systems

MDPI

Article

Integrated Sports Information Systems: Enhancing Data Processing and Information Provision for Sports in Slovakia

Michal Varmus, Milan Kubina, Martin Mičiak and Michal Šarlák *

Department of Management Theories, Faculty of Management Science and Informatics, University of Žilina, 010 26 Žilina, Slovakia; michal.varmus@fri.uniza.sk (M.V.); milan.kubina@fri.uniza.sk (M.K.); martin.miciak@fri.uniza.sk (M.M.)
* Correspondence: michal.sarlak@fri.uniza.sk

Abstract: Integrated information systems in sports have the potential to improve the efficiency of data management and support the managers' decision-making. However, this implementation faces challenges such as inefficiency, data duplicity, and time demands. This study represents a comparative analysis of sports information systems' implementation in four countries—Slovakia, Czech Republic, England, and Denmark. The originality of this study stems from the fact that there is currently no research background examining this issue to the same extent. This study's methodology focuses on the identification of the benefits and challenges occurring while implementing sports information systems and performing data management and analysis. This study also focuses on the potential of these systems to support managerial decision-making in this area. Data were collected from national sports databases and other relevant sources. Verification of the hypotheses showed that the implementation of sports information systems in Slovakia is inefficient in terms of costs and technology. Nevertheless, the systems that were implemented support managerial decision-making and their success is comparable to other EU countries within the aspects studied. Following the results, the main recommendation is to ensure transparency, automation, and strategic planning in the implementation of sports information systems. Future research directions include ethical and legal issues related to the utilization of technology in sports and the improvement of the user experience.

Keywords: information system; sports information system; sports; sports management; efficiency

Citation: Varmus, M.; Kubina, M.; Mičiak, M.; Šarlák, M. Integrated Sports Information Systems: Enhancing Data Processing and Information Provision for Sports in Slovakia. *Systems* **2024**, *12*, 198. https://doi.org/10.3390/systems12060198

Academic Editor: Oz Sahin

Received: 11 April 2024
Revised: 14 May 2024
Accepted: 3 June 2024
Published: 7 June 2024

1. Introduction

Sports managers' decision-making is currently being strongly influenced by all the information that is instantly available and generated by advances in information and communication technologies (ICTs) [1]. These technologies enable the collection of diverse data and have become an essential part of management in commercial businesses and other types of organizations [2]. The introduction of ICTs into sports has significantly changed the way sports are approached. ICTs enable better use of learning resources, enhance various functionalities, and promote overall innovation in sports [3]. Additionally, technologies improve training and monitoring of athletes' performance, leading to its higher levels. Finally, ICTs help with the identification of talent and create better conditions for the development of future sports stars [1,4].

The functionality of knowledge and information management in information systems (ISs) is connected to the development and maintenance of effective computer databases. A database, as an organized collection of records, allows information to be retrieved, accessed, and modified as needed [5,6]. In sports, managers often use relational databases that store data in tables and allow data from different sources to be compared and analyzed. This makes them more comprehensive information and knowledge management tools [7]. ISs have a significant role in achieving effectiveness because they integrate components that combine to form knowledge. These components include hardware, software, data, processes, and people [8].

In sports management, the integration of ISs has become a key force that is swiftly changing the way data are processed and information is delivered. Sports science indicates that sports organizations need to integrate data from different sources to provide customized information to the users [9]. The strategy to ensure the success of sports organizations is based on the systematic collection of information, its analysis, and effective utilization. This approach provides organizations with the opportunity to systematically satisfy all stakeholders, creating a competitive advantage. An important aspect of this strategy is a deep understanding of the contextual and qualitative factors that influence the sports environment [10].

For ISs to function properly, they need to be actively managed and updated. Database management systems (DBMSs) are often used for this purpose [11]. These systems allow users to create tables with defined columns and relationships among them; add, update, and delete data in the cells; and retrieve information from the database using standard database language (SQL) [12]. Due to the increasing emphasis among businesses on big data processing and analysis, knowledge of SQL programming languages has become an important asset for software developers worldwide. This is spreading into the field of sports and their management. Database management skills are considered highly desirable and essential for the effective manipulation and use of data within various environments [13]. The most popular DBMSs worldwide include Oracle, MySQL, Microsoft SQL Server, and PostgreSQL [14]. An example of their utilization was the World Cup in 1994 and 1998, which used the SQL Server for the database system. As a result, data dating back to 1930 were accessible [15]. Another example are the Major League Soccer teams that started using SQL Server to structure and read data. This helps them to set their training processes and team recovery [15,16]. In the last example, Oracle provided the American yachting team with the necessary data to plan courses and game schedules, increasing competitiveness [15,17].

The effective utilization of databases in sports management raises the need to apply the evidence-based approach in decision-making. It does not imply complete elimination of intuition, but rather the inclusion of valuable data in the decision-making process. If the information obtained from the databases does not correspond with intuitive assumptions, such a decision may be considered flawed. However, the existence of facts supporting the decision provides justification [18]. Therefore, it can be argued that the successful management of sports organizations and the achievement of their goals is only possible with understanding of the internal structure of the system, its components, and their operation. ISs in sports are used to apply the evaluation criteria and the indicators with the aim of increasing the efficiency and achieving specific goals of sports organizations [19].

The motivation for this study is based on the fact that the authors' research focuses on sports management in Slovakia as a whole. The focus on ICTs and ISs helps in identifying crucial pieces of information that can properly direct future steps in this research. This is mainly because this is a sector that is nowadays an inherent part of the entire operation of the sports industry. Therefore, a lack of research results in this area would negatively affect other research activities.

The aim of this study is to conduct a detailed comparative analysis of the utilization of ISs in sports in the Slovak Republic, Czech Republic, England, and Denmark. In the case of the Slovak Republic, this study also focuses on the history of the development of these systems, especially because it is a very significant cause of the issue addressed in the hypotheses' verification. Additionally, a part of the aim is to examine the impact of ICTs on managers' decision-making in the sports environment.

The research gap stems from the fact that this is an original study whose focus has not previously appeared in comparable form in any of the available literature sources. This focus is a combination of a comparative analysis of sports ISs in four deliberately chosen countries and a historical context of the current sports IS in Slovakia. This is combined with a precisely defined approach for the evaluation of sports ISs' efficiency. Therefore, this study can help domestic and foreign researchers understand the situation of ISs' management

in sports in selected countries and help other researchers follow the results with further research in this area.

2. Materials and Methods

This chapter discusses the systematic approach applied to achieve the study's aim. It provides a framework for the whole research process, including the research aim, hypotheses, research questions, data sources, and methods applied to analyze the data. Each aspect is delineated in detail, enhancing understanding of the methodology and procedures used. This ensures the results' reliability and validity.

2.1. Research Aim

The aim of this article is to examine the impact of ICTs on managers' decision-making today and its implementation in sports management. The knowledge and information management functionality of these systems is based on databases that enable information to be retrieved, processed, and analyzed. In sports management, the integration of ISs is a key force changing the way data are processed and information is delivered. The study therefore focuses on a comparative analysis of the utilization of ISs in Slovak Republic, Czech Republic, England, and Denmark, with the emphasis on the historical development of these systems in Slovakia. The research should contribute to better understanding of the management of ISs in sports. This study is also addressed to those responsible for setting policies in the field of sports.

2.2. Research Hypotheses

Based on previous research conducted by the authors of [20–33], it was identified that there is a need for research focusing on certain topics. These research areas mainly include the efficiency and implementation of ICTs and ISs, as these areas have been evaluated as the key ones in the past research projects. The hypotheses are linked to the relevant research areas, specifying the selected topic. These areas are listed in Table 1.

Table 1. Relevant research areas.

Area	Description of the Research Area
A	Effectiveness of past implementation of integrated ISs in sports in Slovakia
B	Current state of data management in sports organizations in Slovakia
C	Impact of implementation of integrated ISs on managerial decision-making
D	Effectiveness of the implementation of integrated ISs in sports in different EU countries

These areas are a prerequisite that the research results will be achieved and cover all essential areas of data collection and processing and the overall process of ISs' operation in sports. These areas are described in a more detailed way as follows:

(A) **Effectiveness of past implementation of integrated ISs in sports in Slovakia:** The first relevant area focuses on the analysis of historical cases of implementation of integrated ISs in sports organizations in Slovakia and the evaluation of their effectiveness and efficiency. This area further specifies the effectiveness in terms of the cost-economy of the governing bodies and in terms of the efficiency of the systems' operation. The operation is further described by the implemented legislative requirements within ISs in sports.

(B) **Current state of data management in sports organizations in Slovakia:** The second area involves the current data management practices in sports organizations in Slovakia and identification of problems and shortcomings. The main indicators of this area are the current databases with critical data, the current cost-economy of the governing bodies, and the functionality of the associated integrated information management systems.

(C) Impact of the implementation of integrated ISs on analytical decision-making: The third area is closely linked to the second one. It studies how integrated ISs in sports in Slovakia affect the ability to analyze data and make informed managerial decisions. This perspective can be classified as critical, especially from a managerial aspect.

(D) Effectiveness of the implementation of integrated ISs in sports in different EU countries: The last area involves a comparison of the practices and results of the implementation of integrated ISs in sports among Slovakia and other EU countries, namely England, Denmark, and the Czech Republic. The justification for selecting these countries is specified in Section 2.4.

Each of these areas can be examined based on predetermined indicators, which we listed in Table 2. The selection of indicators was mainly based on a case study from Germany, which focused on the effective implementation of ISs [34]. Additionally, the selection of indicators considered the points mentioned by Slovakia and the Czech Republic in their government programs for the implementation and improvement of ISs [35,36].

Table 2. Indicators and sources of verification for the research activities.

Description	Indicators	Sources of Verification
Main aim: to identify the impact of ICTs on managers' decision-making and its implementation in sports		
Relevant research areas		
A: Effectiveness of past implementation of integrated ISs in sports in Slovakia	$\mathbf{I_{A1}}$: Level of automation and process integration in sports organizations	Statistical and historical context of implementation and utilization of integrated ISs in sports organizations in Slovakia
	$\mathbf{I_{A2}}$: The security level and data protection in the systems	
	$\mathbf{I_{A3}}$: Improved access to information and effective communication among different managing authorities	Comparison of the performance of sports organizations before and after the implementation of new ISs
B: Current state of data management in sports organizations in Slovakia	$\mathbf{I_{B1}}$: Availability and accuracy of data in various areas of administration (finance, athletes' records, marketing data, etc.)	Audit of existing databases and data management systems in sports organizations
	$\mathbf{I_{B2}}$: Level of automation of data collection, processing, and analysis	Analysis of sports management and results reports obtained from existing systems
	$\mathbf{I_{B3}}$: Efficiency of data utilization for strategic decision-making	
C: Impact of implementation of integrated ISs on managerial decision-making	$\mathbf{I_{C1}}$: Improving the quality and speed of data analysis	Comparison of the time required to perform analytical tasks before and after the implementation of new systems
	$\mathbf{I_{C2}}$: Increase in the accuracy and reliability of data-driven decisions	Evaluation of the accuracy of forecasts and recommendations generated from new ISs
	$\mathbf{I_{C3}}$: Enhanced ability to anticipate and plan based on analytical results	Assessment of the feedback and attitudes of employees qualified for decision-making based on new analytical tools
D: Effectiveness of the implementation of integrated ISs in sports in different EU countries	$\mathbf{I_{D1}}$: Level of progress in the implementation of new technologies in the sports sector	Statistics and surveys on the progress and trends in the implementation of ISs in sports organizations in different EU countries
	$\mathbf{I_{D2}}$: Comparison of the level of digitalization and automation of processes in sports organizations	
	$\mathbf{I_{D3}}$: Evaluation of the utilization and acceptance of new information technologies by managers and employees	Comparison of practices and level of digitalization of sports organizations in different countries

Based on the relevant areas and indicators, the following hypotheses were defined. They are described in terms of their connection to the indicators of the relevant areas and the way of their verification.

H_1. *The implementation of integrated ISs in sports was not efficient in the past and therefore there is no efficient data management in Slovakia today.*

Hypothesis H_1 claims that the past implementation of integrated ISs in sports in Slovakia was not efficient, resulting in the absence of efficient data management at present. This lack has a negative impact on the level of automation and integration of processes performed in sports organizations (I_{A1}; I_{B2}) and the availability and accuracy of data in different areas of administration (I_{B1}). Additionally, data security (I_{A2}) and overall efficiency in strategic decision-making (I_{B3}) and communication among different governing bodies (I_{A3}) can be discussed.

Method of verification of hypothesis H_1

The verification of this hypothesis is based on the assessment of historical data on the implementation of ISs in the sports sector in Slovakia and the analysis of the efficiency of this implementation's results. As a supporting aspect, current approaches and results of data management are compared with the standards and best practices in other countries.

H_2. *Implementation of integrated ISs in sports in Slovakia supports analytical and managerial decision-making.*

Hypothesis H_2 claims that the implementation of integrated ISs in sports in Slovakia supports analytical and managerial decision-making. This process has a positive impact on the level of automation of data collection and processing and the analytical processes (I_{B2}), and the effectiveness of data utilization for the strategic decision-making (I_{B3}). However, it also has an impact on the quality and speed of data analysis (I_{C1}), increasing the accuracy and reliability of data-driven decisions (I_{C2}), and enhancing the ability to predict and plan based on analytical results (I_{C3}).

Method of verification of hypothesis H_2

To verify this hypothesis, data and results of analytical processes in sports organizations before and after the implementation of integrated ISs were analyzed. Additionally, secondary data collected are used to present the opinions of managers and other stakeholders on how their ability to make decisions at different managerial levels has changed after the implementation of such systems.

H_3. *Implementation of integrated ISs in sports is significantly more efficient in selected EU countries than in Slovakia.*

Hypothesis H_3 claims that the implementation of integrated ISs in sports is significantly more effective in selected EU countries than in Slovakia. This difference could be caused by different approaches, resources, and priorities of the countries. The assessment of this hypothesis corresponds to the level of progress in the implementation of new technologies in sports (I_{D1}). On the other hand, this process may also indicate the level of digitalization and automation of processes in top sports organizations (I_{D2}) or even the assessment of the utilization and adoption of new information technologies by managers and employees themselves (I_{D3}).

Method of verification of hypothesis H_3

Verification of the last hypothesis is based on the analysis of data on the implementation of ISs in sports in various EU countries and the comparison of the current results and the level of overall effectiveness of these systems with the one in Slovakia.

2.3. Research Questions

The research questions are supposed to assist in setting the overall direction of the research. A total of six research questions were defined this way. They are linked to the

hypotheses listed above. As with the hypotheses, the individual research questions are described in more detail in this section.

RQ_1: *What are the main advantages and challenges in the implementation of integrated ISs in the sports sector in Slovakia?*

Research question RQ_1 deals with the identification of the main advantages and challenges in the implementation of integrated ISs in sports in Slovakia. The main directions of the question include improving the efficiency of management and data management, automatization of processes, increasing the accuracy of decision-making, and supporting strategic planning. The main challenges include high implementation costs, complexity of integration of existing systems, staff resistance to the change, and issues related to data security and protection.

RQ_2: *What are the best practices for data collection, management, and analysis in integrated ISs for sports in Slovakia?*

The second research question focuses on the best practices for data collection, management, and analysis in integrated ISs for sports in Slovakia. This includes the identification of optimal processes and technologies enabling efficient management and interpretation of large amounts of data.

RQ_3: *What is the potential of integrated ISs for decision support and planning in sports in Slovakia?*

The third research question mainly analyzes the potential of integrated ISs for decision support and planning in sports in Slovakia. This includes the possibilities of using analytical and management tools to improve decision-making and planning processes being performed in sports organizations.

RQ_4: *What are the best approaches to ensure trustworthiness and data security in integrated sports ISs in Slovakia?*

The fourth research question focuses on the best approaches for ensuring trustworthiness and data security in integrated ISs for sports in Slovakia. The main objective is to identify measures to protect data from cyber threats and to ensure data privacy and integrity.

RQ_5: *What specific factors influence the success of the implementation of integrated ISs in sports organizations in Slovakia?*

This research question focuses on the identification of factors having an impact on the success of the implementation of integrated ISs in sports in Slovakia.

RQ_6: *What specific factors contribute to more efficient implementation of ISs in sports in selected EU countries compared to Slovakia?*

The last research question focuses on the identification of factors that influence the success of the implementation of integrated ISs in sports in specific EU countries. It compares these factors with the situation in Slovakia. It also links the answers from the previous research question, extending the issue to the European area.

The overall research apparatus, i.e., hypotheses, research questions, and the indicators, are all interlinked in Table 3.

Table 3. Research apparatus interconnections.

Hypotheses	Research Questions	Indicators
H_1	RQ_1; RQ_4	$I_{A1–3}$; $I_{B1–3}$
H_2	RQ_3; RQ_5	$I_{B2–3}$; $I_{C1–3}$
H_3	RQ_2; RQ_6	$I_{D1–3}$

2.4. Research Data

The research data were collected primarily to build on the authors' previous research that included activities in statistics on sports funding at different levels of governance [20–27]. Additionally, the authors focused on describing factors influencing the sports environment, such as marketing, sports popularity, sustainability of sports organization management, etc. [28–33]. The importance of technology in this cycle is underlined by the authors' publication identifying technology as one of the specifics of sports management, which often determines the success or failure of a particular sports organization [37].

The main data sources for this study were national databases dedicated to sports, namely for Denmark it was Statistics Denmark—Research, technology and culture, Business Statistics [38]; for England it was Sport England [39,40]; for the Czech Republic it was the Sports register ("Rejstřík sportu") under the administration of the National Sports Agency [41]; and for Slovakia it was the Slovak Sports Portal, which is under the administration of the National Sports Centre [42–44]. Besides these sources, various other scholarly publications and research reports were also included to serve as expert support for this research.

2.5. Data Processing and Analysis

Another important feature is that this study does not represent a random selection of the counties from which the data were drawn. The study links the results to the research projects conducted earlier. This maximizes the effectiveness of the scientific efforts. Therefore, the selection of the Czech Republic, Denmark, and England for the process of comparison was not random. The authors' experience with research focused on these countries produced valuable results. Additionally, the country selection process refers to the variability of this study. This is represented by the fact that these are four countries with different models of sports policies [45–48]. Despite this fundamental difference, the selection of the Czech Republic is also conditioned based on cultural and social associations linking it to Slovakia [49–51]. Denmark represents a country with a similar demographic situation to Slovakia, but more importantly, it is one of the most innovative countries for 2023, accompanied by the UK (specifically, England) [52]. This is clearly reflected in their technological provision of integrated ISs in sports. England also represents a country that is widely considered a benchmark for how sports should operate.

In terms of data processing and research activities, it is also important to define the term efficiency in this study. Efficiency can be seen in multiple dimensions such as cost efficiency (minimization of costs and resources needed), time efficiency (optimization of activity duration), process efficiency (elimination of unnecessary steps and increase in productivity), organizational efficiency (increased coordination and communication among the stakeholders), and technological efficiency (optimization of technological means, automation of processes, and minimization of errors). A summary of these dimensions is captured in Figure 1, which is linked to the research apparatus (Table 3).

The verification of efficiency from the perspective of the research apparatus is particularly important because it shows what needs to be addressed in the future research. The resulting model and the state of verification of this research are included in the Section 3.5.

The processed data from each country were transformed into tables, which are presented at the end of each subchapter correspondingly. These summary tables contain data on the basic functionalities of the ISs. Within this basic setup, functions were observed within the registration module, the evidence module, the module containing information on socio-economic benefits, the sports infrastructure module, the module containing geographic information of the sports infrastructure, the module containing the database for science, and the module containing the sports funding.

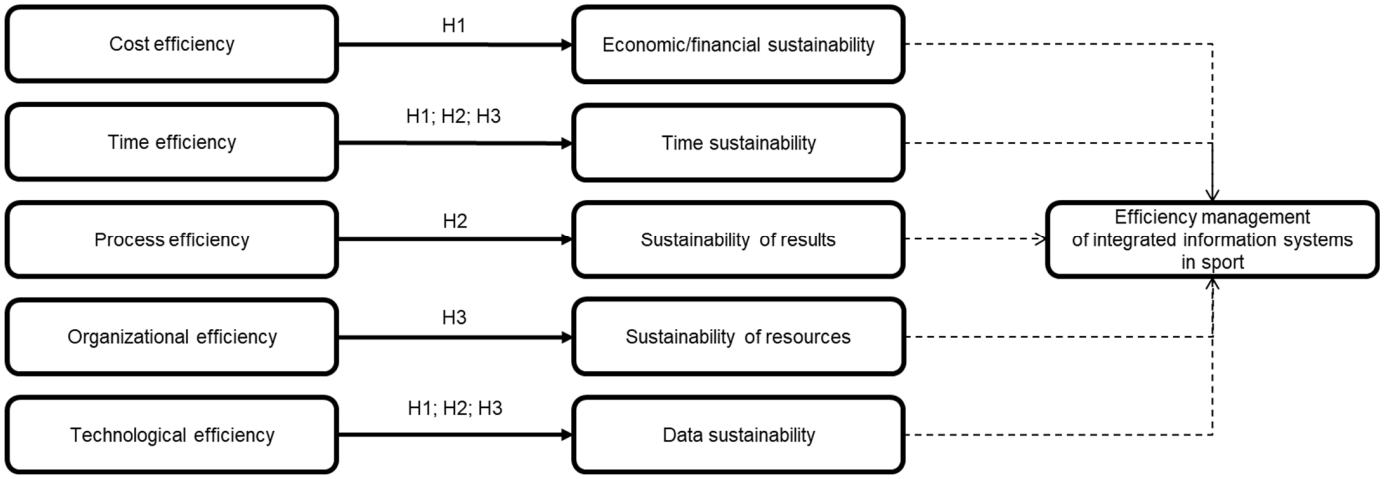

Figure 1. Perceptions of efficiency within this study.

3. Results

The results are divided into four sub-chapters according to the country approached. Within the subchapter on Slovakia, there is a section on the history of the development of ISs in sports, as well as a section defining other partial ISs in sports in this country. The difference between these systems is that the national IS of sports is usually the top-level system to which the other, lower level, ISs in sports should be directly linked. The results chapter concludes with a verification of the research apparatus.

3.1. Slovakia

The IS of sports in Slovakia has been conceived and operated as a means of public administration in accordance with the current legal framework of the Slovak Republic (SR). The operator of the IS of sports was the Ministry of Education, Science, Research and Sport of the SR, specifically its section responsible for sports. The administration of this information and communication system was carried out by the National Sports Centre (NSC), a legal entity with legal subjectivity, which operates within the organizational competence of the Ministry of Education, Science, Research and Sport of the SR [53]. However, this status should be changed, and the Ministry of Education, Research, Development and Youth of the SR should be replaced by the newly emerging Ministry of Tourism and Sport of the SR, which will take over the role of the system's operator [54,55].

The IS of sports was created to provide centralized data collection. Its primary purpose is to simplify the administrative processes resulting from the Sports Act and increase transparency in funds reporting [56]. It is also intended to provide statistics on athletes, sports professionals, sports organizations, and events. The system facilitates sports public's access to published information. In its development, emphasis was put on simplicity, clarity, and sufficient users' comfort for efficient collection and provision of information [57].

The IS of sports provides access to the following services:

- Sports application portal;
- Register of legal persons in sports;
- Register of natural persons in sports;
- Register of sponsorship contracts in sports;
- Register of medal awards [57,58] (p. 1500).

3.1.1. History of Sports ISs in Slovakia

The National Sports Centre was established on 1 January 2004 by merging the National Institute of Sports and the Centre of Academic Sports, in accordance with the Act of the National Council of the Slovak Republic No. 288/1997 Coll. on Physical Culture, as amended, with the addition of the Act of the National Council of the Slovak Republic No.

455/1991 Coll. on Trade licensing, as amended [37,59]. At that time, the center performed the function of an integrated, service and coordination center for sports and care for the sports representation of the Slovak Republic [59]. Its budget was set at 37 million Slovak crowns (EUR 1.23 million) [60].

The IS of sports in Slovakia started to be created in 2004, with the participation of a working group around the then director of the National Sports Centre Miroslav Haviar. This group was based on the conviction that there was no athletes' registration system that would control the transparency and accuracy of data, which was very important at that time since the number of athletes determined the funds allocated to sports associations [61,62]. The initial version of the IS of sports was based on the registration of athletes, associations, and clubs. This task was assigned to DITEC through a tender process, but the company delivered an unsatisfactory solution. This was running on an old platform with high maintenance costs. It led to the termination of the contract with this company and the launch of another tender. This was won by M7. According to Miroslav Haviar and the annual reports of the NSC, the company managed to complete the functionality of the IS of sports, between 2005 and 2007, to a half of what was required. The costs were SKK 1.9 million (EUR 63 thousand) [35,62,63]. The subsequent dismissal of the director of the National Sports Centre caused the cancelation of the contract with M7. Between 2007 and 2010 the IS of sports was not being developed at all [62]. This conclusion is supported by several arguments. One of them is that although the development of the IS of sports was one of the priorities of the then government, more specifically the Ministry of Education, the Government of the Slovak Republic did not even introduce with a unified proposal addressing the functionality of such a system legislatively [64]. Instead, they delivered two completely different proposals, which in one case addressed the IS of sports only marginally and in the other not at all [65]. The second argument was added by the director of StengL, Andrej Petrovaj, who in 2010 won the third, and so far the last, tender for the development of the IS of sports in the Slovak Republic. According to him, work on the IS of sports started completely from scratch and did not build on the previous work in any way. This caused the result that the entire system was officially launched in 2012. At this stage, the IS of sports worked on a basic technical level and was not improved in any fundamental way until 2015. Then, the module for security at sporting events and the module for managing the contribution to the sports representative were added [62]. More fundamental changes were introduced around 2016, when a new Act on sports was passed, bringing the need for a technological upgrade to the IS of sports. This included a modern and transparent display of registers of legal and natural persons or sponsorship contracts [66]. However, there was still a need to add other functions. These focused on the following areas:

- Funding of sports:
  - The granting of an allowance to a recognized sport;
  - The provision of subsidies;
  - The contribution to a national sports project;
  - A module for reporting on the utilization of allocated funds.
- A list of the most successful athletes;
- Records of sports infrastructure;
- A list of providers of state budget funds for sports activities;
- A list of public funds recipients;
- The area of control exercised by the Auditor General for Sports;
- Electronic elections;
- The obligations of the National Sports Federation
- Volunteering;
- The activities of the Anti-Doping Agency;
- Sports voucher allowance;
- Contractual relations in sports;
- Nationwide physical fitness testing of pupils in the first and third years of primary education;

- Training of sports experts [67].

By 2019, no major progress had been made in these areas, despite a total investment of EUR 1.63 million in the IS of sports between 2010 and 2019 [62]. The necessary change was initiated by the then State Secretary for the Sports Section of the Ministry of Education, Jozef Gönci. He argued that the IS of sports was not completed and did not comply with the Sports Act [68]. The response to this issue was the announcement of a new program named Data Management of Public Administration Institutions, under the Operational Program Integrated Infrastructure 2014–2020. This program should have brought compliance with the Sports Act and filled the information gap in the Slovak sports environment. The current version of the system meets 127 legislative requirements (78.39%). The overall functions of the IS of sports in Slovakia are listed in Table 4.

Table 4. Functions included in the IS of sports in Slovakia.

Feature	Status
Registration module	Implemented
Evidence module	Implemented
Information with socio-economic benefits	Not implemented
Sports infrastructure module	Partially implemented
Geographical information	Not implemented
Database for science	Not implemented
Sports funding	Implemented

According to the latest reports, the new IS of sports called ISŠ 2024+ should meet 161 (99.38%) of the total 162 legislative requirements. The only requirement that is not currently met is the computerization of the electoral system. Thus, the IS of sports should be able to display the register of sport support projects, the register of decisions, the register of sports infrastructure, and others [69–71]. Another important element is that the system currently covers a total of 8018 legal entities, 395,185 natural persons, 1243 sponsorship agreements, and 6180 sports clubs [72]. These figures are particularly important for the comparison with selected countries in the following subchapters [42–44]. Changes in the total costs spent on the implementation of IS of sports in Slovakia during subsequent periods are presented in Figure 2.

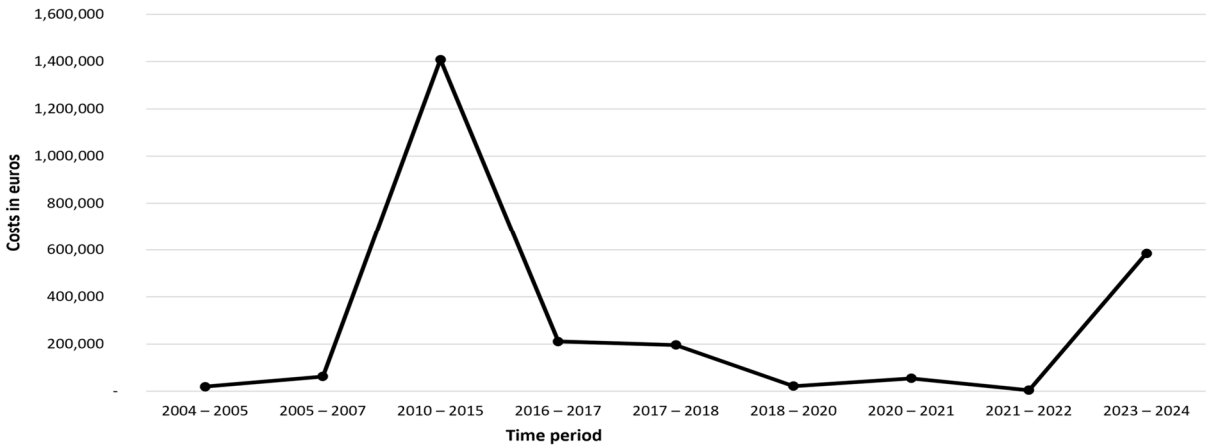

Figure 2. Changes in the total costs spent on the implementation of IS of sports in Slovakia during subsequent periods.

3.1.2. Other Integrated Sports ISs in Slovakia

This chapter covers ISs in soccer, ice hockey, and skiing. These sports were selected based on their high popularity in Slovakia [73–75] and the membership base [43].

Soccer

The IS in soccer started in Slovakia after 2011. The Slovak Soccer Association (SFZ), as the top governing body, wanted to ensure coordination among all governing parties within Slovak soccer. It suffered from a lack of coherent organization as the governing bodies operated separately, without higher control, and managed their activities under the coordination of the SFZ. Each governing body maintained its own records, rules, and processes, which led to data gaps and duplicity, ambiguity, inconsistency, and a lack of transparency. Additionally, the absence of a unified database of clubs and athletes severely limited traceability and management of members. Although a certain level of record-keeping was achieved in the existing system, it was inconsistent, with missing data and limited user access. The organization's processes were lengthy, being performed manually, which decreased efficiency and compliance with modern standards [76].

The project for the implementation of the IS in soccer was operated by TEMPEST, a.s. The development of this system costed a total of more than EUR one million (13 years of development) and its operation costs around EUR four thousand annually [77]. The overall functionality provides the following services for defined user groups:

- Electronic registrations, personal accounts, and ID cards for:
  - Athletes;
  - Sports experts;
  - Other stakeholders with assigned competences.
- Competition management, commissions, standards controlling, delegates, and fair play services for:
  - Clubs: electronic team entries for competitions, player nominations for passports, submissions to commissions and notifications of resolutions from commissions;
  - Commissions: competition fixtures, automatic summaries and tables, decisions and resolutions from commissions, notifications, and disciplinary measures;
  - Yellow and red cards: reports, statistics and competitions concerning clubs and players;
  - Delegates: electronic entry forms and fair play;
  - Players and clubs: player transfers and guest appearances.
- Economics, financial controlling, payments, and central invoicing for:
  - Clubs: fees and fines generated for clubs after the service has been performed and included as invoice items;
  - Monthly collection invoicing: service provided by the SFZ to clubs and other associations; in 2015, EUR 5,145,830 (with 142,316 items) was invoiced under the control of the SFZ;
  - Payment of fees and fines controlled centrally via invoicing: payment compliance over 98%;
  - Ell fees and fines of other associations processed via the SFZ accounting and bank account with central controlling;
  - Match delegates' remuneration: calculation of delegates' and referees' salaries [78].

The implementation of the IS means that the paper agenda in soccer in Slovakia has become rare. The system is used by a total of 45 associations (all those active in soccer) and more than 1700 clubs. According to the top officials involved, there are no objections to the system, either from the associations, the clubs, or the athletes themselves [76–78]. Moreover, the system is based on high integrity with modern technology and experienced human capital to ensure security and integrity with the top Slovak IS of sports [73].

A secondary output of this project is also the creation of a service-result portal Futbalnet.sk, which is directly connected to the IS of soccer. This portal represents a form of visualization of soccer data, intended mainly for the public [79]. At the highest intensity, unique site visits are in the range of 7 to 10 thousand [77].

Ice hockey

Similarly to soccer, ice hockey in Slovakia has one top body, which is the Slovak Ice Hockey Federation (SIHF). The main objective of the implementation of the Ice Hockey IS was to create a centralized platform providing functions for the collection and processing of data on individuals, clubs, and competitions. Emphasis was also put on the computerization of the federation's processes to minimize the administrative burden [80]. The system's development began in 2012. Its total cost is not disclosed. However, based on the SIHF budget for 2024, the amount allocated for the material and technical provision and development of the IS amounts to EUR 100 thousand [81].

As a result, a system was created that covers more than 90 active clubs and more than 11.5 thousand members (the number of active players) [80]. The system also ensures the operation of the following modules:

- Registration system for:
  - Players;
  - Clubs;
  - Coaches;
  - Referees;
  - Doctors;
  - Officials.
- Electronic registry for:
  - Issuance of registration cards;
  - Managing and controlling the processes of transfers and guest players.
- Arenas:
  - Registration of sports venues,
- Competitions:
  - Overview of all league structures, tournaments, and matches;
  - Overview of statistics;
  - Clear match reports;
  - Notifications with match results.
- Current matches:
  - Overview of LIVE and upcoming matches including their statistics.
- Referees:
  - Management of referees, delegating them to individual matches, tracking their performance and statistics;
  - Keeping track of apologies;
  - Sending notifications;
  - Management of delegation letters.
- Match reports:
  - Overview of the evaluations for each match.
- Disciplinary committee:
  - Records of the assessment of athletes' activities, fines, and penalties imposed.
- Content management:
  - Content management system (CMS) for the management of articles, news, and other content on the SIHF public portal.
- System administration:
  - Key system settings, dials, and user accounts and permissions [80–82].

The system is fully interconnected and integrated to ensure the link to the IS of sports [83]. A secondary outcome was that the collected and processed data and statistics were further presented to the public via the SIHF public portal, which provides clear information on players, hockey clubs, and all games played within the individual hockey

leagues [84]. Additionally, an interesting output is the pre-connection of the IS to training systems, which ensure efficient management of the training process, player development plans, player and coach education, and scouting [85].

Skiing

The management of this winter sport is the responsibility of the Slovak Ski Association. In 2022, the association allocated EUR 29,784 for the implementation of a new IS for this association [86]. The role of this system was to optimize the processes related to the administration of the members, the management of competitions, the support of the processes for the nomination and remuneration of referees, the disciplinary committee, and other key activities [87,88]. The outcome was the creation of an IS with the following modules:

- Registration module:
  - Racers;
  - Officials;
  - Referees;
  - Coaches;
  - Volunteers;
  - Sports clubs.
- Evidence module:
  - Recording of membership payments;
  - Registration of applications for registration;
  - Registration of transfers.
- Sports events module:
  - Creation of new events;
  - Management of the application process for events [88].

In total, the system contains data on 203 clubs and 3086 athletes. A part of the implementation is the transfer of data on members and clubs of the Slovak Ski Association and their connection to the Slovak IS of sports [89].

3.2. Czech Republic

The National Sports Information System in the Czech Republic is directly administered by a single top body, the National Sports Agency (NSA). It contains information on the list of sports organizations, athletes, coaches, and sports venues. It also contains a registration module, which is the basis of such systems as identified in the chapter on Slovakia [63]. The system shows a lack of correlation and clarity of data, as duplicity or incompleteness of key data are common. This was also the subject of our studies presented in the methodological approach.

Therefore, in 2020, the Czech Republic decided to digitize and modernize the NSA services, including those related to the IS of sports. The first wave created a great potential for improvement, but the authority was not able to fully meet the expectations. Insufficient capacity in the execution of the agenda severely limited its effectiveness. ISs showed large gaps in functionality, integration, and connectivity to e-government. Subsidies also complicated the process of digitalization of financial support delivery, which was not sufficiently IT-enabled for NSA staff, hindering timely access to the necessary data. The NSA assessed its current ISs as not integrated, and their separate use caused inconsistent data transfers. This made the entire process inefficient, time-consuming, and exposed it to a high risk of error [36,90].

The second wave should directly create the prerequisites for the sports IS to be modernized, transparent, sufficiently protected, but most importantly, efficient. In total, the NSA has allocated EUR 1.45 million and the system should be ready by 2027. The aim is mainly the total automation of the system and the integration with other ISs that are not interconnected yet [36]. The NSA has decided for close cooperation with the newly emerging Ministry of Tourism and Sport of the Slovak Republic, for the purpose of joint

sharing of know-how and procedures. This also affects the topic of ISs of sports [91]. The overall functions of the ISs of sports of the Czech Republic are shown in Table 5.

Table 5. Functions contained in the IS of sports of the Czech Republic.

Feature	Status
Registration module	Implemented
Evidence module	Implemented
Information with socio-economic benefits	Not implemented
Sports infrastructure module	Partially implemented
Geographical information	Not implemented
Database for science	Not implemented
Sports funding	Partially implemented

This IS of sports contains data on 4,136,958 athletes [92], 11,192 sports venues [93], and 14,602 sports clubs [94].

3.3. Denmark

A specific example of a functional and cost-effective IS of sports is offered by Denmark. Although the direct control of the IS of sports (Central Association Register) is with The Sports Confederation of Denmark (DIF), the information is mainly processed by Statistics Denmark. This institution provides data on the sports economy and employment in sports, participation in sports, and data on sports clubs and sports infrastructure [95]. Nevertheless, it is also possible to identify inefficient ways of integrating individual systems, as data processing involves coding, tabulation, checking, and fine-tuning the extracts from registers. Systems integration is therefore still inefficient. At the same time, verification of the results against previous years is performed, or the staff communicate directly with the associations concerned. This is a necessary control function, but is now considered automatable [96]. The fact that the datasets available on the statistical portal contain specific filtering functions is a plus. In data analysis, this feature is crucial, as it allows researchers to use data more efficiently. Additionally, the depth of the datasets is great as these data contain unique factors such as cultural habits [97] and socio-economic status of the sports participants [98]. All these statistics are pivotal elements in sports, and their utilization is not effective as it is only based on rough estimates, like they are in Slovakia. The primary aim is for Denmark to become the most active nation in the world. The sub-concept supports the aim that by 2025, 75% of the population will participate in sports/exercise and 50% will be active in sports organizations [99]. This is not just a theoretical concept. It can be properly verified and monitored over time due to advanced datasets. The functions of the Denmark's IS of sports are listed in Table 6.

Table 6. Functions included in Denmark's IS of sports.

Feature	Status
Registration module	Implemented
Evidence module	Implemented
Information with socio-economic benefits	Implemented
Sports infrastructure module	Implemented
Geographical information	Not implemented
Database for science	Implemented
Sports funding	Partially implemented

This IS of sports covers data on 2,640,850 athletes [100], 11,896 sports venues [101], and 11,396 sports clubs [102]. The amount allocated to this IS is not clear, as it is not publicly communicated. Nevertheless, a study from Germany found that the system's operation costs Denmark around EUR 80 thousand every year [34].

3.4. England

The last country compared, England, is a complex example of how the IS of sports should work. However, on the other hand, it shows some elements to be avoided. Paradoxically, the system contains data that cannot be found directly on a representative website in either of the previous countries. Examples are offered by case studies talking about how the data should be used to the benefit of the sports community [103]. The IS of sports here is managed by Sport England, which takes pride in ensuring that sports and physical activity play a key role in improving the physical and mental health of the nation, boosting the economy, and bringing communities together [104]. Therefore, the IS of sports is based on data designed for research into population activity and sports infrastructure. Population activity is divided into three main categories: data on the adult population (aged 16 and over), data on the activity of children and young people (aged 5 years to 16 years), and data on the behavior of children and young people. The [105] sports infrastructure module is based on a relational database containing all critical information (administrative data, contact details, ownership data, etc.) [38,106].

However, the downside is that the system is not clear enough and the information it provides is difficult to find. The whole system could therefore be assessed as very poorly user-oriented. The functions of this system are listed in Table 7.

Table 7. Functions included in England's IS of sports.

Feature	Status
Registration module	Implemented
Evidence module	Implemented
Information with socio-economic benefits	Implemented
Sports infrastructure module	Implemented
Geographical information	Implemented
Database for science	Implemented
Sports funding	Partially implemented

The system contains information on 39,559,300 athletes [107], 122,195 sports venues [108], and more than 150,000 sports clubs [109]. According to a research project from Germany, the system's operation costs around EUR 1 million every year [34].

3.5. Verification of the Research Apparatus

The last chapter within the results summarizes the findings and creates a synthesis of the verification of the whole research apparatus. Successively, hypotheses H_1 to H_3 are verified, based on the corresponding research questions and indicators.

H1 verification: *The implementation of integrated ISs in sports was not efficient in the past and therefore there is no efficient data management in Slovakia today.*

The first hypothesis perceives efficiency in terms of cost, time, and technology. Regarding time, it can be argued that the implementation was not efficient. The implementation time represents a very long period (20 years—from 2004 to 2024). This is highlighted by the fact that the IS of sports implementation project in Slovakia has already changed a total of three contractors, who always started almost from scratch. Following these findings and cost perceptions of efficiency, the project cannot be seen as effective in this regard either. The final factor includes the technological tools or modules that the system contained, contains, or will contain. This aspect of efficiency can be assessed as more than satisfactory, but only if we look at the future operation of the system, which is not implemented yet (I_{A1}; I_{A3}). The problem with the current operation is mainly the duplicity of data and the unavailable functions required by the Sports Act in Slovakia (I_{B1}; I_{B3}). This problem has been present since the initial attempts. Therefore, it is clear that efficiency is not ensured in this respect.

On the other hand, the history also shows that today, due to these systems, we can process data more efficiently and generate important information. This was included in the manual agenda in the past (I_{A3}). Thus, automation belongs to the effective elements that can be seen as positive, despite its long-term unsustainability (I_{A1}; I_{B2}). Similarly, security is at a very high level due to highly qualified staff and modern elements (I_{A2}). The interconnection of the individual systems is assured, creating a synergistic effect of information exchange among them as a key element of effective data management (I_{B2}).

Evaluating all these facts together confirms that the implementation of integrated ISs in sports has not been efficient in the past, and therefore there is no efficient data management in Slovakia today. This is despite partial successes, such as system interconnection, automation, or security.

H2 verification: *Implementation of integrated ISs in sports in Slovakia supports analytical and managerial decision-making.*

The second hypothesis is related to some of the parts used in the verification of the first hypothesis. These factors are represented by the level of automation of data collection, processing, and analytical processes, but also by the efficiency of data utilization for strategic decision-making (I_{B2}; I_{B3}). Within this hypothesis, efficiency is perceived in terms of time and processes.

The current setup and utilization of ISs show that these systems help solve problems, especially in the administrative processes. However, administration is closely linked to the analytical and managerial perspective of the operation of any sports entity. The potential of these ISs is commonly utilized in training processes, which are more complex and purposeful due to efficient and accurate data analysis. The connectivity and functionality of the systems extends to other elements as well, as demonstrated by the modules of the systems dealing with controlling, record keeping, registration schemes, event planning, competition management, management of referees and various delegates, content management, or standards management. All these modules help sports teams and their stakeholders properly coordinate their activities and procedures (I_{C1}; I_{C2}; I_{C3}).

The interconnectedness of the systems, their partial self-maintenance (I_{B2}), and the use of data for strategic decision-making (I_{B3}) are good examples of elements making the system more effective in terms of managing the overall integration in Slovakia. However, communication and consensus with all stakeholders is also important, as documented by the cases of selected sports federations in Slovakia (I_{C1}; I_{C2}; I_{C3}). Summarizing these findings, the second hypothesis is confirmed.

H3 verification: *Implementation of integrated ISs in sports is significantly more efficient in selected EU countries than in Slovakia.*

The last hypothesis focuses on the efficiency in terms of time. However, it is also seen in terms of organizational and technological sustainability. In terms of time efficiency, it is difficult to assess the databases of England and Denmark, as for these two countries it is not stated when they started to implement such systems. However, it is possible to assess that working with these databases is demanding in terms of time management. The English database is not user-friendly. On the other hand, the Danish database is relatively easy to work with but, as the governing bodies declare, the data that go into it are not subject to advanced automation and are therefore not processed time-efficiently. Among the countries compared, the Czech Republic can be perceived as a country close to the standards of Slovakia regarding their IS management. Not only is it a country experiencing the same problems, but it has also been working on its elimination and effective management for a considerable period, which declares the absence of time sustainability of the systems (I_{D1}; I_{D2}).

Organizationally, it is questionable why the selected countries do not cooperate more on covering source compatibility among integrated ISs. All systems contain huge amounts

of data (Table 8) not being effectively managed, without interconnection and automation. The costs of running these databases are significant. Therefore, maximizing their efficiency and functionality should be the primary pre-implementation consideration. On the other hand, the examples of Denmark and England can be seen as positive in terms of building ISs for the needs of the scientific community. Both countries cooperate directly on studies based on the databases in these ISs. The Czech Republic can be considered a negative example, which must be seen critically in terms of the operation of integrated ISs in comparison with Slovakia (I_{D3}).

Table 8. Costs of individual databases in selected EU countries.

Country	Average Annual Costs (EUR)	Number of Athletes in the Database	Number of Sports Facilities in the Database	Number of Sports Clubs in the Database
Denmark	80,000	2,640,850	11,896	11,396
Czech Republic	289,695	4,136,958	11,192	14,602
England	1,000,000	39,559,300	122,195	151,000 *
Slovakia	128,186	395,185	4553	6180

* Estimated value based on the research of the Club Management Association of Europe.

The last logical element to observe is the technological aspect of the ISs of sports. Data updating is being accomplished best in England, where the ISs are being updated monthly. The functionality of this IS is also at a high level and it is comparable to the system in Denmark. Compared to the IS of sports in Slovakia, the datasets of these systems contain unique data important for the scientific community. These datapoints are scarce in Slovakia, which complicates the work of Slovak scientists and researchers focusing on this field. A significant leap of these systems, in the selected countries, could not be observed, especially if we focus on the future functions of the IS of sports in Slovakia (ISŠ 2024+) (I_{D1}; I_{D2}). A comparison of the ISs functions in all observed countries is captured in Table 9.

Table 9. Functions included in the IS of sports in the selected countries.

Feature	Status/Country			
	Slovakia	Czech Republic	Denmark	England
Registration module	Implemented	Implemented	Implemented	Implemented
Evidence module	Implemented	Implemented	Implemented	Implemented
Information with socio-economic benefits	Not implemented	Not implemented	Implemented	Implemented
Sports infrastructure module	Partially implemented	Partially implemented	Implemented	Implemented
Geographical information	Not implemented	Not implemented	Not implemented	Implemented
Database for science	Not implemented	Not implemented	Implemented	Implemented
Sports	Implemented	Partially implemented	Partially implemented	Partially implemented

From observation and comparison of the selected functional modules of the data-base systems in the selected countries, it can be concluded that England is the only country that has implemented a geographic module for sports infrastructures. This module is very challenging to implement because it is necessary to have a fully functional module in place describing the sports infrastructure in the country. Slovakia and the Czech Republic must first implement new versions of these systems to consider such a module. A question with no clear answer is why a country like Denmark has not implemented such a module yet. A possible answer could be the financial and qualitative efficiency needed for such a module, as reported in a study from Germany [34].

Furthermore, the country comparison showed that Slovakia and the Czech Republic do not currently foresee the implementation of a database module for science. We believe that this fact is mainly because sports and research in these countries are not highly connected. The connection could be even perceived as marginal.

A vivid example of a modern system is the sports funding module, which works well, especially from the Slovak perspective. Slovakia is the only country providing information on sponsorship contracts, allowing users to look at complete financial data on a national level. Other countries have also implemented this module, but in most of them there is no register of contracts or funding amounts from individual ministries or other national bodies.

In the process of this comparison, it was identified that neither Denmark nor England, unlike Slovakia and the Czech Republic, have a vision of the implementation of ISs, so it was difficult to compare these countries in this regard.

The outcome is that it cannot be unequivocally stated that the implementation of integrated ISs in sports is significantly more efficient in the selected EU countries than in Slovakia. Therefore, hypothesis H3 is not considered confirmed.

The overall evaluation of the research apparatus's verification is captured in Figure 3.

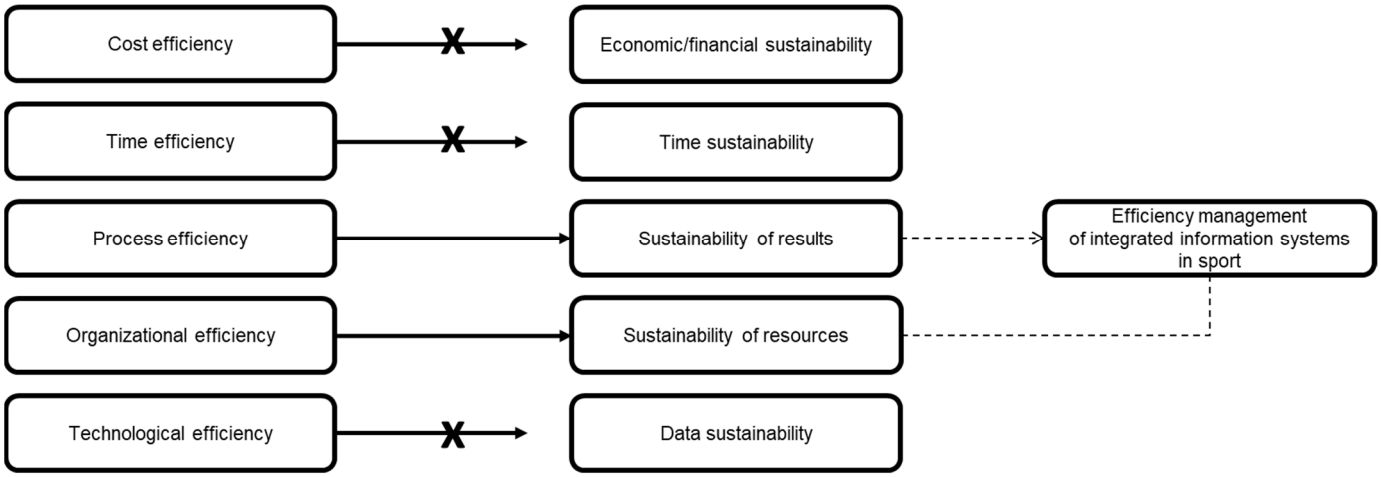

Figure 3. Final verification of the research apparatus.

Verification of the research apparatus shows that Slovakia does not have effective management of integrated ISs. Cost, time, and technological efficiency remain the problematic areas. All these problems are caused by the long-term ineffective management at the top level related to the IS of sports in Slovakia. On the other hand, process and organizational efficiency are set at a high level, which partly ensures the efficiency of the top IS of sports. Table 10 answers all the research questions set.

As it was revealed, ISs of sports are a highly efficient tools for data processing, analysis, and management. However, for these systems to function consistently and to be effective, several requirements need to be met and broader research needs to be applied to take the use of these systems to the next level. These issues are further addressed in the discussion and the conclusion of this study.

Table 10. Answers to the research questions.

Research Question	Findings Providing the Answer
RQ_1: What are the main advantages and challenges in the implementation of integrated ISs in the sports sector in Slovakia?	*Benefits*: Automation and systematization of processes Improved data management compared to manual agendas Ensured data security *Challenges*: Long-term implementation inefficiencies Duplicity of data and incomplete functionalities Time-consuming implementation and contractor changes
RQ_2: What are the best practices for data collection, management, and analysis in integrated ISs of sports in Slovakia?	Automated data collection Accurate data analysis Integration of modules for controlling, planning, and management
RQ_3: What is the potential of integrated ISs for decision support and planning in sports in Slovakia?	Administrative processes Analytical and managerial decision-making Coordination and management of time and process efficiency
RQ_4: What are the best approaches to ensure trustworthiness and data security in integrated sports ISs in Slovakia?	Highly qualified staff Modern security elements Interconnection of systems to create a synergistic effect of information exchange
RQ_5: What specific factors influence the success of the implementation of integrated ISs in sports organizations in Slovakia?	Long-term implementation inefficiencies Technological deficiencies and duplicity of data Communication and consensus with the stakeholders
RQ_6: What specific factors contribute to more effective implementation of integrated ISs in the field of sports in selected EU countries?	Improved trust and data security Improved time efficiency in updating and processing data Improved collaboration between sports clubs and top IS providers in the development and utilization of ISs

4. Discussion

An important part of the research is that it builds on previous research [20–33]. This connection points to our effort to create an in-depth analysis of the operation of sports in Slovakia, with a focus on capturing the economic, informatics, managerial, marketing, and procedural–legal elements of this environment. Linking the overall research with the individual parts of the discussion creates a synergistic effect.

The limitations of this study are primarily present due to the complexities involved in individualized data acquisition and subsequent analysis. Unfortunately, the range of available data across the spectrum remains somewhat limited, making some of the conclusions susceptible to subjective judgement. An example pointing to this is the lack of documentation on the implementation of ISs in England or Denmark. In addition, comprehensive documentation of all the external variables that potentially influence research outcomes proves difficult to obtain. As a result, the interpretive framework of the study must acknowledge these inherent limitations when striving for methodological rigor, thereby promoting a nuanced understanding of its findings within scientific discourse.

The benefits of this study include its connection to our previous research efforts, giving it a solid background, enabling a deeper analysis of the studied sports management aspects. Another benefit is a balanced multiple-case comparison where some of the countries have a closer connection (Slovakia, Czech Republic) enabling a fast transfer of knowledge and best practice and the others represent more advanced, complex solutions in the sports ISs area. However, via the comprehensive and precisely defined approach to the IS efficiency applied in this study, deficiencies in the sports ISs of Denmark and England could be detected as well. This is the last substantial benefit of our research approach.

The results can be seen in the context of an analysis of the overall IS setting of sports in the selected countries. Such an approach is currently still considered unique. However, it is

supported by a study from South Africa, which focused on examining the whole-sports system, with the technology setup aspect covering just the area of sports IS functionality [110]. This study argues that the importance of understanding the national contexts of elite sports systems provides relevant input that should be used in achieving sport success. However, an important part is that the systems in question are effective and provide the necessary level of transparency. It should be noted that it is questionable why the ISs of sports in England and Denmark do not provide access to public contracts describing, e.g., the costs of running these systems. The transformation of the sports industry literally requires this kind of concept to be applied in practice. This is evidenced by statements clearly showing that in the context of new information technologies, a high quality and transparent analysis of all challenges and opportunities is necessary. In addition to transparency and quality, the integration of an IS of sports is critically important [111].

The utilization of an effective IS of sports can be seen in other dimensions. Probably the most important is the perspective of efficiency and data utilization in the case of athletes and sports clubs. Recently, it has become an essential part of the operation of an organization to have decision-making sufficiently supported via the analysis of available data. As an example, in the USA, up to 77% of organizations have data-driven decision-making. Germany and the UK are at the level of 69% [112]. For sports organizations, these data are a source of athletes' progress, allowing their development to be accurately tracked and compared over time [113]. Additionally, modern ISs of sports record factors such as weather, geographical data of the sport infra-structure, or the general condition of the sports field. Based this, research has emerged looking in depth at how the influence of an athlete's confidence can enhance their performance [114]. Today, these data play an essential role in monitoring medical or training processes. It is proven that the proper handling of data obtained from ISs of sports can positively influence the psychological and physical adjustment of individuals [115]. However, the data can also be applied to the historical context of the analyses and be linked to individual sports clubs. Thus, one can ascertain how a club has fared and compile, analyze, and evaluate these factors. This was also the content of the study focused on teams from the English Football League [116].

Other studies emphasize the need for a comprehensive IS of sports for the proper organization of sports events. Modern ISs of sports can predict and reveal potential weaknesses of sports events [117]. Another feature is the effectiveness in the overall management of sports events and visits. This factor is one of the main forces that predict the success of a sports entity [118]. However, the latter depends on the setting of the competition in which the club operates. Changes in competitions, especially the negative ones, can influence attendance in stadiums significantly. This is evidenced by the change in the basketball Euroleague [119] and the change in the qualification for the 2020 European Championship [120]. The effectiveness of such ISs reflects the level of competition as such [121].

The importance of correct operation and overall efficiency of ISs of sports is underlined by the scientific importance of ISs themselves. This can be seen in being able to use the data retrospectively, e.g., in the analysis of sponsorship [122] or the impact of manager turnover on the performance of a business or other organization [123].

Often overlooked in these systems is the importance of integrating them into lower levels of sports governance, such as regions or local governments. It is quite common for these two levels to offer services that are neither automated nor systematic, resulting in a reduction in the dynamics of communication among the stakeholders [124]. On the other hand, all these systems must be provided by highly qualified personnel. These human resources ensure critical security and efficiency in terms of the ISs' sustainability. Therefore, it is necessary that in the future such systems are implemented with a link to e-recruitment, which is a trend in ISs in terms of technology and its application [125,126].

Finally, it is also important to mention the managerial implications stemming from the introduction of high-performance, modern, and efficient ISs. These implications are, e.g., that it is important for systems to be interactive or interoperable, on the basis that

this creates models that are highly valued, in terms of managing human capital [127]. Therefore, managers should prioritize the integration of ISs to support decision-making processes across various aspects of sports management, from athlete development to event organization. Managers should also be facilitators of cooperation, which is what is needed in such systems to ensure transparency and credibility. ISs play a crucial role in this as they create the space for this co-operation and make the whole process faster and more efficient [128,129].

5. Conclusions

This article examines the impact of ICTs on the decision-making of sports managers. Its main aim has been fulfilled via a comparative analysis based on four selected countries: Slovakia, Czech Republic, England, and Denmark. This was mainly based on the findings of what each IS of sports contains and is capable of in each country. However, the main purpose of the research is built on revealing the actual situation in Slovakia. An important finding is that the administration of these higher ISs of sports in Slovakia is with the NSC, which is in direct contact with the new Ministry of Tourism and Sports of the Slovak Republic. This means is that the findings can help in building the strategic agenda of the Ministry in the direction of sustainable ICT governance. This is where the findings meet the policymakers responsible for future changes leading to more efficient implementation and operation of sports IS in Slovakia.

In this regard, as another key finding, the research revealed that the implementation of integrated ISs in sports in Slovakia has not been efficient in terms of costs, time, and technology. Although the systems have brought partial successes such as automation and security, there is no effective data management. These systems support managerial decision-making, and their functionality is comparable to systems in other EU countries. Additionally, the new version of the IS of sports in Slovakia will be technologically upgraded and should come closer to the selected countries compared. On the other hand, it must be emphasized that even if the technological aspect will be enhanced, the cost and time efficiency of the system will remain problematic. It is therefore necessary to consider a more comprehensive integration and better management of these systems in Slovakia. These key findings are connected to the following recommendations focused on all the entities responsible for the setting and operation of integrated sports ISs.

A general recommendation to ensure the effectiveness and efficiency of the ISs of sports is that all sub-systems are made transparent, automated, and strategically planned, both in terms of implementation and maintenance. Slovakia is a country with a transparent implementation and maintenance of a top-level IS of sports but with a lack of long-term strategic planning. This is demonstrated by this study's results. The opposite side of the spectrum of sports ISs is seen in Denmark and England. These systems are highly efficient but do not have transparent funding that can be easily monitored. Another recommendation for Slovak policymakers is to implement support for research in a similar way to Denmark or England. Such a feature promotes the efficiency and is the source of unique data of high value in the sports industry. It is also recommended that sports ISs are made more interoperable and interactive. As shown in the case of Denmark, the top-level IS of sports is highly efficient, but it does not have the necessary interoperability, which is reflected in a lower degree of automation and prolonged data processing and analysis. Finally, the outputs from the ISs of sports need to be easy to use and intuitive for the users themselves—sports managers and policymakers. Thus, there is a need to address the user interface and usability of integrated ISs. The simpler and more intuitive the systems are for users, the more likely they will be used correctly and effectively.

This research can be used in multiple ways by the scientific community. It may set a precedent for comparing other countries and their ISs of sports. Additionally, this article can have applications in ISs or ICTs in sports research. This is because it presents a unique perspective on how selected ISs of sports operate. The limitations should be seen mainly in terms of the complexity of the individual data collected and analyzed. These data are not

currently well available, which makes some conclusions potentially subjective. It is also not possible to consider all external factors that could influence the results.

Future research can focus on the overall context of sports management research in Slovakia and other EU countries. The increasing dependence on technology and data in sports highlights the importance of exploring ethical and legal issues such as privacy, fairness, and data handling. Further research could explore how integrated ISs affect fans' interaction with sports, including the possibilities to improve the fan experience. The trend of artificial intelligence could be further explored to create advanced systems for predicting outcomes or preparing personalized training programs.

Author Contributions: Conceptualization, M.V., M.K., M.M. and M.Š.; methodology, M.Š. and M.M.; software, M.Š. and M.M.; validation, M.V. and M.K.; formal analysis, M.Š., M.V. and M.M.; investigation, M.Š.; resources, M.Š. and M.M.; data curation, M.Š.; writing—original draft preparation, M.Š., M.K., M.M. and M.V.; writing—review and editing, M.Š. and M.M.; visualization, M.Š.; supervision, M.V.; project administration, M.K.; funding acquisition, M.V. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Slovak Research and Development Agency under the project Sustainability strategy of a sports organization in the conditions of the Slovak Republic, APVV-20-0481.

Data Availability Statement: The data are available on demand from the authors.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Zaraté, P. Decision Making Process: A Collaborative Perspective. *Stud. Inform. Control.* **2008**, *17*, 225–230.
2. Koman, G.; Toman, D.; Jankal, R.; Mičiak, M. Business-Making Supported via the Application of Big Data to Achieve Economic Sustainability. *Enterpreneurship Sustain. Cent.* **2022**, *9*, 336–358. [CrossRef] [PubMed]
3. Reyaz, N.; Ahamad, G.; Naseem, M.; Ali, J.; Rahmani, K.M. Information communication and technology in sports: A meticulous review. *Front. Sports Act. Living* **2023**, *5*, 2–26. [CrossRef] [PubMed]
4. Grüttner, A. What We Know and What We Do Not Know about Digital Technologies in the Sports Industry. In Proceedings of the Americas Conference on Information Systems (AMCIS), Cancún, Mexico, 15–17 August 2019.
5. Rainer, R.; Prince, B. *Introduction to Information Systems*, 9th ed.; John Wiley & Sons: Hoboken, NJ, USA, 2022; pp. 5–24.
6. Abror, R. The difference between the concepts of database (DB) and database management system (DBMS). In Proceedings of the Humanity and Science Congress, Essen, Germany, 8–11 June 2022.
7. The Sport Journal. Available online: https://thesportjournal.org/article/information-technology-for-sports-management/ (accessed on 23 February 2024).
8. Sabetrasekh, M.; Salimi, M.; Sarshabadrani, G. The Success of Information Systems in World-Class Sports Organizations: Futures Studies Approach. *Sports Bus. J.* **2023**, *3*, 67–84.
9. Bobel, T.; Rumo, M.; Lames, M. Sports Information Systems: A systematic review. *Int. J. Comput. Sci. Sport* **2021**, *20*, 1–22. [CrossRef]
10. Varmus, M.; Adamík, R. *Manažment Športových Organizácií 2*, 1st ed.; Žilinská Univerzita v Žiline: Žilina, Slovakia, 2023; p. 121.
11. Vincent, J.; Stergiou, P.; Katz, L. The Role of Databases in Sport Science: Current Practice and Future Potential. *Int. J. Comput. Sci. Sport* **2009**, *8*, 50–66.
12. Silva, Y.; Almeida, I.; Queiroz, M. SQL: From traditional databases to big data. In Proceedings of the 47th ACM Technical Symposium on Computing Science Education, Memphis, TN, USA, 2–5 March 2016.
13. Dikovic, J.; Panev, I. SQL query tuning and optimization: An example using AWS. *Zb. Veleuc. Rijeci-J. Polytech. Rij.* **2023**, *11*, 289–310.
14. Statista. Available online: https://www.statista.com/statistics/809750/worldwide-popularity-ranking-database-management-systems/ (accessed on 3 March 2024).
15. Medium. Available online: https://medium.com/@studio3t/https-medium-com-studio3t-sql-databases-in-sports-part-1-30d4e60fe0d5 (accessed on 23 February 2024).
16. Microsoft. Available online: https://news.microsoft.com/features/seattle-sounders-score-with-sql-server-and-fitness-tracking-technology/ (accessed on 23 February 2024).
17. Forbes. Available online: https://www.forbes.com/sites/oracle/2017/02/16/new-oracle-team-usa-boat-an-engineering-marvel-data-machine/ (accessed on 23 February 2024).
18. Atasoy, B.; Özer, U. Database Knowledge Management in Sport. *Int. J. Sport Cult. Sci.* **2021**, *1*, 37–53.

19. Miočić, J.; Zekanović-Korona, L.; Bosančić, B. Information Systems in Sports Organizations: Case Study of the Sports Association of the City of Zadar. In Proceedings of the 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatija, Croatia, 20–24 May 2019.
20. Varmus, M.; Šarlák, M. Prerozdeľovanie financií na šport v krajských mestách na Slovensku. *Magister Off. Odb. Časopis Učenej Právnickej Spoločnosti* **2022**, *6*, 46–60.
21. Varmus, M.; Šarlák, M. Financovanie športu Vyššími územnými celkami Slovenskej republiky. *Magister Off. Odb. Časopis Učenej Právnickej Spoločnosti* **2022**, *6*, 6–20.
22. Greguška, I.; Šarlák, M. Analysis of sport support through self-governing regions and local governments in Slovakia. In Proceedings of the Comparative European Research, London, UK, 22 May 2022; Sciemcee Publishing: London, UK, 2022.
23. Varmus, M.; Kubina, M.; Mičiak, M.; Šarlák, M.; Klampár, P.; Štrba, P. Education and knowledge in the field of sponsorship and general funding of sports infrastructure. In *91st International Scientific Conference on Economic and Social Development: Book of Proceedings*, 1st ed.; Varazdin Development and Entrepreneurship Agency: Varazdin, Croatia, 2023; pp. 128–136.
24. Varmus, M.; Kubina, M.; Mičiak, M.; Šarlák, M.; Greguška, I. Sustainable Management of the Public Financial Model for Sports Support in Slovakia. *Sustainability* **2023**, *15*, 11310. [CrossRef]
25. Varmus, M.; Mičiak, M.; Kubina, M.; Piatka, A.; Stoják, M.; Sýkora, A.; Greguška, I. Determination and Quantification of Foreign Interest in Sports Using Selected Variables for the Support of Appraising Investments in Sports by Businesses and States. *J. Risk Financ. Manag.* **2023**, *16*, 162. [CrossRef]
26. Varmus, M.; Šarlák, M. Historický prehľad vývoja športovej politiky na Slovensku. *Magister Off. Odb. Časopis Učenej Právnickej Spoločnosti* **2023**, *2*, 6–13.
27. Kubina, M.; Boško, P. Spôsoby komunikácie športových klubov cez komunikačné kanály a spravodajské média–vybrané prípadové štúdie. *Magister Off. Odb. Časopis Učenej Právnickej Spoločnosti* **2023**, *1*, 21–27.
28. Varmus, M.; Kubina, M.; Mičiak, M.; Boško, P.; Greguška, I. More sustainable sports organizations' operation as a result of fan involvement into the processes of decision-making and community building. *Entrep. Sustain. Issues* **2023**, *11*, 10–38. [CrossRef] [PubMed]
29. Varmus, M.; Mičiak, M.; Hudec, P.; Fačko, D.; Hliva, M. Case Study: Marketing Communication of a Sports Organization Helping it Move towards its Sustainability. *J. Mark. Res. Case Stud.* **2023**, *1*, 1–12. [CrossRef]
30. Varmus, M.; Mičiak, M.; Kubina, M.; Adámik, R. Determinants of the tennis players' success and their effect on the sports organizations' sustainability. *Entrep. Sustain. Issues* **2022**, *1*, 132–157. [CrossRef] [PubMed]
31. Varmus, M.; Kubina, M.; Boško, P.; Mičiak, M. Application of the Perceived Popularity of Sports to Support the Sustainable Management of Sports Organizations. *Sustainability* **2022**, *14*, 1927. [CrossRef]
32. Varmus, M.; Kubina, M.; Koman, G.; Ferenc, P. Ensuring the Long-Term Sustainability Cooperation with Stakeholders of Sports Organizations in SLOVAKIA. *Sustainability* **2018**, *10*, 1833. [CrossRef]
33. Šarlák, M.; Toman, D. Digitalizácia v športe. *Magister Off. Odb. Časopis Učenej Právnickej Spoločnosti* **2023**, *1*, 6–14.
34. Bundesinstitut für Sportwissenschaft. Available online: https://www.bisp.de/DE/Home/Shiny_Projects/DigitalerSportstaettenatlas.html (accessed on 13 March 2024).
35. Ministerstvo Školstva, Výskumu, Vývoja a Mládeže Slovenskej Republiky. Available online: https://www.minedu.sk/data/att/183.pdf (accessed on 23 February 2024).
36. Národní Sportovní Agentura. Available online: https://www.mvcr.cz/soubor/mv-122769-6-oha-2022-priloha.aspx (accessed on 13 March 2024).
37. Slov-Lex. Available online: https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/1991/455/ (accessed on 21 February 2024).
38. Statistics Denamrk. Available online: https://www.dst.dk/en/Statistik/dokumentation/documentationofstatistics/sports-clubs-and-sporting-facilities (accessed on 13 March 2024).
39. Sport England. Available online: https://www.sportengland.org/research-and-data/data?section=data_about_people (accessed on 13 March 2024).
40. Sport England. Available online: https://www.sportengland.org/research-and-data/data?section=data_about_places (accessed on 13 March 2024).
41. Národní Sportovní Agentura. Available online: https://rejstriksportu.cz/dashboard (accessed on 13 March 2024).
42. Slovenský Športový Portál. Available online: https://sport.iedu.sk/Contract/List (accessed on 23 February 2024).
43. Slovenský Športový Portál. Available online: https://sport.iedu.sk/Contact/Person/List (accessed on 23 February 2024).
44. Slovenský Športový Portál. Available online: https://sport.iedu.sk/Company/List (accessed on 23 February 2024).
45. European Committee of the Regions. Available online: https://portal.cor.europa.eu/divisionpowers/Pages/Slovakia-Youth-and-sports.aspx (accessed on 13 March 2024).
46. European Committee of the Regions. Available online: https://portal.cor.europa.eu/divisionpowers/Pages/Czechia-Youth-and-Sports.aspx (accessed on 13 March 2024).
47. European Committee of the Regions. Available online: https://portal.cor.europa.eu/divisionpowers/Pages/Denmark-Youth-and-sports.aspx (accessed on 13 March 2024).
48. European Committee of the Regions. Available online: https://portal.cor.europa.eu/divisionpowers/Pages/UK-Youth-and-sports.aspx (accessed on 13 March 2024).

49. Janas, K.; Jánošková, B. Comparison of 20 Years of Regional Selfgovernment in the Czech Republic And Slovakia. *J. Comp. Politics* **2022**, *15*, 56–71.
50. Kozák, M. The Work Ethic and Social Change in the Czech Republic and Slovakia—A Modernisation Theory Perspective. *Czech Sociol. Rev.* **2020**, *6*, 741–765. [CrossRef]
51. Štěpánková, L.; Kadličková, D.; Scherman, A. Czech and Slovak life scripts: The rare case of two countries that used to be one. *Memory* **2020**, *10*, 1204–1218. [CrossRef] [PubMed]
52. Statista. Available online: https://www.statista.com/statistics/1102558/most-innovative-countries-gii-score/ (accessed on 13 March 2024).
53. Národné Športové Centrum. Available online: https://narodnesportovecentrum.sk/informacny-system (accessed on 21 February 2024).
54. SITA. Available online: https://sita.sk/dankovi-sa-coskoro-splni-sen-nove-ministerstvo-cestovneho-ruchu-a-sportu-dostalo-zelenu/ (accessed on 21 February 2024).
55. Interez. Available online: https://www.interez.sk/ministerstvo-skolstva-vedy-vyskumu-a-sportu-meni-svoj-nazov-takto-sa-bude-volat-po-novom/#google_vignette (accessed on 21 February 2024).
56. Slov-lex. Available online: https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2015/440/20220615 (accessed on 21 February 2024).
57. iTretisektor. Available online: https://itretisektor.sk/clanky/informacny-system-v-sporte-a-jeho-aplikacia-do-praxe-v-zmysle-zakona-o-sporte/ (accessed on 21 February 2024).
58. Toman, D.; Mičiak, M.; Koman, G.; Bubelíny, O.; Holubčík, M. Decision-making support of sports organizations via modern information systems and ICT tools. In Proceedings of the Globalization and Its Socio-Economic Consequences, Rajecké Teplice, Slovakia, 12 October 2022.
59. Slov-Lex. Available online: https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/1997/288/20140201.html (accessed on 21 February 2024).
60. Haviar, M. Národné športové centrum. *NŠC Rev. Odb. Časopis Národného Športového Cent.* **2005**, *1*, 2–3.
61. Národné Športové Centrum. Available online: https://narodnesportovecentrum.sk/zverejnenia/dokumenty-o-cinnosti-organizacie-statu-a-zriadovacia-listina (accessed on 23 February 2024).
62. Tyzden. Available online: https://www.tyzden.sk/sport/59935/sport-pre-slovensko-informacny-system-sportu/ (accessed on 23 February 2024).
63. Národné Športové Centrum. Available online: https://res.cloudinary.com/narodne-sportove-centrum/raw/upload/v1632923470/Vyrocna_sprava_Narodneho_sportoveho_centra_za_rok_2008_beeb62cb5c.doc (accessed on 23 February 2024).
64. Národná Rada Slovenskej Republiky. Available online: https://www.nrsr.sk/web/dynamic/Download.aspx?DocID=228750 (accessed on 23 February 2024).
65. Tyzden. Available online: https://www.tyzden.sk/casopis/1804/zase-nic/ (accessed on 23 February 2024).
66. Slov-Lex. Available online: https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2015/440/ (accessed on 23 February 2024).
67. Huba, A. Informačný systém v športe a jeho aplikácia do praxe v zmysle zákona o športe. *Magister Off. Odb. Časopis Učenej Právnickej Spoločnosti* **2016**, *2*, 12–16.
68. Slovenský Olympijský a Športový Výbor. Available online: https://www.olympic.sk/clanok/ak-chce-sport-viac-musi-vediet-na-co (accessed on 23 February 2024).
69. Učená Právnická Spoločnosť. Available online: https://beta.ucps.sk/konferencia-sport-a-spolocnost-6-blok-sport-a-legislativa (accessed on 23 February 2024).
70. Konferencia Šport a Spoločnosť. Available online: https://sportaspolocnost.sk/priamy-prenos (accessed on 23 February 2024).
71. StengL. Available online: https://www.stengl.sk/sk/referencia/74/informacny-system-sportu-pre-narodne-sportove-centrum (accessed on 23 February 2024).
72. Slovenský Športový Portál. Available online: https://sport.iedu.sk/Company/List?ActivityID=sport_club (accessed on 13 March 2024).
73. Ministerstvo Školstva, Výskumu, Vývoja A Mládeže Slovenskej Republiky. Available online: https://www.minedu.sk/financovanie-sportu-v-roku-2023 (accessed on 13 March 2024).
74. Slovenský Olympijský a Športový Výbor. Available online: https://www.olympic.sk/clanok/prieskum-msvvs-najoblubenejsim-sportom-slovakov-je-cyklistika (accessed on 13 March 2024).
75. Ministerstvo Školstva, Výskumu, Vývoja a Mládeže Slovenskej Republiky. Available online: https://www.minedu.sk/data/files/10968_ipsos_minedu-sekcia-s%CC%8Cportu_doma%CC%81ci-prieskum-s%CC%8Cportov_2021.pdf (accessed on 13 March 2024).
76. Tempest. Available online: https://www.tempest.sk/uspesne-projekty/slovensky-futbalovy-zvaz-265.html (accessed on 13 March 2024).
77. Učená Právnická Spoločnosť. Available online: https://beta.ucps.sk/informacny-system-slovenskeho-futbalu-by-mal-inspirovat (accessed on 13 March 2024).
78. Letko, J. Digitalizácia a využitie informačných technológií v manažérstve kolektívnych športov (Informačný systém slovenského futbalu, ISSF). In Proceedings of the 8th International Research Conference Management Challenges in the 21st Century, Bratislava, Slovakia, 12 April 2016.

79. Bart. Available online: https://blog.bart.sk/odkial-mame-data-pre-futbalnet-sk/ (accessed on 13 March 2024).
80. StengL. Available online: https://www.stengl.sk/sk/referencia/1/informacny-system-slovenskeho-zvazu-ladoveho-hokeja (accessed on 13 March 2024).
81. Hockey Slovakia. Available online: https://www.hockeyslovakia.sk/userfiles/file/16_%20Prezent%C3%A1cia%20k%20rozpo%C4%8Dtu%20SZ%C4%BDH%20na%20rok%202024.pdf (accessed on 13 March 2024).
82. Hockey Slovakia. Available online: https://www.hockeyslovakia.sk/sk/article/matrika-is-szlh (accessed on 13 March 2024).
83. StengL. Available online: https://www.stengl.sk/downloadinline/12C6FC8F3C894878A9D119DB326E1986-09FD9668B5FC22033B5697566CE31570 (accessed on 13 March 2024).
84. Slovenský Športový Portál. Available online: https://sport.iedu.sk/Company/Company/10899 (accessed on 13 March 2024).
85. Slovenský Športový Portál. Available online: https://sport.iedu.sk/Company/Company/10890 (accessed on 13 March 2024).
86. Zväz Slovenského Lyžovania. Available online: https://www.zvazslovenskeholyzovania.sk/wp-content/uploads/Centralny-register-zmluv-ZSL.pdf (accessed on 13 March 2024).
87. StengL. Available online: https://www.stengl.sk/sk/novinka/1321/slovenski-lyziari-naskocili-na-vlnu-digitalizacie-s-novym-informacnym-systemom) (accessed on 13 March 2024).
88. StengL. Available online: https://www.stengl.sk/sk/referencia/119/informacny-system-pre-zvaz-slovenskeho-lyzovania (accessed on 13 March 2024).
89. Slovenský Športový Portál. Available online: https://sport.iedu.sk/Company/Company/16763 (accessed on 13 March 2024).
90. Sport.cz. Available online: https://www.sport.cz/clanek/ostatni-do-narodnich-sportovnich-center-by-stat-mohl-investovat-az-6-4-miliardy-korun-4343020 (accessed on 13 March 2024).
91. Národní Sportovní Agentura. Available online: https://nsa.gov.cz/zastupci-narodni-sportovni-agentury-jednali-s-ministerstvem-cestovniho-ruchu-a-sportu-sr/ (accessed on 13 March 2024).
92. Národní Sportovní Agentura. Available online: https://rejstriksportu.cz/dashboard/public/agenda/sportovciTreneri (accessed on 13 March 2024).
93. Národní Sportovní Agentura. Available online: https://rejstriksportu.cz/dashboard/public/agenda/sportoviste (accessed on 13 March 2024).
94. Národní Sportovní Agentura. Available online: https://rejstriksportu.cz/dashboard/public/agenda/sportOrganizace (accessed on 13 March 2024).
95. Statistics Denmark. Available online: https://www.dst.dk/en/Statistik/dokumentation/documentationofstatistics/sports-participation/statistical-processing (accessed on 13 March 2024).
96. Statistics Denmark. Available online: https://www.dst.dk/en/Statistik/emner/kultur-og-fritid/idraet (accessed on 13 March 2024).
97. Statistics Denmark. Available online: https://www.statbank.dk/statbank5a/SelectVarVal/Define.asp?MainTable=IDRVAN08&PLanguage=1&PXSId=0&wsid=cftree (accessed on 13 March 2024).
98. Statistics Denmark. Available online: https://www.statbank.dk/statbank5a/SelectVarVal/Define.asp?MainTable=IDRKVU01&PLanguage=1&PXSId=0&wsid=cftree (accessed on 13 March 2024).
99. WHO. Available online: https://cdn.who.int/media/docs/librariesprovider2/country-sites/physical-activity-factsheet---denmark-2021.pdf?sfvrsn=6d68efdd_1&download=true (accessed on 13 March 2024).
100. Statistics Denmark. Available online: https://www.statbank.dk/statbank5a/SelectVarVal/Define.asp?MainTable=IDRAKT02&PLanguage=1&PXSId=0&wsid=cftree101 (accessed on 13 March 2024).
101. Statistics Denmark. Available online: https://www.statbank.dk/statbank5a/SelectVarVal/Define.asp?MainTable=IDRFAC01&PLanguage=1&PXSId=0&wsid=cftree (accessed on 13 March 2024).
102. Statistics Denmark. Available online: https://www.statbank.dk/statbank5a/SelectVarVal/Define.asp?MainTable=IDRFOR01&PLanguage=1&PXSId=0&wsid=cftree (accessed on 13 March 2024).
103. Sport England. Available online: https://www.sportengland.org/funds-and-campaigns/case-studies (accessed on 13 March 2024).
104. Sport England. Available online: https://www.sportengland.org/about-us/uniting-movement (accessed on 13 March 2024).
105. Sport England. Available online: https://activelives.sportengland.org/ (accessed on 13 March 2024).
106. Sport England. Available online: https://www.activeplacespower.com/pages/search (accessed on 13 March 2024).
107. Sport England. Available online: https://activelives.sportengland.org/Result?queryId=23431 (accessed on 13 March 2024).
108. Sport England. Available online: https://www.activeplacespower.com/pages/downloads#download (accessed on 13 March 2024).
109. Club Management Association of Europe. Available online: https://www.cmaeurope.org/cmae_news/number-of-sports-clubs-in-uk/ (accessed on 13 March 2024).
110. Jacobs, S.; De Bosscher, V.; Venter, R.; Patatas, J.M.; Scheerder, J. Contextual factors influencing the South African elite sporting system: An 'open system' approach. *Int. J. Sport Policy Politics* **2021**, *13*, 699–714. [CrossRef]
111. Deng, C.; Tang, Z. Historical Opportunity and Structural Transformation of Sports Industry Development under the Background of New Information Technology. In Proceedings of the 5th Annual International Conference on Information System And Artificial Intelligence (Isai2020), Hangzhou, China, 22 May 2020.

112. Statista. Available online: https://www.statista.com/statistics/1235448/worldwide-data-driven-decision-making-organizations-by-country/ (accessed on 13 March 2024).
113. Gschwend, M.; Krumer, A. On the importance of fixed effects over a short period of time when using sports data: A lesson from home advantage in alpine skiing. *Eur. Sport Manag. Q.* **2023**, *5*, 1291–1303. [CrossRef]
114. Ahammer, A.; Lackner, M. Does confidence enhance performance? Causal evidence from the field. *Manag. Decis. Econ.* **2019**, *40*, 704–717. [CrossRef]
115. Ahmad, N.; Adib, M.; Ahmad, Z.; Zaihidee, F.; Txi, M. Integration of the Health Monitoring System with IoT Application in Sports Technology: A Review. *J. Kejuruter.* **2022**, *5*, 101–109. [CrossRef] [PubMed]
116. Doran, J.; Jordan, D. The effect of geographical proximity and rivalry on performance: Evidence from the English Football League. *Reg. Stud.* **2018**, *11*, 1559–1569. [CrossRef]
117. Garnica-Caparrós, M.; Memmert, D.; Wunderlich, F. Artificial data in sports forecasting: A simulation framework for analysing predictive models in sports. *Inf. Syst. E-Bus. Manag.* **2022**, *20*, 551–580. [CrossRef]
118. Strom, R.; Nielsen, C.; Jakobsen, T. Can international elite sport success trickle down to mass sport participation? Evidence from Danish team handball. *Eur. J. Sport Sci.* **2018**, *18*, 1139–1150. [CrossRef] [PubMed]
119. Di Mattia, A.; Krumer, A. Fewer teams, more games, larger attendance? Evidence from the structural change in basketball's EuroLeague. *Eur. J. Oper. Res.* **2023**, *309*, 359–370. [CrossRef]
120. Haugen, K.; Krumer, A. On the importance of tournament design in sports management: Evidence from the UEFA Euro 2020 qualification. In *Innovation and Entrepreneurship in Sport Management*, 1st ed.; Ratten, V., Ed.; Edward Elgar Publishing: Camberley, UK, 2021; Volume 3, pp. 22–35.
121. Wen, Y.; Feng, W. Design and Application of Major Sports Events Management Information System Based on Integration Algorithm. *Comput. Intell. Neurosci.* **2022**, *2022*, 1–10.
122. Herold, E.; Breuer, C. Does the Game Matter? Analyzing Sponsorship Effectiveness and Message Personalization in Sport Live Broadcasts. *J. Sport Manag.* **2023**, *37*, 290–301. [CrossRef]
123. Pereira, H.M.; Dietl, M.H.; Lang, M.; Orlowski, J. The effects of managerial turnover on employee performance. In Proceedings of the 14th Annual Meeting of the Swiss Society of Sport Science (SGS), Bern, Switzerland, 16 February 2023.
124. Zafor, A.; Erylmaz, E.; Alzahrani, I.A. IS diffusion: A dynamic control and stakeholder perspective. *Inf. Manag.* **2022**, *59*, 103572.
125. Koman, G.; Toman, D.; Jankal, R.; Boršoš, P. The Importance of e-Recruitment within a Smart Government Framework. *Systems* **2024**, *12*, 71. [CrossRef]
126. Koman, G.; Toman, D.; Jankal, R.; Boršoš, P. Risk management in a human resources information system. *Entrep. Sustain. Issues* **2023**, *11*, 331–352. [CrossRef] [PubMed]
127. Karagiorgos, A.; Lazos, G.; Stavropoulos, A.; Karagiorgou, D.; Valkani, F. Information system assisted knowledge accounting and cognitive managerial implications. *EuroMed J. Bus.* **2022**, *2022*, 1450–2194. [CrossRef]
128. Roberts, N.; Qahri-Saremi, H.; Vijayasarathy, L.R. Understanding IT Value at the Managerial Level: Managerial Ambidexterity, Seizing Opportunities, and the Moderating Role of Information Systems Use. *Data Base Adv. Inf. Syst.* **2021**, *52*, 39–55. [CrossRef]
129. Vitaletti, A.; Pizzonia, M.; Zecchini, M.; Pennino, D.; De Falco, S.E.; Pacileo, F.; Naldini, S. On-chain global maintenance services: Technical, legal and managerial implications. *Int. J. Parallel Emergent Distrib. Syst.* **2023**, *2023*, 1–14. [CrossRef]