle elements 4. Participating in contests for fans 	P1
The audience watching the game on television	<ol style="list-style-type: none"> 1. Watching the game on television 2. Participating in contests for fans 3. Participating in the best player voting 	P2
The audience watching the game via the web broadcast	<ol style="list-style-type: none"> 1. Watching the game via the Internet transmission 	P3
Players	<ol style="list-style-type: none"> 1. Playing the game 2. Supporting own team by non-playing athletes 3. Cooperating with the team staff 4. Cooperating with journalists before, during and after the game 	G

Table 2, cont.

1	2	3
Team staff	<ol style="list-style-type: none"> 1. Proving operational direction for the team 2. Cooperating with other team staff members 3. Cooperating with journalists before, during and after the game 	SZ
Referees	<ol style="list-style-type: none"> 1. Supervising the game ceremonial and course 2. Controlling the game course as well as the behavior of players and the team staff according to the rules of the game 	SDZ

Source: own elaboration.

In order to facilitate the analysis of solutions used during the PlusLiga games, sports spectacle participants have been divided into groups according to the task performed and the dominant form of activity during the show (see Table 2). A similar approach to the audience treated as a heterogeneous community was also adopted by K. Wiejak [2004].

3. Analysis of the results

Computer and electronic tools used during the show in PlusLiga will be presented in this section. Consequently, suggestions of possible solutions for sports spectacle participants that could increase their operating efficiency (teams, training staffs) or expand the sports product rendering it more attractive will be made. Tools and solutions used now in PlusLiga are presented in Table 3.

Table 3. Tools and solutions used now in PlusLiga

Tool	General feature	Manufacturer
1	2	3
Ball velocity meter	Measurement of ball velocity after the serve	BT Sport
Data Volley 2007 computer system	Detailed computer based analysis and evaluation of player actions in full range	Data Project
Data Video 2007 computer system	Coupling video recording with data given by computer scouting system (i.e. Data Volley 207), analysis of player actions using video recording	Data Project
Click and Scout computer system	Narrow range analysis and evaluation of players mainly designed for tablets	Data Project
Digital advertising panels	Visual presentation of advertisements and banners	BT Sport and others
Wall screen	Presentation of advertisements, information about the match, participants, the course of the competition, replays	Different companies

1	2	3
System Challenge video verification	Referee calls verification at the team's request	CVS
e-Scoresheet computer scoresheet	Keeping the regulations required game recording of the match	Data Project
Voice communications system	Provision of wireless communication for the staff and the team	Different companies
Internet TV and VOD service	Provision of paid access to legal match broadcasts using the Ipla platform	Different companies, the platform owner is Platforma Cyfrowy Polsat

Source: own elaboration.

3.1. Detailed description of distinguished tools used in PlusLiga

Ball velocity meter. The ball velocity is measured right after the serve in any action during the game. The measurement result is displayed on highly visible displays (i.e. LED technology screens) located behind the baseline.

Data Volley 2007 computer system. Data Volley 2007 (DV 2007) is a professional computer program for the analysis and evaluation of players in the game of volleyball. Real-time analyses are made for serves, serve receptions, setting directions, attacks, blocks and defenses. These actions are evaluated in terms of their execution by the players, place, and effects. Using a scoreboard panel, which is one of the system elements, we can define the initial team setup, modify it by inserting substitutions, determine the setter and libero as well as indicate the number of timeouts and the result.

Information that can be obtained through observations is received in real time based on work of an observer who uses short codes (basic code, advanced code, extended code) allowing to select one of the three ranges of observed actions. Codes can be inserted by hand or using the options offered by the program, which allows even less experienced scoutmen to create advanced observations. Based only on the basic code, one can create real-time rankings, taking into account specific action effects, effects of the game of a specific player, effects of the given team setting during the set or the match. The program also provides data on the effectiveness of actions in particular zones of the court. There are nine zones at each court half, each measuring 1×1 m. We can get real time information about each activity carried out in the given area as well as the various compilations of collected data. DV 2007 also allows for an analysis of the service hit and attack directions of individual players owing to the use of appropriate codes or based on the ball trajectory drawing on a touch screen or by a mouse. It also shows the attack decomposition into particular court zones.

The match reports can be printed in a PDF format, as well as published in the Internet using the html protocol. Additionally, you can generate a set or match

recording in the play-by-play system along with a brief description of the event. All observations are archived, which allows for a multidimensional analysis of game players and teams over several matches. DV2007 also allows you to open a video file containing a match recording and generate the game statistics. This is especially useful if you do not have a person who can do it live.

The data obtained from DV2007 can be shared on an ongoing basis during the match with the coaching staff, journalists, television and all interested parties. When there is a projector or a large screen with suitable additional software available, the DV2007 data can also be viewed by fans in the sports hall. This will allow insight into the statistics of the serving player, display of replays as well as presentation of information about sponsors [*Data volley...*].

Data Video 2007 (Data Project). Data Video (DV_i 2007) is a computer program that allows one to couple digital camera recordings with results of player action scouting obtained, for example, from DV2007 or Click and Scout. In the analysis phase, the user can select an action in accordance with their own criteria, taking into account, *inter alia*, the player's action conditions (i.e. the ball setting height), the action zone, the set phase or a previous action. The program also lets one re-play some portion of the game (e.g. the last action) with a certain delay, which is useful in the work of coaches running the team during the match. You can add some elements (arrows, lines, circles) to the recorded picture to facilitate game analysis. Similarly as in DV2007, you can prepare compilations based on games series, share the material or compress it [*Data video...*].

Click and Scout (Data Project). System Click and Scout (C&S) is a relatively inexpensive program for the analysis and evaluation of volleyball games designed for mobile devices with a touch screen (tablets) and smartphones as well as PCs and laptops. In PlusLiga matches, the system generates statistics available live via the league's website.

The C&S interface support does not require any time-consuming training and is not complicated. Player positions in the service hit reception can be determined according to the actual setting. There is an option to cancel the service reception position determination, if the observed game level is low. The place from which the attack is executed is determined in accordance with reality. C&S provides an option to save the attack and service hit directions and effects as well as the way of service hit and attack performance in different sections of the game.

The system generates effectiveness summaries for selected players and the entire team during the serve, reception and attack. Based on the data collected during the meeting, it presents directions, methods and effects of serving of the player currently located on the serve. It gives a preview of the serve characteristics in real time and a better preparation of the receiving team. C&S also presents the attack directions, methods and effects of selected receiving team players, taking into account various team settings and various situations (e.g. attack after the serve reception or after a successful defense). It allows you to preview the attack in real time, which facilitates the operational direction of defensive actions.

C&S allows you to generate reports and post-match analyses with regard to the overall team performance over several matches. It cooperates with other programs used to observe and analyze the game produced by Data Project (e.g. DVi 2007 or DV 2007) and allows for data exchange between these programs [*Click and Scout*].

Wall screens (BT Sport). Wall screens displaying large screen (e.g. LED) high quality pictures generated by cameras or other sources (e.g. computers or computer systems) [*Telebimy*].

Digital advertising panels (BT Sport). Big format, high quality display panels, generally LED-based [*System reklamowych...*].

System Challenge video verification (CVS). System Challenge is a tool for verifying the decisions of judges based on a system of digital cameras and an appropriate program operated by a specially trained personnel. In a situation where the players on the court believe that the judges made a wrong decision during the game assessment, the team captain can ask for a check to be performed with regard to a specific aspect [*Regulamin...*]. Consequently, the second referee re-plays and re-watches given action elements with the help of the System Challenge operating staff. If the referee notices that the judge's assessment was wrong or certain events have not been taken into account, they may change the decision.

Computer scoresheet: e-Scoresheet (Data Project). Owing to its convenient interface, e-Scoresheet provides a record of all the facts and events that so far have been reported in a paper form. In addition, it is coupled with the web site of the competition organizer, where the event can be followed live. This product is fully compatible with other volleyball dedicated products by Data Project. It also generates an electronic protocol in a form identical to the paper form [*e-scoresheet*].

Voice communication system. Wireless voice communication systems are used primarily by the team staffs to communicate during matches. It improves the operational management of the team and the exchange of information, especially as regards the analysis of the game of the other team and the own team.

Internet TV and VOD service (Ipla platform). Owing to this solution, legal television broadcasts (also in HD) are available in the Internet, as well as broadcasts produced by other legal entities.

3.2. The use of tools by sporting spectacle participants

3.2.1. Analysis of the as-is state

The as-is state analysis indicates that show participants take advantage of IT tools supporting their participation in the show in varying degrees.

Participants of group P1:

- observation of the ball velocity after the service,
- observation of actions replays on wall screens,

- readout of information about the conditions, course, elements of the competition characteristics, teams, athletes and other show participants on wall screens,
- watching advertisements on digital panels,
- watching the computer visualizations of initial team setups at the match beginning on wide screens,
- watching the TV broadcast elements on wide screens,
- Internet access at the hall,
- watching images from different parts of the hall via wide screens,
- perception of visual and sound effects creating the show.

Participants of group P2:

- observation of the ball velocity after the service,
- observation of TV action replays,
- reception of information provided by TV producers:
 - 1) player profiles and statistics,
 - 2) coach profiles and statistics,
 - 3) profiles of other show participant (spectators, officials, referees),
 - 4) game progress and score,
 - 5) statistics of previous games and events,
 - 6) interesting facts about players, teams, clubs, competition,
- insight into the System Challenge image verifying the referees' decisions,
- close observation via television elements of operating directions given to players and teams by members of the coaching staff,
- live expert and journalist commentary.

Participants of group P3:

- 1) the same range as the P2 group if TV broadcasting is available in the Internet,
- 2) sound and vision from the hall at lower broadcast quality,
- 3) team names and the score.

Participants of group G:

- the same range as the P1 group in almost every aspect
- ongoing access to statistics characterizing the game of their own team and the game of the opposing team in aspects available via the computer supported game analysis (e.g. DV 2007).

Participants of group SZ:

- the same range as the P1 group in every aspect,
- use of detailed current match statistics,
- use of their own databases or statistics from the PlusLiga web page,
- use of video material compilations concerning their own activities and the activities of the opposing team,
- use of current video material compilations concerning their own activities and the activities of the opposing team,
- use of means of direct wireless voice communication with staff members.

Participants of group SDZ:

- the same range as the P1 group in almost every aspect,
- use of an electronic match protocol,
- use of the referee decision verification system (e.g. System Challenge) supported by game officials and system personnel.

3.2.2. The projected state

Computer and electronic solutions that can facilitate operational activities of selected entities forming the sports spectacle will be described in this chapter. These solutions can also increase the sports spectacle attractiveness for participants from different segments. These solutions seem to be able to deliver the highest quality product to the customers of a sports organization.

Participants of group P1:

- personalized access to the electronic game program available through mobile applications,
- access to the electronic game program via display devices installed in the hall,
- personalized access to match fragment replays and slow motion sequences through mobile applications,
- access to match fragment replays and slow motion sequences via display devices installed in the hall,
- personalized access to individual and team match statistics updated after each set through mobile applications,
- access to individual and team match statistics updated after each set via display devices installed in the hall,
- personalized access via the Internet to System Challenge elements,
- post-match press conference broadcasts via the Internet,
- Internet broadcasts, including team staff member communication with players during timeouts and breaks between sets.

Participants of group P2:

- increase in the television broadcast interactivity, which includes:
 - 1) viewer selection of statistics to be displayed,
 - 2) selection of image providing cameras,
 - 3) selection of the transmission option: with or without TV commentary.

Participants of group P3:

- transmission quality improvement (vision, sound), especially for games not broadcast on television,
- provision of elements that enrich the perception in order to reach a television broadcast level.

Participants of groups G and SZ:

- increase in the range of data collected remotely by means of micro-sensors that do not restrict the movements of athletes, relating to:

1) physiological body parameters of athletes of the own team and the opposite team,

2) kinematic parameters of players' actions (e.g. movement speed, distance traveled, acceleration),

3) biomechanical parameters of activities and operations of athletes of the own team and the opposite team,

4) three-dimensional kinematic and biomechanical analysis of the actions and activities of athletes of the own team and the opposite team,

5) nervous system monitoring (especially the brain activity).

Participants of group SDZ:

- independent use of System Challenge in a way that shortens time to review the decisions of judges,
- improvement of the speed and resolution of the Challenge System cameras,
- use of wireless voice communication systems between the judges.

4. Conclusions

The study analyzed a sports spectacle that is a product offered by PlusLiga – a Polish professional men's volleyball league. It focuses on computer and electronic solutions and tools that enrich the sports product examined. Results show a wide range of use for this type of tool, while pointing out to further opportunities for improvement.

On the basis of analyzes, the following practical guidelines can be formulated.

- It is recommended to increase the possibility of spectacle reception by the audience in the hall by increasing the scope of information provided by the display devices (projectors and screens).
- It is recommended to enrich the range of information available in real time during the match via web applications for smartphones and tablets.
- The quality of match broadcasts via the Internet should improve, especially in case of matches not broadcast by traditional televisions, and should be enriched by elements available for TV viewers and fans in the hall.
- Camera used in video verifications should have a maximum resolution and speed.
- It is recommended to shorten the time required for a video verification of the referee decisions by limiting the number of people operating the system. The ideal situation would be to ensure that a video verification is conducted during the match by a designated referee only (first referee or second referee).
- It is recommended to optimize the work of referees by improving the voice communication between them through the use of wireless communication systems.
- Solutions allowing a remote assessment of the mental and physical condition of players and their performance in terms of kinematics and biomechanics, including 3D technology, should be developed.

References

- Dellaserra C.L., Gao Y., Ransdell L., 2013, *use of integrated technology in team sports: A review of opportunities, challenges, and future directions for athletes*, The Journal of Strength and Conditioning Research, vol. 11.
- Guizzo E., 2005, *Bugged balls for tough calls [ball tracking systems]*, IEEE Spectrum, vol. 7. *Click and Scout*, <http://www.dataproject.com/VolleyBall/ClickandScout.aspx> (24.01.2014).
- Data video 2007*, <http://www.dataproject.com/VolleyBall/DataVideo2007.aspx> (24.01.2014).
- Data volley 2007*, <http://www.dataproject.com/VolleyBall/DataVolley2007.aspx> (24.01.2014).
- e-scoresheet*, <http://www.dataproject.com/VolleyBall/e-Scoresheet.aspx> (24.01.2014).
- Frekwencja na polskich parkietach siatkarskich*, <http://www.siatkanews.tnb.pl/news.php?readmore=3488> (24.01.2014).
- Kristan M., Pers J., Perse M., Kovacic S., Bon M., 2005, *Multiple interacting targets tracking with application to team sports*, [in:] Lončarić S., Babić H., Bellanger M. (eds.), *Proceedings of the 4th International Symposium on Image and Signal Processing and Analysis*, Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb.
- O'Donoghue P., 2006, *The use of feedback videos in sport*, International Journal of Performance Analysis in Sport, vol. 6, no. 2, pp. 1–14.
- O nas*, <http://www.plusliga.pl/O-nas> (24.01.2014).
- Owens N., Harris C., Stennett C., 2003, *Hawk-eye tennis system*, [in:] *International Conference on Visual Information Engineering 2003, VIE 2003*, Institution of Electrical Engineers, London, pp. 182–186.
- Panfil R., 2004, *Sport club product management*, Wyższa Szkoła Edukacja w Sporcie, Warszawa [in Polish].
- Panfil R., *Strukturalizowanie produktu klubu sportowego, czyli tworzenie wartości dodanej*, <http://sport.wszic.pl/index.php?c=articles&id=6> (24.01.2014).
- Panfil R., *Zarządzanie w sporcie*, http://www.equal.org.pl/download/produktAttachments/org1530_poz_11_zarzadzanie_w_sporcie.pdf, (24.01.2014).
- Perechuda K., Nawrocka E., Idzikowski W., 2011, *E-organizer as the modern dedicated coaching tool supporting knowledge diffusion in the beauty services sector*, [in:] Korczak J., Dudycz H., Dyczkowski M. (eds.), *Advanced Information Technologies for Management – AITM 2011. Intelligent Technologies and Applications*, Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, nr 206, Wrocław, pp. 152–163.
- Pingali G.S., Opalach A., Jean Y.D., Carlbom I.B., 2002, *Instantly indexed multimedia databases of real world events*, IEEE Transactions on Multimedia, vol. 4, no. 2, pp. 269–282.
- Raport Sport Barometr Plus*, October 2013, www.pentagononline.pl (24.01.2014).
- Regulamin wideoweryfikacji w sezonie 2011/12*, http://www.pwzps.p9.pl/index.php?option=com_docman&task=cat_view&gid=156&Itemid=462 (24.01.2014).
- Silva M., Lacerda D., João P.V., 2013, *Match analysis of discrimination skills according to the setter attack zone position in high level volleyball*, International Journal of Performance Analysis in Sport, vol. 13, no. 2, pp. 452–460.
- Solomon A.V., Paik C., Alhaulti A., Phan T., 2011, *A decision support system for the professional soccer referee in time-sensitive operations*, [in:] Neeley K.A. (ed.), *Systems and Information Engineering Design Symposium (SIEDS), 2011 IEEE*; IEEE, vol. 5, p. 35–40.
- Sosgórnik A., 1999, *Zarządzanie*, Wydawnictwo AWF w Katowicach, Katowice.
- System reklamowych band wideo*, <http://www.btsport.pl/telebimy/telebimydol.html> (24.01.2014).
- Telebimy*, <http://www.btsport.pl/telebimy/telebimydol.html> (24.01.2014).

- Wiejak K., 2004, *Media ponowoczesne w wychowaniu człowieka współczesnego*, [in:] Strykowski W., Skrzydlewski W. (eds.), *Kompetencje medialne społeczeństwa wiedzy. Media a edukacja*, Oficyna Ekonomiczna Wydawnictwa eMPI2, Poznań.
- Yoshida M., James J., Cronin J. Jr, 2013, *Sport event innovativeness: Conceptualization, measurement, and its impact on consumer behavior*, *Sport Management Review*, vol. 16, no. 1, pp. 68–84.

ZASTOSOWANIE NARZĘDZI INFORMATYCZNYCH I ELEKTRONICZNYCH W CZASIE WIDOWISKA SPORTOWEGO W PIŁCE SIATKOWEJ NA PRZYKŁADZIE PLUSLIGI

Streszczenie: Celami artykułu są analiza wykorzystania narzędzi informatycznych i elektronicznych w piłce siatkowej mężczyzn na przykładzie meczów w ramach PlusLigi oraz przedstawienie dyrektyw praktycznych dotyczących ich wykorzystania w piłce siatkowej mężczyzn, tak aby zwiększać atrakcyjność widowiska sportowego. W realizacji celów wykorzystano analizę dokumentacji i obserwacje. Materiał badawczy to dokumenty tworzone przez organizatora rozgrywek, organizacje krajowe i międzynarodowe zarządzające dyscypliną sportu, firmy produkujące narzędzia informatyczne i elektroniczne wykorzystywane w czasie widowisk sportowych oraz wyniki obserwacji. Wyniki wskazują na dość duży zakres wykorzystania tych narzędzi w czasie meczów. Dodatkowo dzięki technologiom z obszaru informatyki i elektroniki możliwe jest dalsze doskonalenie produktu tworzonego i udostępnianego w czasie meczów PlusLigi, co znalazło swój wyraz w sformułowanych dyrektywach praktycznych.

Słowa kluczowe: sport profesjonalny, piłka siatkowa, widowisko sportowe, narzędzia informatyczne, narzędzia elektroniczne.