NOVA IMS Information Management School

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Data Governance for Effective Sports Companies

A Strategy to Enhance Performance and Compliance in the Age of Sports Information

Gonçalo Fontelas Filipe

Master Thesis

presented as partial requirement for obtaining the Master Degree in Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

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DATA GOVERNANCE FOR EFFECTIVE SPORTS COMPANIES

by

Gonçalo Fontelas Filipe

Master Thesis presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Systems Management and Information Technologies

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Gonçalo Fontelas Filipe

Castelo Branco, 15th July 2024

DEDICATION

This thesis is dedicated to my beloved grandparents, both living and those who have passed away.

To my living grandparents, your unwavering support, encouragement, and love have been a constant source of strength and inspiration throughout my academic journey. Your wisdom and guidance have shaped me into the person I am today, and I am forever grateful for your presence in my life.

To my grandparents who are no longer with us, your legacy lives on in my heart. Your memories continue to inspire me, and your teachings and values remain a guiding light. Although you are not here to witness this milestone, I know you are with me in spirit, and I dedicate this work to honor your memory.

Thank you all for being my pillars of strength. This thesis is a testament to your enduring love and support.

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ABSTRACT

The sports market's complexity demands standout strategies from sports companies. Intense competition and globalization drive the need for innovation. Effective governance and adaptability are crucial for success. Data governance enhances sports companies by improving decision-making, optimizing fan experiences, managing athletes, and efficiently allocating resources. The increasing volume of sports data necessitates comprehensive governance for sustainability and growth. Strategic data use is essential in this dynamic landscape. Sports companies must adopt data-driven approaches to boost performance and engage fans and sponsors. Data governance provides a foundation for a comprehensive sports experience, allowing refined marketing strategies, efficient operations, and superior fan experiences. However, the best strategy for leveraging data for competitive advantage remains unclear. Despite advances, the application of data to differentiate sports organizations needs further clarity. The lack of guidelines on using data for competitive advantage and enhancing fan experiences warrants investigation. This research defines a data governance strategy to improve sports organizations' effectiveness in the age of sports information. Objectives include reviewing literature, identifying gaps in small and medium-sized organizations, determining best practices, defining and validating a strategy, and analyzing results. The results will enhance data management knowledge in sports, improve governance practices, and promote effectiveness. Addressing knowledge gaps and providing practical guidance aims to boost the fairness and efficiency of sports organizations. Insights into balancing fan experience and privacy will advance data governance science, benefiting sports organizations globally.

KEYWORDS

Data Governance; Sports Companies; Data Management; Data Quality; Decision Making

Sustainable Development Goals (SDG):

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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
CDO	Chief Data Officer
CIO	Chief Information Officer
CMM	Capabilities Maturity Model
CT	Labor Code
DG	Data Governance
DGA	European Commission for Data Governance Law
DGI	Data Governance Institute
DSR	Design Science Research (DSR)
EU	European Union
GDPR	EU's General Data Protection Regulation
ICT	Information and Communications Technology
ISoS	Information System of Systems
IT	Information Technology
ML	Machine Learning
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RWE	Real-World Evidence
RWD	Real-World Data
SLRQ	Systematic Literature Review Questions
SMEs	Small and Medium-sized Enterprises

1. INTRODUCTION

1.1. BACKGROUND AND PROBLEM IDENTIFICATION

Over time, the sports market has become increasingly complex and demanding. In this context, it is very important for sports companies to define a business strategy that stands out from the rest (Cooper et al., 1999). The fierce competition in the sports sector, driven by an increasingly demanding and globalized public, has led organizations to seek innovative approaches to achieve and maintain their relevance. The ability to adapt and be flexible in governance has become a key element for the success of sports organizations in the current scenario.

The current advances in data governance (DG) have proven to be crucial tools for the development of organizations and companies. Sports companies are no exception. It is worth noting that DG in sports is not just a trend, but an absolute necessity for the effective management of operations (Delacroix & Lawrence, 2019). DG in sports therefore not only improves data-driven decision making, but also helps to optimize the fan experience, manage athletes and allocate resources efficiently (Zhai & Massung, 2016). The growing amount of data generated at sporting events and the need to harness this wealth of information make DG a critical discipline for the sustainability and continued growth of sports companies.

In today's scenario, where challenges and opportunities are becoming more and more dynamically intertwined, the ability to harness relevant data and use it strategically is crucial. In this context, sports companies are recognizing the importance of a data-driven approach to optimize not only their operational performance but also their engagement with fans and sponsors (Fried & Mumcu, 2016). DG is becoming a critical foundation for creating a comprehensive and enhanced sports experience that extends beyond the field of play. Access to advanced analytics and accurate information enables sports organizations to adapt their marketing strategies, effectively manage their operations and deliver a better experience to fans. Therefore, integrating DG is becoming an essential practice for sports organizations looking to gain a competitive edge in today's landscape (Davis & Spekman, 2004).

However, it is not clear what the best strategy is for sports companies to stand out from the rest. Although there have been remarkable advances in data collection and analysis in sports, the application of this information to differentiate a sports organization seems to remain unclear. One of the biggest challenges remains the lack of clear guidelines on how to use data to create a competitive advantage in the sports market (Fonti et al., 2023). Data management in the sports context often leaves a gap in understanding how this acquired information can be turned into concrete strategies that allow a sports organization to differentiate itself - an aspect that deserves further investigation.

Another area that lacks clarity and focus is the management of data related to the fan experience. While the importance of an enriching fan experience is recognized, data management in sports often does not comprehensively address how information can be used to personalize and enhance that experience (Uhrich, 2021). There is no consensus on best practices for the ethical and effective use of fan data and how to balance personalization and privacy. The need for clear data management guidelines to enhance the relationship between sports companies and their fans is therefore a gap that requires detailed analysis.

With the constant evolution of data usage in sport and the need to meet the growing expectations of fans, there is a need to address a relevant challenge and opportunities for improvement that can benefit sports organizations, athletes and fans in sport (Uhrich, 2021). Research in this area has the potential to provide practical guidance and valuable insights to enhance organizational effectiveness in the age of sports information. So, an important question arises: "How can we develop and implement data governance strategies to improve effectiveness in sports organizations in the age of sports information?"

1.2. OBJECTIVE

The aim of this research is to define a DG strategy that helps to improve the effectiveness of sports organizations in the age of sports information.

To achieve this main objective, the following intermediate objectives were defined:

- Conduct a comprehensive literature review on the use of DG techniques in sport to understand current practices and provide a solid foundation for research.
- Investigate the gaps in small and medium-sized sports organizations that put them at a disadvantage compared to monopolistic organizations and identify the factors that influence the effectiveness of DG.
- Identify the best DG practices that can be adapted for sports organizations of different sizes and assess the impact of DG on strategic decision making in sports organizations.
- Define a DG strategy.
- Validate the strategy and analyze the results to gain relevant insights that can contribute to the further development of DG in professional sports.

1.3. IMPORTANCE AND RELEVANCE

The results of this project will contribute to the development of science and knowledge by providing valuable insights in the area of data management in sport. It is also aimed to contribute to improving DG in sports organizations and promoting its effectiveness in the age of sports information.

First, the research will fill a significant knowledge gap by producing a comprehensive literature review on DG in the sports context. This will provide an understanding of best practices, challenges and current trends in DG in sport and create a solid knowledge base for researchers, academics and practitioners in the field.

This project will also provide an in-depth analysis of the differences between small and medium-sized sports organizations and monopoly organizations and identify factors that influence their effectiveness in DG. By addressing these discrepancies, the research will help to address a lack of understanding and provide practical guidance for sports organizations to improve their DG to promote greater fairness in the industry.

Finally, the research will examine the impact of DG on critical areas such as fan experience and privacy. This analysis will provide valuable insights into how DG strategies can be adapted and optimized to

enhance the relationship between sports companies and their target audiences. As a result, this project will contribute to the advancement of the science by providing a deeper understanding of DG in sport, how organizations can benefit from this understanding and how the strategy can therefore impact world sport.

2. LITERATURE REVIEW

The realm of DG within the realm of professional sports is an evolving and vital domain, molded by the ever-expanding crossroads between information technology and efficient data administration. As the management of large-scale data becomes a widespread practice for numerous organizations, offering an array of advantages including heightened business acumen, judicious decision-making, optimal bidding strategies, competitive edge, refined resource allocation, and escalated business efficacy, the sporting industry too witnesses a profound assimilation of these groundbreaking advancements (Abeza et al., 2022). In this context, the existing literature highlights the critical importance of DG in addressing the specific challenges faced by sports organizations in today's scenario (Andrew et al., 2019). The ability to manage vast amounts of data, ranging from athlete performance statistics to fan information, is fundamental to the sustainable success of sports organizations. This critical analysis will serve as a foundation for the proposed research and outline the fundamental elements that will guide the understanding and improvement of DG in professional sport.

2.1. SPORTS ORGANIZATIONS CHARACTERIZATION

2.1.1. Overview

In order to characterize sports organizations, it is necessary to take a comprehensive look at the involvement and influence of small and medium-sized enterprises (SMEs) in the sports sector and to underline the need for a deeper understanding of their role.

In the contemporary business landscape, emerging enterprises play a crucial role in generating employment opportunities, fostering innovation, and driving development. Consequently, it is important to pinpoint the key determinants for SMEs (Azimzadeh et al., 2013).

Under the terms of article 100º of the Portuguese Labor Code, various types of companies are enshrined in the legal system, including micro, small, medium and large companies. The distinction between them is based on the number of workers they employ, the first being less than 10 workers (article 100/1,a) of the Labor Code, "CT" from now on), then 10 to less than 50 workers (article 100/1,b) CT), then 50 to less than 250 workers (article 100/1,c) CT) and, finally, 250 or more workers (article 100/1,d) CT), respectively.

SMEs face several unique challenges that are not applicable to their large-scale counterparts: significant resource constraints, a culture marked by short-termism, and informal management practices are factors that affect SMEs more acutely than larger organizations. These elements shape not only operational dynamics, but also the ability of SMEs to effectively adopt and implement DG strategies. Understanding these specific challenges is crucial for contextualizing DG in the sports sector, especially when considering the diversity of the organizations that make up the sports landscape.

Furthermore, according to María Jesús Nieto and Lluís Santamaría in Technological Collaboration: Bridging the Innovation Gap between Small and Large Firms, is imperative to emphasize the significance of the innovative capacity possessed by SMEs as a fundamental factor in establishing

sustainable competitive advantage within today's market. The continuous evolution of novel products and processes stands as an indispensable requirement for their survival and expansion. Disparities in innovation endeavors and outcomes can be elucidated through recognizing the inherent advantages historically attributed to larger corporations.

Entrepreneurship, adaptability, and swift responsiveness serve as internal circumstances that typically foster innovation within SMEs. Nonetheless, these organizations face relative shortcomings due to their limited access to crucial resources and capabilities necessary for fostering innovative initiatives. Contrarily, prominent large-scale companies are characterized by possessing superior assets and breadth of influence. Consequently, they possess a more formidable arsenal when undertaking innovations demanding extensive expertise from specialized teams or sophisticated equipment (Nieto & Santamaría, 2010).

2.1.2. Types

According to the legislation governing Portuguese civil law, there are various types of companies in Portugal. Since this study is being carried out in Portugal, although it deals with issues of a global nature, it will be governed by the national legal system. Furthermore, since sports organizations are companies, it is assumed that they are governed by the same laws as other companies.

On the basis of the Portuguese government's public services portal, there are two types of company, namely singular and collective companies. For this purpose, it is only important to highlight collective companies.

According to Mafalda Barbosa in *Lições de Teoria Geral do Direito Civil* the companies in discussion are collective persons, which are characterized as being a collectivity of people or a mass of assets, whose purpose is to achieve certain common or collective interests. Collective persons include associations, foundations and companies. In this case, we're only going to talk about commercial companies, since they are the ones in which sports companies of interest to the research are included. In this context, partnerships are known as collective partnerships, quota partnerships, anonymous partnerships, commandite partnerships and cooperatives. In line with both sources, a collective partnership is a type of commercial company (carrying out acts of commerce in a collective or individual name), which does not require a mandatory minimum amount for share capital and has unlimited liability, i.e. the partners are liable to creditors for the partnership's debts. On the other hand, in a quota partnership, as the name suggests, the share capital is divided into quotas, each partner has a share in the partnership and is liable not only for the realization of the value of their share, but also for the realization of the shares of the other partners, i.e. only the assets of the company are liable for its debts. Next, in anonymous companies, the share capital is divided into shares and the partners are not liable to the partnership for the capital of the other partners, nor are they liable to the creditors of the partnership itself - the liability of the shareholders is limited to the value of the shares that correspond to them. In addition to these, limited partnerships have two types of partners, namely limited partners (liable only for their capital contribution) and general partners (liable for the partnership's debts on an unlimited basis and jointly and severally with each other). Finally, cooperatives are autonomous non-profit collective persons, freely constituted, with capital and variable composition, whose purpose is the economic, social or cultural needs of their members.

Another possible distinction concerns the public utility that each collective person pursues, which can be based on public law or private law. However, we should only emphasize what concerns private law collective persons, since state-owned companies (public law) are not relevant to this case. In this regard, there are private law collective persons of public utility with a disinterested purpose, such as foundations (created by an act in which a person allocates part of their assets for a specific public purpose); private law collective persons of public utility with an interested but ideal purpose, such as cultural, recreational and charitable associations, among others; private law collective persons of public utility with a non-profit economic purpose, which aim to achieve certain benefits for the members but, although they may have an economic slant, these benefits do not translate into obtaining or attempting to obtain profits; private law collective persons and private property, which are companies with a profitable scope with the aim of dividing the profits obtained by the members, as is the case with partnerships.

That said, the situation in the sports industry is identical and when organizations are created, they establish their intended purposes and adapt their constitution and evolution on the basis of the law.

2.1.3. Challenges and Opportunities

According to Danny Sandwell in *The top 7 data governance challenges organizations face and how to address them*, there are seven DG challenges that organizations face (Sandwell, 2023).

Firstly, there is the problem of understanding the profound significance of DG in an organizational context. As organizations generate increasing amounts of data, a digital revolution is needed to handle it effectively. While the focus is often on fast data retrieval, it is equally important to understand and control data through proper governance. This challenge is especially evident for established organizations making the transition to digital transformation. However, this transformation enables the exchange of relevant information, benefiting employees, customers and suppliers. The role of the Chief Data Officer (CDO) becomes crucial to ensure streamlined data management through a solid infrastructure and a comprehensive platform that applies governance principles. The analyst group also plays a vital role in increasing the value of DG, addressing the challenges arising from poor or misunderstood data and providing valuable information for informed decision-making.

Another issue that arises concerns the belief that IT owns the data. Initially, organizations often limited DG to the IT department, seeing it as a matter of enforcing rules and restricting access to data. Unfortunately, this led to DG being neglected during IT budget cuts, as it was seen as having no real business value. The misconception that DG was the sole responsibility of IT hindered digital transformation efforts. Successful organizations have resolved this issue by reintegrating DG into their business operations, highlighting its true importance, demonstrating its impact and establishing clear lines of data ownership. They have achieved this by appointing experienced data stewards who work closely with database administrators to ensure controlled access without delaying operations. This approach, exemplified by a European Union public service, resulted in significant cost savings, reduced time to discover data sets and positive business results within 18 months. The main change lies in the recognition that data ownership is aligned with business functions, rather than being the sole responsibility of IT.

Similarly, there is the differentiation between resources, which can be limited or misallocated. When corporate leadership recognizes the importance of DG, it is faced with a challenge: the lack of resources for key positions such as Data Owner and Data Administrator. While the appointment of a data owner requires a high-level decision-maker, finding an administrator is difficult due to the lack of qualified individuals. To solve this problem, organizations often train existing staff members, such as business analysts or IT professionals, to take on administrator roles on a part-time basis. As the benefits of DG become evident through successful demonstrations, organizations begin to prioritize dedicated roles, with larger companies requiring up to 10 administrators in different divisions. Even organizations with limited resources can implement effective governance in the early stages by hiring specialist consultants who can operate within their constraints.

On the other hand, the issue of isolated data must also be considered. Isolated data often occurs when there are different approaches to data operations and technology versions during modernization. Legacy systems, although functional, present challenges when it comes to migration, which can be solved by integrating downstream solutions at a lower cost. Traditional relational databases are great for structured data, but struggle with unstructured data such as videos and social media. Hybrid databases offer a compromise by combining both capabilities. Silos are common in companies, where different departments focus on specific areas without seamless communication. Eliminating these silos is essential to maximize the use of data. One solution is to collect different types of data in various technologies and use data management tools to establish uniform metadata links. Instead of relying on static documentation, dynamic mapping of infrastructure architecture can increase flexibility. Metadata management is crucial to operationalizing DG, allowing business users to focus on understanding the flow of data rather than the specifics of the platform.

Next, poor data quality and lack of trust must be addressed. Ensuring data quality is a fundamental aspect of DG, as it has a direct impact on trust, use and strategic results. When data is not trusted, it undermines its usefulness in strategic decision-making. It is essential to resolve any problems with data quality in order to build trust, even if the adjustment may require some effort. It is essential to identify problems such as blank records or duplicate lines. Implementing data intelligence tools, establishing quality metrics and incorporating feedback loops are effective solutions within the framework of DG. By being transparent about data quality, users can make informed decisions about trusting the data available.

The context of deficient data also needs to be addressed. Although poor data quality can lead to a lack of trust, it is important to note that a lack of trust does not always mean that the data quality is poor. Sometimes, a lack of trust can be the result of users having difficulty understanding what the data means. For example, if labels are ambiguous or records are incorrectly classified, this can create perception problems rather than real problems with the data. To solve this problem, it is crucial to establish a feedback loop that allows users to ask questions and get a comprehensive context for interpreting the data.

Finally, look at the lack of data control. In organizations with IT skills but no DG, there is often an excess of misguided control, motivated by security and protection concerns. Fear of potential threats and the need to safeguard trade secrets can unintentionally exclude individuals who have the potential to extract maximum value from data. The goal of DG is to prevent this exclusion and create an environment that doesn't just reject ideas, but strategically positions itself to accept them with

confidence. True data control, supported by data management tools, involves understanding the data landscape, identifying the purpose of each data asset and determining the appropriate use. This ensures that security measures are effectively applied across multiple data sources.

Organizations are presented with a significant chance to revolutionize their operations by addressing the fundamental challenges of DG. This can be achieved by promoting a deeper understanding of the importance of data, dispelling the misconception that IT is solely responsible for it, and utilizing resources efficiently. Key issues such as data isolation, quality, and context should be tackled, and crucial roles like the CDO and data stewards should be implemented. By doing so, companies can unlock the full strategic potential of their data assets. To maximize the value of data, advanced tools such as data intelligence and metadata connections should be utilized. True transformation occurs when DG is aligned with business functions, fostering a culture of transparency and effective control. This enables informed decision-making and optimized operations.

2.2. DATA GOVERNANCE PRACTICES

Identify the best DG practices that can be adapted for sports organizations of different sizes and assess the impact of DG on strategic decision making in sports organizations.

Data management solutions are becoming too expensive and unable to face the reality of constantly complex data, as companies become increasingly sophisticated in their use of data, generating new demands that require different types of processing (Al-Ruithe et al., 2019). Consequently, DG has begun to play a more prominent role in companies. Until recently, governance was mainly informal, without structure and without wider support from organizations, as it is an area that is still poorly studied and less practiced in the industry. According to the Data Governance Institute (DGI), DG is “data governance is a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods” (Al-Ruithe et al., 2019)

As explained by the authors of the article *Data Governance for Real-World Data Management: A Proposal for a Checklist to Support Decision Making*, DG can be defined as a strategy for the overall management of the usability, availability, integrity, quality and security of data in order to guarantee its full potential (Solà-Morales et al., 2023). To achieve this, we need to understand what practices already exist, how to apply them and what impact they will have on sports companies. A collection of information helps to identify the main topics of DG, its main limitations and possible improvements. In this example below, the authors propose a checklist containing 24 questions, divided into four topics: data privacy and security, data management and linkage, data access management and generation of real-world evidence (RWE) (Solà-Morales et al., 2023). As RWE is "clinical evidence on the safety and efficacy of a medical product that is generated using real-world data (RWD) resulting from the provision of routine health care" (Dang, 2023), and our focus is on the sports domain, we will ignore the last group of the checklist. After completing this checklist, the information was validated in three rounds through a Delphi panel. The Delphi method is a forecasting process and a structured communication framework based on the results of several rounds of questionnaires sent to a panel of experts (Twin, 2023). Foram convidados vários experts de diferentes áreas, vindos de diversos países. Este painel leu a revisão de literatura e depois compilou três questionários consecutivos, cada um com

trinta perguntas/afirmações a que tiveram acesso. In the end, after the Delphi Panel Data Analysis, they finally obtained a list of good governance practices appropriate for the area they were studying, suggesting how DG can be assessed qualitatively through a proposed checklist and revealing the importance of various DG practices, such as ensuring data privacy and security, guaranteeing and maintaining data quality and traceability, monitoring by specific review committees with clear and transparent criteria, and recommending the use of data access agreements. Here are the final practices, on Table 1:

Table 1 – Good Data Governance Practices

Good data governance practices	**Does this apply?**
Section 1 – Data privacy and security	
1.1 The appropriate patient consent for the collected RWD has been obtained	Yes ☐ No ☐
1.2 If the original consent does not cover the secondary data use, either secondary consent has been obtained, or the data use fits into the criteria to be exempt from obtaining explicit consent.	Yes ☐ No ☐
Note: Guidance on what type of data usage fits under the exemption criteria will need to be established on a policy level (if not already established).	
1.3 The data are adequately anonymized with a validated process (e.g., pseudonymization) that is replicable for other datasets.	Yes ☐ No ☐
1.4 The dataset has clear and transparent data protection measures according to highest quality standards	Yes ☐ No ☐
Section 2 – Data management and linkage	
2.1 Data ownership is clearly stated and easily found before accessing the data	Yes ☐ No ☐
2.2 The dataset has publicly available SOPs for data quality maintenance.	Yes ☐ No ☐
2.3 There are procedures for regular quality checks, including relevant data quality indicators.	Yes ☐ No ☐
2.4 The traceability of the data in the dataset is clearly described.	Yes ☐ No ☐
2.5 Data are consistent, accurate, complete, and up to date	Yes ☐ No ☐
2.6 The data types, units of measure, and clinical definitions are harmonized according to best quality standards using common data models	Yes ☐ No ☐
Section 3 – Data access management	
3.1 Data access requirements are clear and transparent and according to best available quality standards	Yes ☐ No ☐
3.2 Data access agreements are in place in which the integrity of the RWD user and data security are established.	Yes ☐ No ☐
RWD indicates real-world data; RWE, real-world evidence; SOP, Standard Operating Procedure	

2.3. DATA GOVERNANCE IN SPORT INDUSTRY

It is intended to carry out an exhaustive literature review to examine and evaluate the utilization of DG techniques in the sports industry. To achieve this, I will employ the PRISMA methodology - that stands for "*Preferred Reporting Items for Systematic Reviews and Meta-Analysis*" - which is a systematic approach for conducting reviews and meta-analyses (Moher et al., 2010). This methodical approach will enable a comprehensive analysis of existing literature, facilitating the identification of current practices and trends in DG within the sports field. By adhering to the PRISMA guidelines, the objective is to ensure a structured and transparent review process, guaranteeing a rigorous and reproducible methodology. The insights obtained from this literature review will serve as a strong basis for future research, providing valuable insights into the strengths, challenges, and opportunities associated with DG techniques in the dynamic realm of sports.

2.3.1. PRISMA Methodology

The PRISMA methodology covers both systematic reviews and meta-analyses. The authors explain in *Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement*, that a systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyze data from the studies included in the review. Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies. Meta-analysis refers to the use of statistical techniques in a systematic review to integrate the results of the included studies (Moher et al., 2010).

A team of 29 individuals including review authors, methodologists, clinicians, medical editors, and consumers collaborated to create the PRISMA Statement. The development process involved incorporating evidence whenever available and resulted in the creation of a 27-item checklist and a four-phase flow diagram (Liberati et al., 2009).

The entire process follows a simple workflow and is divided into four phases:

1. Identification - Use popular databases to implement a specific search strategy and locate relevant articles, documents and other scientific papers.
2. Screening - Apply a set of highly specific criteria to selectively incorporate relevant articles and exclude those that do not contribute to the research.
3. Eligibility - Evaluate the included articles to determine their eligibility and exclude others based on valid justifications.
4. Included - List of results of the documents that will be used as a complete source for the investigation.

2.3.2. PRISMA Execution

The previous paragraphs have helped to explain the topic we want to study. From this analysis it is possible to extract keywords, which will be used to create a search string to find the scientific articles

relevant to this study. It is important to have a clear picture of the state of the art regarding DG in the world of sports companies.

Therefore, the intended research should answer the following questions presented in Table 2.

Table 2 – PRISMA Questions

SLRQ1	What kind of methods are currently useful in data governance for sports organizations?
SLRQ2	What are the main problems with data governance in sports organizations?
SLRQ3	What is the current state of research in this area?
SLRQ4	What are the advantages and disadvantages of using DG strategies in this area?

To address these inquiries, the most pertinent studies in this area were chosen based on the PRISMA definition. A set of keywords, deemed more relevant from the various concepts examined in the theoretical background, were utilized for the search. Only English words were employed, resulting in the majority of the retrieved articles being written in English. Papers written in other languages were excluded from the selection, following the criteria outlined in the PRISMA execution. The keywords employed are as follows on Table 3:

Table 3 – Keywords

	Sports Organizations	**Data Governance**
Keywords	Sports Management	Data Governance
	SMEs in Sports	Chief Data Officer
	Legal Framework	Legacy Systems
	Data Challenges	Data Quality
	Digital Transformation	Strategic Potential

To ensure the retrieval of relevant data for the study, a specific search string was created to include the specified words or terms in abstracts, titles, and keywords of scientific articles and papers. The choice of these words was made to focus on the desired topics. Since the technology in question is rapidly evolving, the interest was in recent scientific documents that provide up-to-date and pertinent information. To achieve this, a filter was applied to display articles published between 2019 and 2024, aiming to obtain accurate insights into the current state of DG utilization in sports organizations. The search string employed was as follows:

- **(“Data Governance” OR “Chief Data Officer” OR “Legacy Systems” OR “Data Quality” OR “Strategic Potential”) AND (“Sports Management” OR “SMEs in Sports” OR “Legal**

Framework" OR "Data Challenges" OR "Digital Transformation") AND ("State of the art" OR "Methods" OR "Strategies" OR "Current State").

In addition to searching for keywords related to data governance and sports organizations, a *boolean query* was used to include terms from the research questions. This was done to find articles that specifically address the problems being studied. The search was performed in January 2024 across the following scientific information resource databases, on Table 4:

Table 4 – Scientific Information Resource Databases

Resource Database	Resource URL
Scopus	https://www.scopus.com/home.uri
Web of Science	https://www.webofknowledge.com/

In accordance with the PRISMA methodology, the next stage involved establishing the criteria for including or excluding articles identified through the search process, as shown on Table 5.

Table 5 – Including and Excluding Criteria

Inclusion Criteria	Exclusion Criteria
Any scientific article showing evidence of Data Governance in Sports Organizations	Papers focusing on Sports Organizations but without focusing on Data Governance utilization
Paper must be a peered reviewed conference or journal paper written in English	Articles not in English and duplicate papers
Paper is published between 2020 and 2024	Articles published before 2020
	Non-academic or non-scientific papers (e.g., websites, magazines reports, newspapers, consulting articles, books, citations)
	Papers with titles outside the scope of this work

Once the search string is entered into various sources websites, we move on to the identification phase of the PRISMA workflow. Here, we receive an output containing all the articles identified through database search, totaling (n=266) articles. In the screening phase, the initial step involves eliminating duplicate articles. After removing (n=59) duplicates, the screening phase progresses to the next step with (n=207) records. During this stage, the inclusion and exclusion criteria were enforced, which included filtering out articles published before 2020, articles not in English, non-academic or non-scientific papers, inaccessible articles, and other specified exclusion criteria. This led to the exclusion of (n=108) articles, leaving a total of (n=99) articles for the eligibility phase. During this phase, the abstracts of the articles were carefully reviewed, and those deemed irrelevant to the study were excluded. Articles that focused on specific industries were considered too narrow for the scope of this study, which aims to explore the broader applicability of DG in sports organizations. As a result, (n=41) articles were removed. A total of (n=58) articles were included in the qualitative phase of the study, where the main text of the articles was assessed. These articles demonstrated evidence of utilizing various methods of DG across different areas and addressing the research questions. Articles that did not contribute to answering the research questions were excluded, resulting in a final list of (n=43) articles included in the study. This process is illustrated in the workflow diagram below:

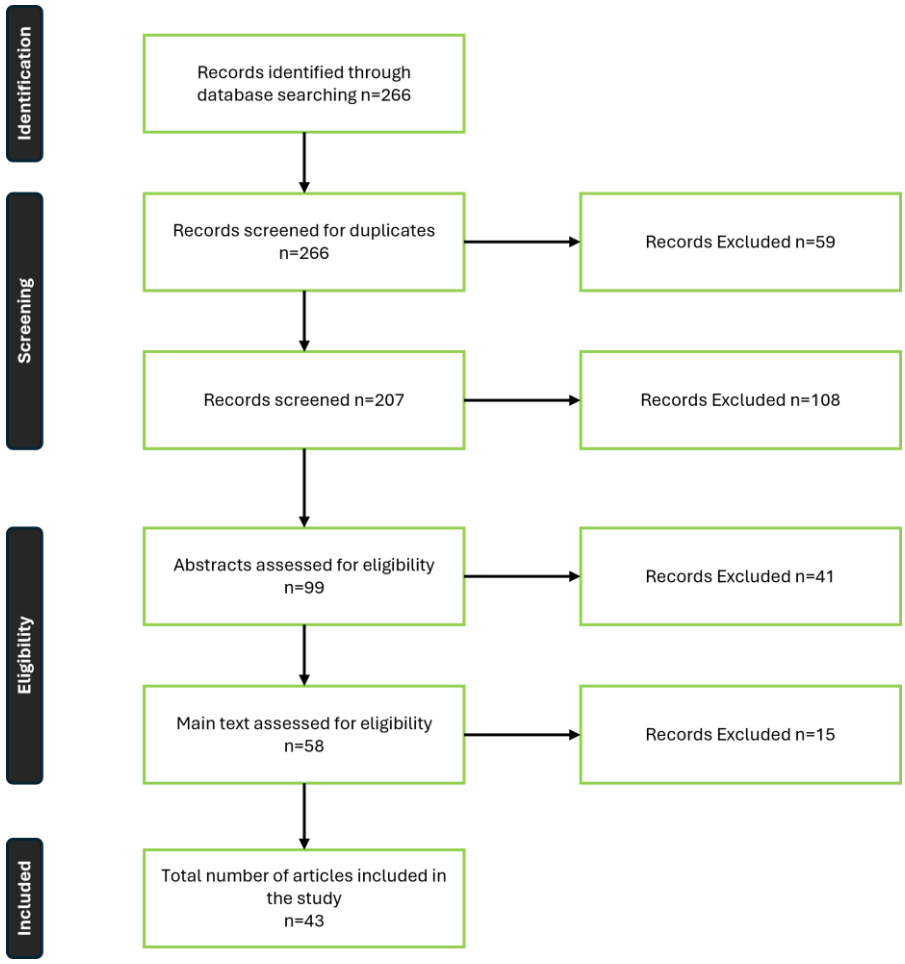

Figure 1 – Articles Workflow Diagram

The research yielded a total of 20 journal articles, 14 conference papers, 3 books, 2 book chapters and 4 reviews that were advanced to the included phase. These publications are detailed in the Table 6, providing a summary of their contributions, conclusions, and suggestions for future work.

Table 6 - Articles

#	Authors	Article	Contribution	Publication Type
[1]	(Aldoseri et al., 2023)	Re-Thinking Data Strategy and Integration for Artificial Intelligence: Concepts, Opportunities, and Challenges	This review is of great relevance to my research as it can provide me with fundamental alternatives for solving challenges and problems in the course of data analysis, namely regarding the quality of the data I am analyzing, the privacy and security of the data, the interpretation of the data, among others. By adopting the strategies recommended in the article to address these challenges, I can gain valuable guidance for developing an effective data governance strategy to apply to sports companies, balancing technological developments with ethical and legal concerns.	Review
[2]	(Aldossari et al., 2023)	Factor Influencing the Adoption of Big Data Analytics: A Systematic Literature and Experts Review	This article looks at Big Data analysis by small and medium-sized enterprises (SMEs), which often encounter challenges related to making strategic decisions based on large amounts of data. This study addresses the main factors that influence the adoption of these Big Data analyses, which are crucial for companies to understand how they should establish data governance that is effective and drives successful initiatives.	Article
[3]	(Aloufi & Abdulaziz, 2022)	Challenges and Obstacles Facing Data in the Big Data Environment	This review can contribute to research essentially through four aspects, namely by providing answers to the challenges posed by Big Data analysis, identifying them and providing tools and strategies for overcoming them; in addition, it reflects on the impact that these challenges have specifically on companies and, finally, it confronts the theoretical implications with practical application.	Review
[4]	(Arena et al., 2022)	A novel decision support system for managing predictive maintenance strategies based on machine learning approaches	This article reflects the importance of digital transformations essentially in the industrial environment, focusing on the modern use of more efficient modern devices and machines. It presents these	Article

#	Authors	Article	Contribution	Publication Type
			transformations in decision trees and demonstrates how to implement predictive maintenance based on different sectors, applying it to a real industrial study. It is therefore essential as it offers different perspectives on the impact of data analysis on decision-making processes, specifically in industrial contexts but easily adapted to data governance in sports companies.	
[5]	(Bodendorf & Franke, 2024)	What is the business value of your data? A multi-perspective empirical study on monetary valuation factors and methods for data governance	This article offers a theoretical-methodological approach to assessing the value of certain data, such as business assets. It is essentially based on three dimensions to establish this value, namely benefits, costs and quality. It also addresses how the pressure imposed by organizations themselves influences data governance decisions, especially for monetary reasons. These aspects are fundamental to obtaining a theoretical conception of the influencers of data governance in companies.	Article
[6]	(Bollweg, 2022a)	Data Governance as Driver of Value Stream Optimization and as Pacemaker for the Digital Transformation	This chapter highlights the importance of approaching digital transformation in a professional and structural way, highlighting a relatively simple and effective method: data-driven value stream optimization. This method highlights the need to empower company employees with specialized knowledge, helping to identify and implement digital transformation options in the company itself. For this reason, it is a key article for understanding how to implement a structured approach to data management in sports companies.	Book Chapter
[7]	(Bollweg, 2022b)	Measuring the Success of Data Governance	The importance of this book's chapter for research is based on its ideas about the importance of professional data management for goal-oriented business development in the age of digital transformation. In addition, it introduces a capability maturity model (CMM) to assess and compare data management maturity levels with defined development objectives. The way the article is developed provides a very important approach to guiding the analysis and improvement of data governance in sports companies.	Book Chapter

#	Authors	Article	Contribution	Publication Type
[8]	(Carvalho et al., 2020)	Technology and quality management: A review of concepts and opportunities in the digital transformation	This paper contributes to research by highlighting the importance of integrating Quality Management into organizations' Digital Transformation. It addresses and organizes technological concepts and integration opportunities related to Quality Management in the appropriate literature. Ultimately, it provides important insights for integrating quality data management into the analysis and operations of sports companies during digital transformation.	Conference Paper
[9]	(Chawla et al., 2023)	The role of CIO in digital transformation: an exploratory study	This article highlights the role of the Chief Information Officer (CIO) in the digital transformation of organizations. It empirically examines the multidimensional task requirements associated with digital transformation in the context of the CIO role and identifies crucial new functions, such as legacy systems integration, risk management and IT security, which are not adequately addressed in the existing literature on CIO roles. These insights are important for understanding how IT leaders can drive digital transformation in sports companies.	Article
[10]	(Creus, 2021)	The digital transformation of the knowledge worker	This paper highlights the need for digital transformation in the oil and gas industry, proposing a broad framework for increasing the productivity of professionals. It highlights the importance of rethinking the business model based on six key dimensions, namely a corporate strategy, a digital strategy, culture, some knowledge processes, data governance and data science. These ideas can be useful in understanding how sports companies can improve their efficiency and competitiveness through digital transformation.	Conference Paper
[11]	(Fan et al., 2021)	A Review on Data Preprocessing Techniques Toward Efficient and Reliable Knowledge Discovery from Building Operational Data	The article offers a review of data pre-processing techniques for analyzing operational data in buildings, highlighting their importance and applicability. It also proposes advanced data science techniques to solve practical challenges. These approaches can be useful in managing data	Review

#	Authors	Article	Contribution	Publication Type
			in sports companies, improving their analysis and effectiveness.	
[12]	(Gökalp et al., 2021)	The development of the data science capability maturity model: a survey-based research	The article proposes a data science capability maturity model to assess and improve organizations' data science capabilities. It identifies key areas, such as strategy management, data analysis and data governance, and offers a roadmap for continuous improvement. This model can be adapted for sports companies, helping them to develop data governance strategies to improve their effectiveness in the sports information age.	Article
[13]	(Golding & McNamarah, 2024)	Sagicor's digital transformation maturity journey	The case study reports on the data digitization and analysis maturity journey of a financial conglomerate made up of five different companies. The aim is to align the companies with a single data strategy and promote a data-driven culture. Although technical advances have been made, such as the implementation of a system of rules against fraud and improvements in the level of analytical maturity, challenges remain in data quality and governance, data literacy and the consolidation of a data-driven culture. This study can provide valuable insights for data governance strategies in sports companies.	Article
[14]	(Graetsch et al., 2023)	Dealing With Data Challenges When Delivering Data-Intensive Software Solutions	The study investigates the challenges faced by software teams in dealing with data. It identifies key issues such as data access, alignment and quality, as well as proposing strategies, including the implementation of data governance, which can be useful for sports companies to improve their effectiveness in data management.	Article
[15]	(Green, 2020)	A digital start-up project - CARM tool as an innovative approach to digital government transformation	The study describes how a government digital transformation project, called CARM Tool, can benefit large government organizations. This project aims to modernize manual processes, improve visibility and accountability, and advance workforce skills. Although focused on the public sector, its innovative approaches can inspire data governance strategies in sports companies, aimed at improving efficiency and performance.	Article

#	Authors	Article	Contribution	Publication Type
[16]	(Guggenmos et al., 2022)	Security First Security by Design or Security Pragmatism – Strategic Roles of IT Security in Digitalization Projects	The article proposes a method for integrating information security into digitization projects in order to take advantage of its strategic potential. This can contribute to improving the effectiveness of sports companies in the age of sports information by offering a management tool for evaluating and deciding on the appropriate information security for these projects.	Article
[17]	(Harper et al., 2021)	Evolving Clinical Data Strategies and Tactics in Response to Digital Transformation	The article examines how the increasing volume and variety of clinical data is affecting clinical data management organizations. A survey revealed that companies use multiple data sources and are facing an increase in the time needed to finalize the database. Mitigation strategies include developing a formal data strategy and investing in new data technology tools and infrastructure. More research is needed to address these challenges. These findings can inform the data governance strategy for sports companies in the sports information age, improving their operational effectiveness.	Article
[18]	(Hendrawan et al., 2023)	A Comprehensive Framework of Role Data Governance in Ensuring Data Quality: Literature Review	This study examines the importance of data quality, with a focus on the field of education, and highlights relevant dimensions for the education sector. It identifies the key elements that drive rapid digital transformation and support data quality processes. It proposes data quality management strategies tailored to the needs of education, aimed at addressing the challenges of digital change. The findings can inform a data governance strategy for sports companies, improving their operational effectiveness in the sports information age.	Conference Paper
[19]	(Jäntti & Aho, 2024)	Quality aspects of digital forest service management: a case study	This article explores how digital transformation can benefit the forestry industry, especially for machine operators. It highlights the importance of a holistic approach to ensuring the quality of the digital technologies used, suggesting that digital transformation can increase transparency, reduce costs and increase productivity. These findings can be applied	Article

#	Authors	Article	Contribution	Publication Type
			to data governance to improve the effectiveness of sports companies in the age of sports information.	
[20]	(Lalova-Spinks et al., 2023)	The application of data altruism in clinical research through empirical and legal analysis lenses	This study explores the views of clinical research stakeholders on "data altruism" and discusses key issues related to its legal application. Interviews with experts revealed significant concerns and challenges associated with the concept of data altruism, especially in relation to its interaction with existing regulations, such as the EU's General Data Protection Regulation (GDPR). Although data altruism can facilitate data sharing, its application in clinical research currently faces legal uncertainties and requires additional efforts from the legislator to be effective.	Article
[21]	(Lee et al., 2022)	How to Operate a National Chief Data Officer: A Comparative Analysis on the Governance of Major Countries	This study addresses the importance of data for data-driven policymaking and digital economic transformation. It analyzes the emergence of the position of Chief Data Officer (CDO) in countries such as the United States, the United Kingdom and South Korea, as part of national governance to lead data innovation. The research compares CDO systems in terms of legal basis, organization, required capabilities and hiring process, highlighting the importance of organizational awareness, leadership authority and support capacity for the success of the CDO system. These findings can inform data governance strategies for sports companies, especially in terms of organizational structure and leadership in the sports information age.	Conference Paper
[22]	(Leon & Horita, 2021)	On the modernization of systems for supporting digital transformation: A research agenda	This paper analyzes digital transformation in companies, highlighting the need for technological adaptation to meet the commercial demand for new digital products and services. It carries out a systematic mapping of the literature to assess the extent to which modernized systems are investigated in the context of corporate digital transformation. The results indicate a significant gap in the investigation of modernization models with integrated systems and in the analysis of methods or architectural models that allow	Conference Paper

#	Authors	Article	Contribution	Publication Type
			the gradual evolution of modernized systems without interrupting business activities. These findings can inform data governance strategies for sports companies, especially in relation to the modernization of systems to facilitate digital transformation.	
[23]	(Ma & Du, 2022)	Enterprise data at Huawei: Methods and practices of enterprise data governance	This book draws on Huawei's data governance history to describe its vision, methodology and comprehensive data governance system. It highlights the challenges Huawei faced during its digital transformation and how the company developed its data infrastructure and governance practices to drive digital transformation. Although focused on Huawei's experience, it can provide valuable insights for business leaders and digital transformation implementers, including strategies for improving data quality, dealing with data silos and deriving maximum business value from data. These concepts can be applied in sports business contexts, helping them to improve their data governance and effectiveness in the sports information age.	Book
[24]	(Moyo et al., 2022)	An Analysis of Cause-Related and Social Marketing Strategies in the South African Sport Management Industry	The study investigates how sports organizations in South Africa adopt marketing strategies related to social causes, such as socially responsible marketing. Although there is evidence of engagement in this type of activity, a lack of understanding of the concepts and underutilization of its strategic potential are highlighted. The study proposes a framework to guide the effective execution of socially responsible marketing campaigns, aiming to improve the marketing performance of sports organizations. These findings can inform data governance strategies for sports companies, emphasizing the importance of socially responsible marketing in the sports information age.	Article
[25]	(Nelson & Zanti, 2023)	Four Questions to Guide Decision-Making for Data Sharing and Integration	The article presents a Four Questions Framework to guide data integration partners in building a solid foundation of governance and legality to support the	Article

#	Authors	Article	Contribution	Publication Type
			ethical use of data. Developed in the United States, the framework aims to provide a simple tool that can be adapted to any context. Using practical experience and working groups, the framework highlights four essential questions: Is it legal? Is it ethical? Is it a good idea? How do you know (and who decides)? These questions are discussed within a data governance context, emphasizing the importance of collaboration and continuous analysis throughout a data use project. This approach can inform data governance strategies for sports companies in the age of sports information.	
[26]	(Ngesimani et al., 2022)	Data governance in healthcare information systems: A systematic literature review	The study investigated the challenges related to data governance in health information systems (HIS) through a systematic literature review. It identified the importance of effectively implementing data governance to deal with data problems and highlighted the growing interest in the area, especially with the adoption of cloud computing. It concluded that data governance is key to digital transformation in healthcare, highlighting the importance of electronic health records. These findings can inform data governance strategies for sports companies in the sports information age.	Review
[27]	(Osório et al., 2021)	Open and Collaborative Micro Services in Digital Transformation	The study addresses the integration of legacy systems into an open services architecture to manage agri-food silo infrastructures. It proposes a strategy based on the Information Systems of Systems (ISoS) concept for integrating legacy systems into an open services architecture. This can inform approaches to integrating legacy systems in sports companies to improve effectiveness in the sports information age.	Conference Paper
[28]	(Parvin, 2021)	Success Factors of an Enterprise-Wide Digital Twin Strategy	The paper explores strategies for integrating different "Digital Twins" projects into a single combined vision, with the aim of creating value and competitive advantage for the business. It highlights approaches used by large operators to develop "Enterprise Scale Digital Twin"	Conference Paper

#	Authors	Article	Contribution	Publication Type
			strategies and highlights lessons learned and recommendations. This can inform how sports companies can approach data governance to improve their effectiveness in the sports information age, focusing on technical and commercial scalability and data quality management.	
[29]	(Pires et al., 2022)	The Redesign and Evolutive Development of Legacy Reservoir Data Management Systems - A Case Study	The paper highlights the importance of modernizing legacy systems as a digital transformation strategy, rather than replacing them with new technologies. It describes the successful case of a Petrobras reservoir data management system, highlighting relevant aspects related to redesign and evolutionary development. This experience can provide insights into how sports companies can approach data governance to improve their effectiveness in the sports information age, prioritizing the modernization of legacy systems.	Conference Paper
[30]	(Qiao et al., 2023)	Research and implementation of unified management method for power distribution and distributed new energy data resources	This article proposes a unified management method for data resources in energy distribution. It addresses the challenges of managing a wide variety of equipment and data in the distribution network. The proposal aims to integrate and manage diverse and unstructured data in a unified way, promoting digital transformation. This can offer insights into how sports companies can improve data governance for enhanced effectiveness in the sports information age.	Conference Paper
[31]	(Rocha et al., 2023)	Understanding Digital Transformation challenges: evidence from Brazilian and British manufacturers	The book discusses the challenges faced by large Brazilian and British manufacturers in becoming smart factories. Nine case studies were carried out, identifying technological, socio-managerial and macro-environmental challenges. Practices to overcome these challenges include clear communication of the digital strategy, development of a digital mindset among employees and innovation collaborations. These practices may be relevant to improving the effectiveness of sports companies in the age of sports information.	Book

#	Authors	Article	Contribution	Publication Type
[32]	(Sayeed et al., 2023)	TRUSTEE: Towards the creation of secure trustworthy and privacy-preserving framework	The paper discusses the importance of digital transformation in organizations' data management and the challenges faced by traditional data governance. It introduces TRUSTEE, a platform designed to provide a secure, privacy-centered framework for accessing and using data to ensure its integrity and security. This approach could be relevant to improving the effectiveness of sports companies in the age of sports information, especially in the management and protection of sensitive data.	Conference Paper
[33]	(Stein & Maass, 2022)	Requirements for Data Valuation Methods	The paper addresses data valuation as a crucial element in understanding its value and incorporating it appropriately into business operations. Through interviews with experts, requirements and quality criteria for data valuation methods were identified. These findings may be relevant for sports companies in effectively managing their data in the sports information age, helping to better understand the value of data and the associated quality criteria.	Conference Paper
[34]	(Treder, 2020)	The chief data officer management handbook: set up and run an organization's data supply chain	The book addresses the crucial role of the Chief Data Officer (CDO) in today's landscape, offering practical guidelines for improving data management within companies. It provides insights into how to develop a sustainable approach, avoid common pitfalls and create an effective structure for the data office. Important topics such as data supply chain, data strategy and data governance are covered comprehensively. The book also highlights the importance of team collaboration in data management and emphasizes the vital role of data in current and future technological innovations. These insights can be applied to improve data governance in sports companies in the age of sports information.	Book
[35]	(Tsai et al., 2023)	Task Conflict Resolution in Designing Legacy Replacement Systems	The article explores the challenges faced by organizations when replacing legacy information systems (LIS) during digital transformation. It proposes a model for dealing with conflicts and identifying resolution strategies appropriate to the	Article

#	Authors	Article	Contribution	Publication Type
			context of replacing legacy systems. The results highlight the importance of multidisciplinary teams and specific strategies for resolving conflicts during the replacement process. These findings can be useful for improving data governance in sports companies in the sports information age.	
[36]	(Vardanyan & Kocharyan, 2022)	The GDPR and the DGA Proposal: are They in Controversial Relationship?	The article analyzes the European Commission's proposal for the Data Governance Act (DGA) and its interaction with the General Data Protection Regulation (GDPR). It highlights inconsistencies between the DGA and the GDPR, pointing to possible legal conflicts and uncertainties that could affect the protection of personal data in the EU. These issues have implications for data governance in sports companies in the sports information age.	Article
[37]	(Venâncio et al., 2023)	Digital transformation in maintenance: interoperability-based adequacy aiming smart legacy systems	The article proposes a framework for digital transformation, focused on interoperability in maintenance systems, aimed at overcoming barriers faced by organizations in adopting technologies, especially in legacy systems. It highlights the importance of people as drivers of transformation and suggests strategies based on strategic decisions and multi-criteria decision-making methods. The study shows that the framework can facilitate the implementation of technologies in legacy maintenance systems, resulting in a "Smart Legacy System". These approaches may be relevant to sports companies in the age of sports information.	Article
[38]	(von Ditfurth & Lienemann, 2022)	The Data Governance Act: – Promoting or Restricting Data Intermediaries?	The article analyzes the Data Governance Act (DGA), which aims to facilitate data reuse and sharing in the European Union, focusing in particular on the regulation of data brokering platforms. It examines the provisions related to these platforms, highlighting their potential benefits and risks, as well as proposing an informed discussion about the legal framework and possible alternatives. This analysis may be relevant to understanding how sports	Article

#	Authors	Article	Contribution	Publication Type
			companies can effectively manage and share data in the age of sports information.	
[39]	(Weritz et al., 2020)	Exploring the Antecedents of Digital Transformation: Dynamic Capabilities and Digital Culture Aspects to Achieve Digital Maturity	The paper highlights six dynamic capabilities and three key factors for digital maturity during digital transformation in organizations. These capabilities include agility, innovation and market orientation, while the key factors address continuous learning, ethics, digital leadership and data governance. These findings are relevant to improving the effectiveness of sports companies in the sports information age.	Conference Paper
[40]	(Wolfart et al., 2021)	Modernizing legacy systems with microservices: A roadmap	The paper presents a roadmap for modernizing monolithic legacy systems with microservices to facilitate digital transformation. This roadmap, made up of eight activities grouped into four phases, can serve as a guide for professionals, a basis for researchers and an incentive for the development of tools. This approach can be useful for sports companies in improving their data governance strategies and effectiveness in the age of sports information.	Conference Paper
[41]	(Xu et al., 2023)	A Review of Policy Framework Research on Promoting Sustainable Transformation of Digital Innovation	The article proposes a policy framework to drive digital transformation and innovation, addressing aspects such as policy needs, guidelines and dimensions for the sustainability of digital innovation. These policies aim to expand the positive impacts of digital innovation by providing guidance for areas such as data governance capabilities and digital security. This framework can inform data governance strategies for sports companies in the sports information age, offering insights into how to improve effectiveness through sustainable digital innovation policies.	Article
[42]	(Yeraliyeva et al., 2023)	Effectiveness of public administration of the digital economy in Kazakhstan	The study investigates how the Kazakh government manages the digital economy, including policies and strategies to support the sector. It identifies challenges faced by the government and the private sector, such as infrastructure and regulation. Using interdisciplinary and documentary analysis, it offers recommendations for improving the effectiveness of public administration.	Article

#	Authors	Article	Contribution	Publication Type
			These findings can be applied to data governance strategies for sports companies, especially in terms of policies and regulations to improve effectiveness in the sports information age.	
[43]	(Zhang et al., 2021)	A visual comparative analysis of research progress on digital transformation in China and other countries	The paper compares research on digital transformation in China and other countries, analyzing 403 foreign and 302 Chinese literatures from 2008 to 2020. It highlights the rapid development in both contexts, with a greater emphasis on foreign literature in terms of citations and collaborations between researchers. Both focus on the role of digital technology and national strategies in business transformation. It suggests future research directions, including the Chinese scenario, intersection between technology and management, influencing factors and behavioral strategies. These findings can inform data governance strategies for sports companies.	Conference Paper

2.3.3. PRISMA Results Analysis

Following a meticulous research endeavor utilizing the PRISMA methodology as elucidated in the antecedent section, the subsequent phase entails a comprehensive analysis of the findings. This undertaking necessitates a meticulous scrutiny of each enlisted article to discern their principal contributions and to address the overarching research inquiries.

RQ1 - What kind of methods are currently useful in data governance for sports organizations?

The analysis of the aforementioned articles revealed various types of methodologies for analyzing corporate DG. However, given the scarcity of documentation and research covering this area of the market, the strategies and methodologies used are geared towards the ramifications of the study in question. It should also be noted that the methodologies used will be grouped together, as some of them are identical, although applied to different aspects of the market.

Firstly, it is important to note that several of the articles selected emphasize the importance of a thorough and concise systematic review and mapping of the literature [22, 26, 42], making it possible to correlate documentary analysis in an interdisciplinary way.

Then, throughout several articles, systematic and methodological frameworks are developed and used: “four questions framework”, with the aim of guiding data integration partners in building a solid basis of governance and legality to support ethical use data [25]; “policy frameworks” to drive digital transformations and innovations, considering aspects such as political needs and guidelines and dimensions for sustainability and digital innovation [41].

However, there are articles that provide unique and innovative models designed and selected for this purpose. Thus, refer, for example, to the Capabilities Maturity Model (CMM) [7] which aims to evaluate and compare data management maturity levels with the development objectives defined by the company itself. Note in addition, for example, a method used in [6] previously mentioned, called Data-Based Value Stream Optimization, which highlights the need to train company employees with specialized knowledge, helping to identify and implement digital transformation options in the same company. One methodology to highlight is the use of the TRUSTEE platform [32], which is a platform designed to provide a secure, privacy-centric framework for accessing and using data in order to ensure its integrity and security.

During the analysis process of these articles, it can be concluded that there are different decision-making methods with different criteria [37], as well as methods of integrating information security into different specific projects [16], corporate strategies regarding digital, culture, processing of acquired knowledge, DG and data science [10], marketing strategies that relate to social causes [24], strategies for integrating different projects called “digital twins” into a single combined vision [28], some interviews carried out with experts [33], among others, which have a more tenuous importance at the heart of DG.

A further point to highlight concerns the importance of digital transformation, which is inevitably directly related to DG. For this reason, we also emphasize some methodologies adopted to guarantee the quality of this digital transformation, such as those referred to in [8], which analyzes a Quality Management methodology in digital transformation, the Data Science Capabilities Maturity Models [12] and the methods of regulating data intermediation platforms [38].

Based on the entire analysis of the articles and specifically the methods used, it is important to note that not all methodologies are fully adaptable to the reality of sports companies. However, most of them are key starting points for developing research on them.

Therefore, it must be highlighted that the methods of systematic-methodological literary review are of extreme importance and, therefore, must serve as a base reference point for all research development, so that excellent suitability and quality can be guaranteed. of the data analyzed and used.

In addition to this, it is also necessary to resort to the compatibility and use of some of the previously mentioned methodologies with the necessary adaptations to the sports market. The analysis of these methods used in other studies allowed the capture of new platforms (such as TRUSTEE) which are extremely important to guarantee the quality of DG for sports organizations.

RQ2 - What are the main problems with data governance in sports organizations?

Through the analysis of the articles, problems in DG in sports organizations were identified, which can serve as leverage for the study of this work. According to [1, 3, 16, 26, 32], some of the most prominent challenges are the quality, privacy, security and interpretation of the data to be analyzed, reflecting the need to address these issues to ensure the integrity and reliability of the data used.

It can be seen from the [2, 14, 17] that making strategic decisions based on large amounts of data also emerges as a significant problem in SMEs (and beyond), especially due to the increased time needed to complete tasks and the complexity associated with large-scale data analysis.

The [5] notes that the pressure imposed by organizations influences DG decisions, especially for monetary reasons, adding an additional layer of ethical and practical challenges to the management and governance of sports data.

As described in the [9], crucial functions such as those of the Chief Information Officer (CIO) are often not adequately addressed in the existing literature on CIO roles, especially with regard to legacy systems integration, risk management and IT security, creating gaps in the understanding and effective execution of these functions.

Interviews with experts revealed significant concerns associated with the concept of data altruism, especially in relation to its interaction with existing regulations such as the EU's General Data Protection Regulation (GDPR), highlighting the importance of an ethical and legal approach to data altruism. sports data management [20].

The need for technological adaptation to meet commercial demand for new digital products and services, in the face of digital transformation in sports companies, creates additional challenges for DG, requiring flexible and agile strategies to manage these changes [22].

According to the [24], the lack of understanding of concepts and the underutilization of the strategic potential of marketing in sports organizations emerge as additional problems, highlighting the importance of an integrated approach to DG strategy in the era of sports information.

Consideration of the questions "Is it legal? Is it ethical? Is it a good idea? How do you know (and who decides)?" is crucial in a DG context, highlighting the importance of ongoing collaboration and analysis throughout a data use project in order to ensure legal and ethical compliance [25].

The use of legacy systems, which constitute an old architecture and require modernization [29], presents additional challenges, including conflicts during the replacement process and the integration of new technologies into the existing ecosystem [27, 29, 35, 37, 40].

In [31] it is clear that technological, socio-managerial and macro-environmental challenges, with a lack of strategies to overcome these challenges, further complicate DG in sports organizations, requiring a comprehensive and multifaceted approach to address these issues.

According to [36, 38], the inconsistencies between the European Commission for Data Governance Law (DGA) and the General Data Protection Regulation (GDPR), pointing to possible conflicts and legal uncertainties that could affect the protection of personal data in the EU, have significant implications for DG in sports companies.

Policy needs, directions and dimensions for the sustainability of digital innovation, with a view to providing guidance for areas such as DG capabilities, also emerge as key concerns that need to be addressed proactively and comprehensively [41].

Finally, in [42] the following problem is described: poorly designed infrastructure and regulations can make effective DG in sports organizations even more difficult, highlighting the importance of a careful and structured approach to data management in this context.

In conclusion, the problems identified in DG in sports organizations, despite being diverse and coming from different contexts addressed in the articles analyzed, converge into common and crucial challenges that require attention and effective solutions. Data quality, privacy and security, along with accurate data interpretation, emerge as key concerns, highlighting the importance of sound DG policies and practices. Furthermore, the integration of legacy systems, organizational pressures and gaps in understanding crucial roles, such as that of the CIO, accentuate the complexity of the sports data management environment. By proactively and comprehensively addressing these challenges, sports organizations can establish solid foundations for effective DG, ensuring data integrity, security and usefulness to drive success in modern sports environments.

RQ3 - What is the current state of research in this area?

It is clear from the examination of the articles and the selection of relevant sources for the study that there isn't a thorough diversity that is particularly relevant to the realm of sports organizations. Research on DG management typically focuses on small and medium-sized businesses, specifically on their operations and strategies [2, 4, 10, 13, 16, 26, 27, 30, 42, 43]. However, these businesses are methodically integrated into markets that are either relatively innovative or not at all. It is crucial to remember that in order for these businesses' approaches and strategies to be applicable and appropriate in the context of sports organizations, they must be modified [6, 7, 8, 10, 12, 22, 25, 26, 28, 30, 32, 37, 41, 42].

The theme's limitations, however, can serve as inspiration for this study's growth because, other from the challenge of getting consistent results, there are no restrictions on how the collected data should be analyzed, developed, or interpreted [24]. Having said that, the primary obstacle to the advancement of research is the ethical and legal constraints that are in place both domestically and internationally.

RQ4 - What are the advantages and disadvantages of using DG strategies in this area?

Companies in every industry, including sports, where data analytics is essential for creating competitive strategies and enhancing performance, now prioritize DG. As a result, it's critical to weigh the benefits and drawbacks of DG strategy implementation in sports enterprises.

Regarding the benefits, we may check [2, 14, 17] informed decision making, which means that DG enables sports firms to make better judgments based on verifiable facts and precise data analysis. This can result in more strategic choices that are targeted and effective for the desired outcomes.

Sports companies can verify improvements in performance by identifying areas for improvement in the performance of athletes, teams, or even internal operational processes through data analysis and understanding, which can result in significant efficiency gains and improvements [1, 3, 16, 25, 26, 31, 32].

As a structured approach to data management can help sports companies identify and mitigate potential risks, such as data security breaches or regulatory compliance issues, protecting the organization's interests and reputation, it is anticipated that the application of DG will also result in a decrease in risks [9, 20, 25, 36, 38, 42].

Sports organizations may promote innovation in areas like performance analysis, talent scouting, and marketing initiatives by efficiently employing data. This brings us to another advantage: innovation and competition. In the sports market, this may give an advantage over competitors [22, 31, 41].

Through article analysis, certain disadvantages of implementing DG in sports companies were discovered, including implementation costs [5]. It seems that adopting DG strategies may necessitate large investments in people, technology, and procedures, which can be costly for sports companies with limited funding, like SMEs [31].

The technological complexity of handling massive data volumes and intricate information systems was also discovered to be a drawback. This can be a difficult task, particularly for sports organizations without prior experience with DG and the resulting integration of disparate data sources. Technical complexity can be increased by data and systems [2, 9, 14, 17, 20, 31, 41].

The implementation of new DG policies and procedures may face resistance from stakeholders and employees who are used to older procedures in some companies. This can negatively impact the efficacy of DG implementation [22, 27, 29, 35, 37, 40].

The improper access and use of personal data can pose a serious risk of violating the privacy of athletes, staff, and fans. This could have a negative impact on the company's reputation and lead to potential legal disputes, so it is important to be aware of the risk of privacy violations [20, 36, 38, 41].

Lastly, there are potential restrictions on how data interpretation can be done [1, 3, 16, 26, 32]. Because improper or incorrect interpretation of the data can result in harmful conclusions and decisions, it is crucial to make sure that the analyses are founded on reliable methodologies and that the data are interpreted correctly [20, 25, 42].

This chapter highlights the significance of exercising caution when weighing the advantages and disadvantages of putting DG strategies into practice in sports organizations. Adopting such strategies can have many benefits, including better decision-making, increased operational effectiveness, and a deeper comprehension of the market and customers, but it's also critical to identify and deal with potential challenges. It's important to recognize the difficulties associated with interpreting and integrating various data sets, privacy and security concerns, and data quality. Sports businesses can, however, optimize the value of their data by managing these issues with effective governance and

strategic approaches, fostering organizational success and guaranteeing a strong competitive position in the market. It is imperative to understand that DG is a continuous process that requires dedication, flexibility, and long-term investment rather than a one-size-fits-all answer. Sports companies can reap the benefits of effective DG by taking a proactive, customer-centric approach. This will help them position themselves as innovative leaders in their respective sectors and get ready for the opportunities and challenges of the digital future.

3. METHODOLOGY

As mentioned above, the aim of this work is to define a DG strategy that can add value to sports companies and, eventually, create a competitive advantage for those companies that put it into practice, compared to others in the field. For this to be possible, it is necessary to use the Design Science Research (DSR) methodology. According to the author in *Conceptual Model of Artifacts for Design Science Research*, the definition of this methodology involves a design process that results in an artifact, in which that artifact and its design must be the basis of a research process. In turn, an artifact is an object with material and/or immaterial characteristics that is intentionally designed and created to solve some kind of problem (Bækgaard, 2014). In this case, the artifact will be the DG strategy that this research aims to build.

3.1. DESIGN SCIENCE RESEARCH

Peffers, in A Design Science Research Methodology for Information Systems Research, designed a widely used method for effectively conducting, presenting, and assessing DSR. This method involves a series of steps, beginning with identifying a problem, establishing objectives for the solution, designing and developing the artifact, demonstrating it in a real-world setting, and finally evaluating and communicating the results obtained (Peffers et al., 2008).

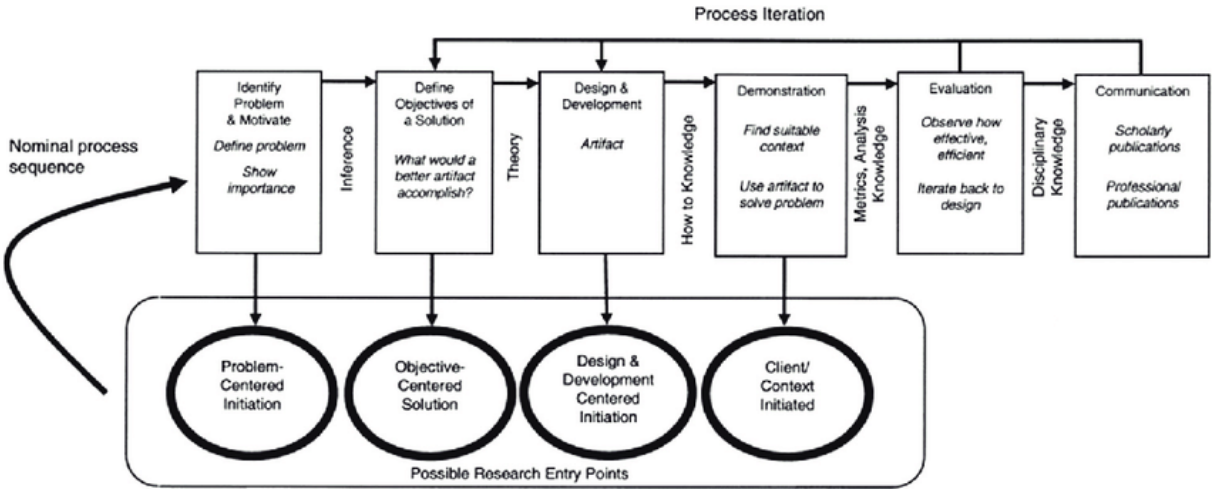

Figure 2 – DSR Method – (Peffers et al., 2008)

To understand how the DSR developed by Peffers actually works, it is necessary to take a look at each of its six activities:

1. **Identifying the problem and motivation:** In this first phase, the aim is to obtain a specific conceptualization of the research problem in question and try to understand the value of a given solution. Since, with the definition of this problem, an artifact will be developed that provides a viable solution, it can be extremely important to translate it conceptually so that the solution can be appropriate given its complexity. On the other hand, by establishing the value of a solution, on the one hand, the researcher and the target audience seek a solution

and easily accept the results achieved and, on the other hand, it makes it easier to understand the reasoning used by the researcher for that same problem. Therefore, in order to carry out this stage, it is necessary to know the state of the problem and the importance of obtaining that solution.

2. **Defining the objectives of a solution:** This stage of the process is where the objectives to be achieved with a given solution are established, based on what has been defined as the problem and considering what is or is not possible and feasible, i.e. in the first stage. Therefore, the objectives set can be either qualitative or quantitative, but above all they must be deduced rationally from the first stage, i.e. the problem specification. In order to pursue them, not only must the state of the problem and the solutions already found be known, but also their effectiveness.
3. **Design and development:** Based on the previous activities, the artifact is created. The creation of the artifact covers the specific determination of the utility required for the artifact and its architecture, and then the actual creation of the artifact. To do this, you need to have a broad understanding of the theory that can be applied to a solution.
4. **Demonstration:** In the fourth stage, once the artifact has been created, the aim is to test its use and applicability to solve a variety of problems. For this stage, you must know exactly how to use the artifact to solve the problem in question.
5. **Evaluation:** This is an important phase as it assesses whether the artifact actually provides and/or supports a solution to the specific problem. This evaluation can be carried out using a variety of different procedures, such as establishing a comparison between the functionality of the artifact and the objectives of the solution established in the second stage or comparing this functionality with the results of satisfaction surveys. At the end of the evaluation, the effectiveness of the artifact is considered by the researchers when deciding whether to return to the third activity and improve it, or whether to move on to the next phase.
6. **Communication:** Finally, the results of the research must be communicated in a rigorous and careful manner, publishing the results obtained and encouraging the possible integration of the artifact into the real context. This communication allows other researchers (academic or empirical) to contribute to achieving conceptual excellence, improving the studies carried out and developing the specific problem.

In summary, the DSR methodology outlined by Peffers includes six essential activities that guide the development and evaluation of IT artifacts to solve real-world problems and contribute to scientific knowledge. Each activity, from identifying the problem and defining the objectives of the solution to designing, demonstrating, evaluating and communicating the results of the artifact, plays a crucial role in the research process. Through these activities, researchers gain a comprehensive understanding of the problem at hand, develop viable solutions, test their effectiveness and disseminate the results to the academic and empirical community. By following this structured approach, researchers can navigate the complexities of developing IT artifacts, ensure the relevance and applicability of solutions and contribute significantly to the advancement of knowledge in the field of information systems.

The literature review carried out above corresponds to the first activity of this DSR methodology, in which it is possible to identify the problem and thus define an artefact, i.e. the strategy that will be developed, and it also enables moving on to the second activity in which the objective of the solution is defined and, by verifying its feasibility, and if well applied, it allows to proceed to the next activity.

3.2. RESEARCH IMPLEMENTATION

In the rapidly evolving landscape of modern sports, where data plays an increasingly pivotal role in decision-making and performance optimization, the effective implementation of DG strategies is essential for sports companies to thrive in the age of Sports Information. Recognizing the critical importance of robust DG frameworks tailored to the unique challenges and opportunities of the sports industry, this research embarks on a structured journey guided by the Design Science Research (DSR) methodology as mentioned before. By systematically applying each step of the DSR process, this study aims to develop and implement a comprehensive DG strategy specifically designed to enhance the effectiveness of sports organizations in managing and leveraging their data assets.

The journey begins with the fundamental stage of Problem and Motivation Identification, where a thorough analysis of the current state of DG in sports companies is carried out. Through stakeholder engagement and in-depth assessments, key challenges and areas for improvement are identified, laying the foundations for the subsequent stages of the DSR process. This phase is crucial for articulating the specific research problem and outlining the motivation behind its approach, emphasizing the transformative potential of improved DG practices in driving organizational success and competitive advantage. At this stage of the work, this step has already been taken, in which the methods currently used, the main problems, the current state of research, and the advantages and disadvantages of using DG strategies in the field of sport have been identified, all of which is described in chapter 2.3.3 Analysis of PRISMA results. In addition, a questionnaire is proposed for professionals in the field in order to carry out comprehensive analysis and involve stakeholders to understand their perspectives on existing challenges and potential solutions in the domain of interest.

Based on the knowledge gained from identifying the problem, the next stage involves defining the objectives of a solution, where clear and measurable objectives are set for the DG strategy. Aligned with the problem identified and the organizational objectives, these objectives serve as guiding principles for the design and implementation of the strategy, ensuring its relevance and effectiveness in solving the challenges identified. Using a rational and logical approach, qualitative and quantitative metrics are defined to assess the impact and success of the proposed solution. Analyzing the problems identified in the previous step, the objectives of this research are then defined, which will be based on solving disadvantages and problems identified in articles, combining the solution with strategies and advantages already successfully applied today.

With the objectives defined, the focus shifts to the design and development phase, where a conceptual framework for the DG strategy is developed. Based on relevant best practices, theories and methodologies, the architecture of the framework is meticulously designed to meet the unique needs and challenges faced by sports companies in managing their data assets. This phase involves a careful analysis of utility requirements and the creation of an implementation plan to translate the conceptual framework into tangible actions. This is where the best strategies and methodologies found earlier in the literature review will be applied to the specific case of DG in sports companies.

Continuing the journey, the Demonstration phase sees the development of a prototype or pilot implementation of the DG strategy, allowing for real-world testing and validation of its functionality and applicability. Through iterative testing and feedback gathering, the prototype is refined to ensure alignment with stakeholder needs and preferences, paving the way for its seamless integration into

sports organizations' operational workflows. Here, the model developed above will be applied to a real sports company, trying to solve problems identified in that particular company.

After a successful demonstration, the Evaluation phase critically assesses the performance and impact of the implemented DG strategy. Using rigorous evaluation methods and analysis techniques, the effectiveness of the developed strategy will be analyzed by measuring it against predefined objectives and success criteria. Strengths, weaknesses and areas for improvement will be identified, informing future iterations and improvements of the data management approach.

Finally, the Communication phase ensures the widespread dissemination of research findings and insights, fostering collaboration and knowledge exchange among researchers, practitioners, and sports organizations. Through academic publications, industry reports, and engaging presentations, the research outcomes are shared to promote the adoption of effective DG practices and drive continuous improvement in the sports industry's data management landscape.

4. STRATEGY

This chapter introduces a DG strategy aimed at enhancing the efficiency of sports organizations. It begins by outlining the assumptions that informed the development of the strategy, then proceeds to evaluate and discuss its implementation.

4.1. ASSUMPTIONS

After a thorough analysis of the literature on DG and the tailoring of the study to the context of sports companies, it can be concluded that:

- Small and medium-sized businesses often struggle to make strategic decisions when confronted with vast quantities of data, especially when it comes to ensuring the quality, privacy, security, and accurate interpretation of that data during analysis. As a result, there is a need for a system to streamline the organization and handling of data, making it more accessible and usable, for example, the TRUSTEE framework, CMM and Value Stream Optimization.
- Some companies tend to struggle with DG decisions on a monetary level and end up facing ethical and practical challenges to the management and governance of sports data. This can mean that they need a well-defined strategy that can predict future results in the short and medium term and thus be able to respond to the challenges that may arise, such as the "four questions framework" and the "policy frameworks" studied in the literature review.
- The definition and role played by the CIO is not always well defined, whether in terms of legacy systems integration, risk management and IT security, but also in the implementation of DG policies and procedures, facing various challenges stemming from resistance on the part of stakeholders and employees, implementation costs and the technological complexity of dealing with large amounts of data. This can lead to the need to define what the real role of the CIO is, what his priorities and concerns are, what set of skills he needs to achieve success and the strategy that he needs to define.
- It is important to validate that there are no inconsistencies between the DGA and the GDPR, so that there are no legal and ethical conflicts and uncertainties that could affect the protection of personal data within sports companies and, thus, guarantee data security using methods of integrating information security.
- It was noted that there is a need for technological adaptation in the face of digital transformation in sports companies, to fill the gaps identified, and it is therefore important to carry out a systematic mapping of the literature to assess the extent to which modernized systems are investigated in the context of corporate digital transformation.
- The current use of legacy systems that require modernization can present conflicts during the process of replacing and integrating new technologies into the existing ecosystem, requiring a practical solution, such as a roadmap for modernizing legacy systems with microservices, a strategy based on the concept of ISoS, the application of the concept of multidisciplinary teams, giving importance to people as drivers of transformation, facilitating digital transformation and overcoming barriers faced by organizations in adopting new technologies.
- There are needs, guidelines and policy dimensions for the sustainability of digital innovation, which aim to provide guidance in areas such as DG capability, which can be answered based

on a policy framework that aims to expand the positive impacts of this digital innovation and provides guidance such as DG capabilities and digital security.

By identifying problems faced by the government and the private sector, such as infrastructure and regulation, it is possible to put forward recommendations to improve the effectiveness of sports companies in the age of sports information, especially in terms of policies and regulations.

4.2. STRATEGY – PROPOSAL

In order to help sports companies find and implement the best DG practices adapted to their reality, a strategy is proposed, in the form of a framework which, when implemented, is expected to result in a competitive advantage over other companies in the field.

As part of this study, a framework is proposed to help companies identify the best practices that already exist in their policy and apply new ones, which together present a competitively advantageous strategy and, according to the assumptions described above, correspond to the following conceptual structure.

In order to implement a DG strategy, it is necessary to have an Operating Model, which describes the concrete terms of how DG delivers the added value promised to the company and what processes are needed to achieve this. The Operating Model is made up of the Organizational Model and the Scaling Model, which complement each other (Bollweg, 2022a).

Thus, the aim is to use the Operating Model to create a uniform approach to the introduction, operation and development of DG that is in line with the company's existing organizational model, i.e. the company's current reality, as shown in the process displayed in Figure 3.

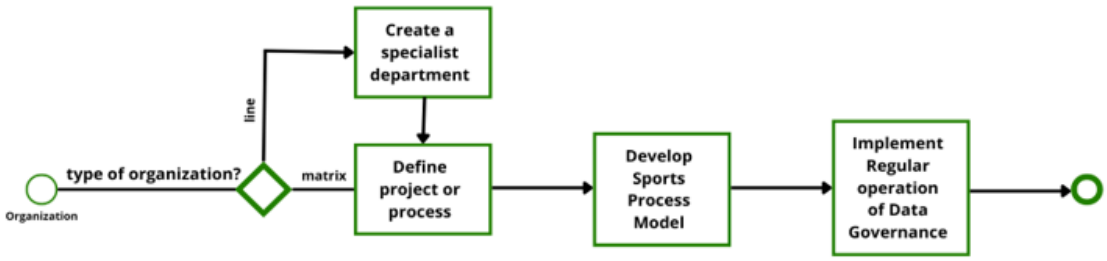

Figure 3 – Global Strategy for the Operating Model

The strategy will involve defining the company's type of organization, which will help define the next steps for implementing DG in the company. On the one hand, if you're a line organization, you'll need a specialized department; on the other hand, if you're a matrix organization, you'll need to define a project or process responsible for implementing DG in the company.

This is followed by the process model, in which an analysis is made of all the company's processes, and they are redefined in order to implement DG in the best way.

Finally, the regular operation of DG is carried out, where a cycle of activities is carried out to manage the data spaces created previously, using the TRUSTEE framework, found earlier in the literature review.

All the steps of the strategy are explained below.

4.2.1. Line Organization vs Matrix Organization

The aim is to assess whether the sports organization functions as a line organization or a matrix organization in order to determine the best approach for implementing DG strategies.

In a Line Organization, departments are structured based on specific functions such as marketing, finance, and operations, with a clear hierarchical chain of command. Each team within these departments reports to a single manager who directs their activities and ensures that tasks align with the organization's goals. This traditional organizational structure simplifies managerial control and coordination, as each employee knows exactly whom to report to and follow for instructions.

The advantages of a Line Organization are apparent in its straightforward decision-making pathways and the ease with which managers can oversee their teams. However, this structure is not without its drawbacks. One significant disadvantage is the potential for delays in communication and decision-making, especially when information must pass through multiple hierarchical levels. This can hinder the speed at which decisions are made and implemented. Additionally, the Line Organization often faces challenges in fostering interdepartmental cooperation, as departments may operate in silos with limited interaction. This separation can lead to a slower overall development process, as the flow of information and collaborative efforts across departments are restricted.

In contrast, the Matrix Organization overlays a functional structure with strategic business areas related to specific products or processes. This means that employees might report to both functional managers and project or product managers, creating a dual-reporting system. For example, in a sports organization, a marketing specialist might report to both the head of the marketing department and the manager of a specific sports event.

The Matrix Organization offers several advantages. Its structure enhances problem-solving capabilities by bringing together diverse perspectives and expertise from different departments. This collaborative approach often results in improved product and process quality, as well as faster delivery times due to more efficient communication and decision-making processes. The interdepartmental communication inherent in a Matrix Organization facilitates better coordination and integration of efforts, aligning various functions with the organization’s strategic objectives.

However, the Matrix Organization also presents challenges. The dual-reporting lines can lead to potential misunderstandings and conflicts, as employees might receive conflicting instructions from different managers. This structure requires a significant communication effort to ensure that all team members are aligned and that information flows smoothly between the various managers and

departments. The complexity of managing cross-functional teams can also be demanding, requiring strong leadership and coordination skills.

When applying these organizational structures to sports organizations, it is crucial to assess the current format and determine which approach will best support effective DG. This involves evaluating how teams are formed and managed and how communication flows within the organization. The chosen structure will significantly impact the ease and efficiency with which DG practices can be implemented.

Even if one organizational structure is already in place, it is important to present the pros and cons of both Line and Matrix Organizations to key stakeholders. This ensures that the organization makes an informed decision or adapts the existing structure to better suit its needs.

For sports organizations operating as a Line Organization, implementing DG may require additional effort to facilitate interdepartmental communication and streamline data-sharing processes. Standardized protocols and communication channels will be essential to mitigate delays and improve cooperation across departments. For instance, integrating data from coaching, medical, and marketing departments may pose challenges due to the siloed nature of a Line Organization. However, with well-defined DG policies and procedures, these challenges can be addressed to ensure effective data management.

On the other hand, sports organizations with a Matrix Organization can more seamlessly integrate DG practices. The inherent cross-functional nature of this structure aligns well with the needs of DG, reducing organizational costs and enhancing the efficiency of data management. This approach can help the organization align its DG processes with its strategic goals more effectively. For example, a Matrix Organization can more efficiently handle the integration of performance data, marketing analytics, and medical records, providing comprehensive insights that drive informed decision-making.

By understanding the existing organizational structure and its implications for DG, sports organizations can tailor their approach to ensure efficient and effective data management practices that support their strategic objectives. This foundational assessment sets the stage for subsequent phases of the DG strategy, ensuring that the chosen organizational structure facilitates rather than hinders the successful implementation of DG initiatives.

4.2.2. Process Model

According to the author in *Data Governance as Driver of Value Stream Optimization and as Pacemaker for the Digital Transformation*, after validating the company's type of organization, we move on to the process model (Bollweg, 2022a).

The Process Model phase in DG for sports organizations is a critical step to ensure the systematic development, implementation, and scaling of DG initiatives. This phase is divided into two parts, with the first part focusing on the operationalization of the current scale model. This model is designed to guide the organization through five essential steps: Design, Implement, Scale, Control, and Optimize, shown in the Figure 4:

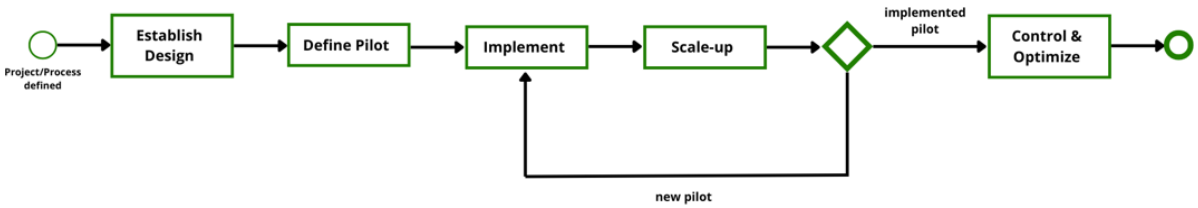

Figure 4 – Process Model

- Design – data strategy, roles and structure, DG services and operating model.
- Implement – data processes and data spaces, data quality.
- Scale – adapting other data areas to the most important applications.
- Control – monitoring data quality and managing data projects.
- Optimize – automation, data process optimization, innovation factors and competence groups.

Design

The Design step is foundational, establishing the blueprint for DG within the sports organization. This involves:

- Data Strategy: Formulating a comprehensive data strategy that aligns with the organization's overall goals and objectives. This strategy should address how data will be collected, managed, and utilized to support decision-making processes.
- Roles and Structure: Defining clear roles and responsibilities for DG. This includes identifying key stakeholders such as data stewards, data owners, and DG committees.
- DG Services and Operating Model: Developing the services and operating model necessary for effective DG. This includes outlining the processes and tools that will support data management and ensuring they are integrated into the organization's operations.

Implement

The Implementation step is where the designed strategies and models are put into practice. This includes:

- Data Processes and Data Spaces: Establishing data processes and creating data spaces that facilitate efficient data management and accessibility.
- Data Quality: Implementing mechanisms to ensure high data quality. This involves setting data quality standards and establishing processes for data validation, cleansing, and enrichment.

Scale

Once the initial implementation is successful, the next step is to scale the DG initiatives. This involves:

- Adapting Other Data Areas: Expanding DG practices to other areas within the organization, prioritizing the most critical applications first. This phased approach ensures that DG is manageable and sustainable as it grows.

Control

The Control step focuses on maintaining the integrity and effectiveness of DG through continuous monitoring and management:

- Monitoring Data Quality: Continuously monitoring data quality to ensure that it meets the established standards. This involves regular audits, data profiling, and quality checks.
- Managing Data Projects: Overseeing data projects to ensure they align with the DG framework and contribute to the organization's strategic objectives.

Optimize

The Optimization step aims to enhance and refine DG practices through innovation and continuous improvement:

- Automation: Implementing automation tools to streamline data processes and reduce manual efforts. This can include automated data entry, processing, and reporting.
- Data Process Optimization: Continuously optimizing data processes to improve efficiency and effectiveness. This involves analyzing current processes, identifying bottlenecks, and implementing improvements.
- Innovation Factors and Competence Groups: Encouraging innovation by forming competence groups that focus on exploring new data technologies and methodologies. These groups can drive the adoption of best practices and foster a culture of continuous improvement.

After completing the Design phase, the organization moves to the Implementation phase, where a pilot project is developed as the main process. If this pilot is successful, the DG framework is scaled up in the subsequent phase by developing additional pilots. This iterative process continues until the entire organization has adopted the DG practices.

It is important to note that in this model, the organization does not need to complete the entire operational configuration before moving on to the last two phases—Control and Optimize. Whenever a pilot is successfully implemented, the process can and should transition directly to the Control and Optimization phases. This approach accelerates the development and integration of DG within the organization, ensuring that improvements and benefits are realized as quickly as possible.

In a sports organization, the Design phase might involve developing a data strategy to integrate player performance data, fan engagement metrics, and financial information. Roles would be defined for data stewards in each department—coaching, marketing, finance—and a DG committee would be established to oversee the initiative.

The Implementation phase would then pilot this strategy in one area, such as player performance data. If successful, the Scale phase would extend the practices to other areas, such as fan engagement metrics. Concurrently, the Control phase would monitor data quality, and the Optimize phase would seek ways to automate data collection from wearable technology and optimize data analysis processes to provide real-time insights.

By following these steps, sports organizations can systematically develop robust DG frameworks that enhance decision-making, improve data quality, and drive organizational success.

Once the first part of the Process Model is in place, we can move on to the second part, which further refines and expands the DG processes to ensure comprehensive and sustained integration within the sports organization.

The second part of the Process Model focuses on anchoring the logic of data spaces and DG roles within the sports organization's existing operations. This ensures that the changes brought about by DG are seamlessly integrated and readily accepted by the organization. This part is divided into five steps, with each step aiming to solidify DG within the company's operational framework. The phases of this second part of the process model are as follows in Figure 5.

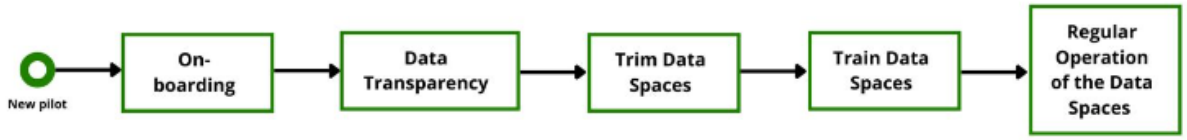

Figure 5 – Implement Process

On-Boarding

The On-Boarding step is the initial phase of embedding DG into the sports organization. It aims to reach three critical milestones: process competence, organizational competency, and establishing a network of contact persons.

- Process Competence
  - Objective: Ensure that DG staff are well-acquainted with the business process activities and work steps from the outset.
  - Actions:
    - Familiarization: DG staff must thoroughly understand the individual activities and steps involved in the business processes of the sports organization. This includes everything from athlete performance tracking, event planning, fan engagement strategies, to financial operations.
    - Issue Identification: By becoming familiar with the business processes, data specialists can directly identify the current issues faced by various business units. This enables them to propose development and optimization solutions that are precisely tailored to the organization's needs.
    - Integration: Data management functions should be integrated into process work right from the start. This proactive involvement ensures that DG contributes effectively to process improvement from the very beginning.
- Organizational Competency
  - Objective: Ensure that the data management team understands the company's overall processes and organizational structure.
  - Actions:
    - Understanding Processes: The data management team must gain a deep understanding of the sports organization's processes, including standard deadlines, decision-making pathways, and the pressing issues currently faced by the organization.
    - Coordination and Communication: Early identification and resolution of communication or coordination problems are crucial. Understanding the organizational dynamics allows the data management team to facilitate

smooth interactions between different departments, enhancing the success of DG implementation.

- Contact Persons and Network
    - Objective: Establish a robust network of contacts with in-depth knowledge of the business processes.
    - Actions:
        - Creating a Network: Building a network of contacts who are knowledgeable about the business processes is essential. This network facilitates effective communication and coordination between the DG team and the rest of the organization.
        - Regular Meetings: DG staff should regularly attend process organization meetings. This involvement helps in creating a strong foundation for DG functions and ensures that the transition to new processes is smooth.
        - Identifying Experts: It is crucial to identify and document colleagues who are experts on data-related topics within the processes. These individuals will serve as key resources and points of contact for the DG team, ensuring that DG initiatives are well-informed and effectively implemented.

Integrating DG into the company's process structures can typically take around 14 days. During this period, it is vital for the DG team to understand the core processes in depth and be able to follow the activities carried out by the process personnel. This thorough integration process ensures that the DG team is well-prepared to contribute to and enhance the organization's operations.

For a sports organization, this step might involve DG staff becoming familiar with the training schedules, performance metrics, and health data of athletes. They would need to understand the deadlines for game preparations, athlete recovery periods, and seasonal event planning. Regular interactions with coaching staff, medical teams, and event organizers would help the DG team to identify key data-related issues and propose effective solutions. Establishing contacts with department heads and other key personnel ensures that DG processes are aligned with the organization's overall objectives and operational workflows.

By achieving these milestones in the On-Boarding step, sports organizations can ensure that their DG staff are well-prepared to support and enhance business processes. This foundational step sets the stage for the subsequent steps in the Process Model, ensuring a smooth and effective integration of DG within the organization.

Data Transparency

The next step is Data Transparency, which involves a thorough examination of core processes at the IT and data domain level to ensure clear visibility and control over data assets. This step is divided into three key milestones: identification of systems, identification of data, and identification of data domains.

- Identification of Systems
    - Objective: Accurately identify and document all IT systems used within the organization, including any shadow IT systems that operate independently of the central IT department.
    - Actions:

        - System Inventory: Conduct a thorough inventory of all IT systems, documenting each system's purpose, functionality, and usage. This includes systems directly managed by the IT department as well as those that have been adopted independently by other departments (shadow IT).
        - Leveraging Contacts: Utilize the network of contacts established during the On-Boarding phase to identify all relevant systems. Engaging with key stakeholders across departments ensures a comprehensive understanding of the IT landscape.
        - Documentation: Document the identified systems meticulously, noting their roles in data creation, usage, maintenance, and deletion. This documentation establishes a clear picture of the IT environment and sets the boundaries for DG efforts.
- Identification of Data
    - Objective: Understand the data lifecycle within each identified system, including what data is created, used, maintained, and deleted.
    - Actions:
        - Data Examination: Analyze the data associated with each IT system to understand its lifecycle. Determine what data is generated by processes, how it is used, who maintains it, and the conditions under which it is deleted.
        - Process Documentation: Document the findings, noting which data is created by the organization's processes and which is used but not created by them. Establish clear lines of communication with data creators outside of the organization when necessary.
        - Responsibility Mapping: Map out the responsibilities for each data type, ensuring clarity on who is responsible for data quality, maintenance, and governance.
- Identification of Data Domains
    - Objective: Classify and group data into domains to facilitate easier management and communication.
    - Actions:
        - Data Classification: Classify data into meaningful domains, grouping similar types of data together. For example, categorize data related to orders as "order data" and data related to documentation as "documentation data".
        - Simplification and Categorization: Simplify data management by creating clear, manageable categories. This not only aids in effective DG but also improves communication about data across different levels of the organization.
        - Documentation of Domains: Document these data domains, ensuring that all relevant data is captured under appropriate categories. This documentation serves as a reference for data management and governance efforts.

The Data Transparency step typically takes around 14 days, similar to the On-Boarding phase. During this period, the DG team works closely with IT and other departments to identify and document systems, data, and data domains comprehensively. This phase ensures that the organization has a clear understanding of its data assets and their respective roles within business processes.

For a sports organization, identifying systems might involve cataloging software used for player performance tracking, ticket sales, and fan engagement. The data examination would then determine what performance metrics are generated, how ticket sales data is used, and what fan engagement

data is maintained. This information would be categorized into domains such as "performance data," "sales data," and "engagement data," simplifying management and communication about these data types.

By achieving these milestones, sports organizations can ensure that their DG team has a clear and comprehensive understanding of the IT systems and data assets. This transparency is crucial for effective DG, enabling the organization to manage its data assets efficiently and ensure they align with the overall strategic goals.

Trim Data Spaces

Following the On-Boarding and Data Transparency steps, the next one in the Process Model is Trim Data Spaces. This step aims to define the direction of data organization, integrating processes, key contacts, and documentation of IT systems to ensure streamlined and efficient DG. The process focuses on personalizing data spaces and embedding governance functions through three main milestones: tailoring the data spaces, assigning data responsibility, and assigning DG roles.

- Tailoring the Data Spaces
    - Objective: Define and organize data spaces to ensure efficient management and governance, integrating process organization, key contacts, and IT system documentation.
    - Actions:
        - Data Gap Analysis: Use the results from the Data Transparency phase to identify and cut data gaps. This involves pinpointing areas where data is lacking or redundant and making necessary adjustments to ensure completeness and efficiency.
        - Minimize Data Spaces: Streamline data spaces by reducing their number and complexity. Smaller, well-defined data spaces are easier to manage and govern.
        - Define Boundaries: Establish clear boundaries for each data space, typically aligning them with specific IT systems. This helps in grouping content into coherent data domains.
        - Group Data into Domains: Categorize data within these spaces into domains (e.g., "order data," "player performance data") to facilitate management and improve communication with stakeholders. This organization simplifies DG and ensures that all stakeholders have a clear understanding of data classifications.
- Assignment of Data Responsibility
    - Objective: Assign clear data responsibilities within the organization, ensuring accountability and effective management.
    - Actions:
        - Designate Data Owners: Typically, senior executives are assigned as data owners based on the creator principle. This strategic role ensures that high-level oversight is provided for critical data assets.
        - Operational Representation: Data owners are represented operationally by data administrators, who handle the day-to-day management and oversight of data.

        - Avoid Ineffective Models: Steer clear of political models that distribute data responsibility broadly, as these are often ineffective and difficult to understand. Instead, focus on clear, hierarchical responsibility assignments.
        - Empower the Right Individuals: Avoid assigning data responsibility to operational staff who may lack the strategic decision-making capabilities necessary for effective data management. Ensuring that those with the authority and knowledge are responsible for DG enhances organizational capabilities.
- Assignment of DG Roles
    - Objective: Establish and assign specific DG roles to ensure effective implementation and operation of the DG framework.
    - Actions:
        - Identify Key Roles: Identify essential roles such as data owners, data administrators, data project managers, and IT administrators. Each role should have clear responsibilities and expectations.
        - Strategic Planning: Develop a strategic plan for filling these roles. Convincing the organization to allocate resources for these positions can be challenging, particularly for roles that require new skills and tasks, such as data administrators.
        - Resource Allocation: Ensure that sufficient resources are allocated to support DG roles. This includes providing training and support to individuals in these positions.
        - Role Distribution: Distribute roles according to the complexity of the system. For example, complex systems may require multiple IT administrators or subject matter experts to ensure effective governance.
        - Existing Roles: Leverage existing roles such as IT administrators and subject matter experts, who may already be in place before DG implementation. This helps in creating a seamless transition and integration of DG practices.

The Trim Data Spaces step can vary in duration depending on the complexity of the organization's data landscape, but it generally involves a thorough review and reorganization process that could take a few weeks. During this phase, the DG team collaborates with various departments to tailor data spaces, assign responsibilities, and establish governance roles.

In a sports organization, tailoring data spaces might involve consolidating player performance data from multiple systems into a single, cohesive data domain. Senior executives such as the head coach or performance director could be designated as data owners, with data administrators assigned from the coaching staff to manage day-to-day data operations. Assigning roles might include appointing a data project manager to oversee data-related projects and ensuring that IT administrators are equipped to handle the technical aspects of DG.

By achieving these milestones, sports organizations can ensure that their data spaces are well-defined, responsibilities are clear, and governance roles are established. This structured approach facilitates effective data management and governance, aligning data practices with the organization's strategic goals.

Steps 4 and 5 mark the critical transition from creating a DG framework to embedding it into regular operations. These steps ensure that the organization can sustain its DG efforts over the long term.

Train Data Spaces

This step is vital for equipping employees with the knowledge and skills necessary for effective DG.

- Training of Data Spaces
    - Objective: Ensure that employees assuming DG roles are adequately trained in both the DG process and data management practices.
    - Actions:
        - Structured Training Programs: Develop and deliver structured training programs tailored to the needs of different DG roles. These programs should cover essential topics such as DG principles, data management techniques, and specific responsibilities associated with each role.
        - Interactive Workshops: Conduct interactive workshops that allow employees to engage with the material actively. Use case studies, simulations, and practical exercises to reinforce learning and provide hands-on experience.
        - Continuous Learning Opportunities: Offer ongoing learning opportunities such as webinars, online courses, and access to industry resources to ensure that employees can stay updated with the latest best practices and technological advancements in DG.
- Initial Data Projects
    - Objective: Provide practical experience by closely accompanying initial data projects within the data spaces.
    - Actions:
        - Pilot Projects: Identify initial pilot projects within each data space that can serve as practical training grounds for newly trained employees. These projects should be closely monitored and supported by the DG office.
        - Mentorship and Support: Assign experienced mentors from the DG office to guide employees through these initial projects. This hands-on support helps bridge the gap between theoretical knowledge and practical application.
        - Regular Reviews and Feedback: Implement a system of regular reviews and feedback sessions to track progress, address challenges, and ensure that the projects are on track. These sessions also provide an opportunity to refine processes and practices based on real-world experiences.
- Initial Coordination with Other Data Spaces
    - Objective: Facilitate effective coordination and collaboration between different data spaces, promoting a culture of shared responsibility and communication.
    - Actions:
        - Cross-Functional Teams: Establish cross-functional teams comprising members from different data spaces to work on common projects and initiatives. This fosters collaboration and ensures that DG practices are harmonized across the organization.
        - Documentation and Communication: Develop clear documentation and communication protocols to ensure that data requirements, responsibilities, and expectations are well-defined and understood by all parties involved. This includes documenting data requirements from requesting data spaces and communicating them effectively to the generating data spaces.
        - Cultural Change Initiatives: Implement cultural change initiatives to promote a mindset of shared responsibility and collaboration. This might include

workshops on effective communication, conflict resolution, and the importance of DG in achieving organizational goals.

- Regular Coordination Meetings: Schedule regular coordination meetings between data spaces to discuss ongoing projects, share best practices, and address any issues that arise. These meetings help maintain alignment and ensure that DG efforts are cohesive and integrated.

The Train Data Spaces step is crucial for ensuring that the DG framework is not only understood but effectively implemented by all relevant employees. This step typically involves a combination of intensive initial training and ongoing support, taking several weeks to a few months to fully embed these practices into the organization's operations.

In a sports organization, training data spaces might involve workshops for coaches, analysts, and administrative staff on how to manage player performance data, ticket sales data, and fan engagement data. Initial data projects could include pilot programs for integrating performance metrics into coaching strategies or optimizing ticket sales processes based on data analytics. Coordination between different data spaces, such as performance and sales, would ensure that data from player metrics is effectively utilized in marketing campaigns and fan engagement strategies.

By achieving these milestones, sports organizations can ensure that their employees are well-prepared to manage DG roles effectively. This structured training and support approach lays the foundation for a robust DG culture that supports the organization’s strategic objectives.

Regular Operation of the Data Spaces

The final step in the Process Model is crucial as it transitions DG from its formative stages into regular, sustainable operations. This step ensures that the DG framework becomes an integral part of the organization's daily functions, allowing the DG Office to shift its focus from operational involvement to strategic oversight.

- Regular Operation of the Data Space
  - Objective: Ensure that data spaces can operate independently and efficiently, with established routines and processes.
  - Actions:
    - Operational Independence: Transition the day-to-day management of data spaces from the DG Office to the assigned DG roles within the data spaces. This typically occurs after approximately four months of setting up the data organization.
    - Established Processes: Ensure that all necessary DG processes are in place, documented, and routinely followed. This includes data management practices, quality control measures, and compliance protocols.
    - Decision-Making Autonomy: Empower DG roles to make informed decisions independently, reducing the need for continuous oversight and allowing the DG Office to focus on strategic initiatives.
- Regular Reconciliations
  - Objective: Maintain continuous alignment and integration between different data spaces and the broader process organization.
  - Actions:

        - Scheduled Reconciliations: Implement regular reconciliation meetings between data spaces and within the process organization to ensure alignment and address any emerging issues. These meetings should be scheduled at consistent intervals to maintain regular communication.
        - Internalized Exchange Practices: Ensure that the exchange of information and data between adjacent data spaces is internalized and becomes a routine part of operations. This includes documenting and adhering to agreed-upon data exchange protocols.
        - Feedback Loops: Establish feedback mechanisms to continuously assess the effectiveness of data exchanges and make necessary adjustments. This ensures that all data spaces remain aligned and operate cohesively.
- Regular Data Projects
    - Objective: Continuously improve and innovate through the regular execution of data projects that enhance the maturity and capabilities of the data spaces.
    - Actions:
        - Ongoing Project Pipeline: Maintain a pipeline of data projects that are regularly initiated and completed. These projects should aim to address current challenges, optimize processes, and introduce new capabilities.
        - Strategic Alignment: Ensure that data projects are strategically aligned with the organization's goals and objectives. This alignment helps in prioritizing projects that offer the most significant value addition.
        - Learning and Development: Use data projects as opportunities for learning and development. By tackling new challenges, data spaces can continuously improve their skills, processes, and overall maturity.
        - Project Reviews: Conduct regular reviews of data projects to evaluate outcomes, share insights, and incorporate lessons learned into future initiatives. This iterative process helps in refining the approach and achieving better results over time.

The Regular Operation of the Data Spaces step marks the culmination of the Process Model, embedding DG into the organization's routine operations. This phase typically involves a few months of transition, during which the DG Office gradually steps back, allowing the established DG roles to take full ownership. Continuous support and strategic oversight from the DG Office remain crucial to ensure sustained success.

In a sports organization, regular operation of data spaces might involve the coaching staff independently managing player performance data, the marketing team handling fan engagement data, and the sales department overseeing ticket sales data. Regular reconciliations would involve scheduled meetings to align data strategies across these departments, ensuring that insights from player performance data inform marketing campaigns and ticket sales strategies. Regular data projects could include initiatives like integrating new data analytics tools, optimizing fan engagement strategies based on data insights, or developing new performance metrics for athletes.

By achieving these milestones, sports organizations can ensure that their DG practices are well-integrated into their daily operations, driving continuous improvement and strategic alignment.

The completion of the Regular Operation of the Data Spaces step signifies that the organization has successfully embedded DG into its core operations. This maturity allows the DG Office to focus on higher-level strategic tasks, ensuring that DG continues to evolve and adapt to new challenges and opportunities. The Process Model thus provides a comprehensive roadmap for implementing effective

DG in sports organizations, ensuring that data is managed efficiently and strategically to drive success. The organization is now ready to transition into the final phase of the strategy, known as the Regular Operation of DG. This phase will focus on maintaining and refining the DG practices ensuring ongoing alignment with the organization's strategic goals and continuous improvement in data management capabilities.

4.2.3. Regular Operation of Data Governance

The final step to implement the strategy is transitioning to and maintaining the regular operation of DG. This phase is as complex and challenging as the initial implementation of DG. It begins after a data space has been tailored, data domains (roughly) defined, and data responsibility assigned. Additionally, regular data projects should already be identified and implemented. Ideally, the data space is also controlled via a project or process organization within the matrix organization or via a specialist department within a line organization of a company. This means that the data space is already anchored in the matrix or line, and the specialist department integration has been successfully completed within the implementation phase.

The transition to regular operation is a significant turning point in the implementation of DG. At this point, the organizational setup ends, and the actual data work begins, i.e., the value creation of the data within the organization. Unfortunately, like all implementation steps in building DG, this one is not straightforward. Employees who are to fill the roles of DG and those who support these roles are usually inexperienced in the practices of data management and still need to be empowered to perform the tasks at hand.

The tasks that DG roles must perform as a standard activity to manage data spaces are diverse, and the thematic focus for performing these tasks varies from company to company. However, they generally fall into one of the following four categories: understand data, identify pain points and areas for improvement, implement data projects, and monitor data development, as seen in Figure 6.

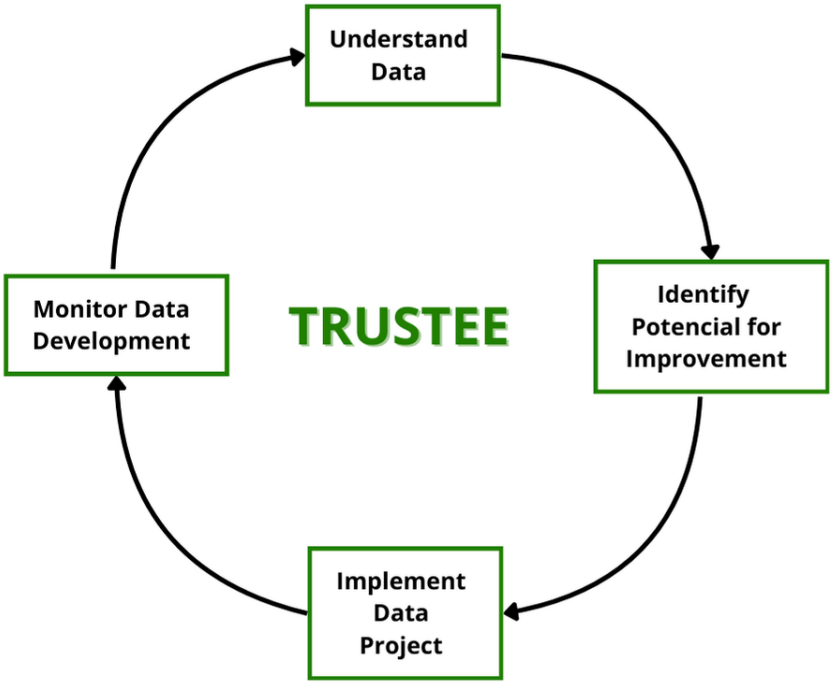

Figure 6 – Regular Operation Four Categories

To effectively transition and maintain regular DG operations in sports companies, the TRUSTEE framework is utilized. The TRUSTEE framework aims to meet all the requirements of end users (i.e., consumers, organizations, industry, etc.) for access to federated and FAIR data through a private structure of public and private organizations. The architecture is formed from the perspective of FAIR data and open access, in line with Horizon Europe guidelines. Its aim is to improve the experience of stakeholders with secure, reliable, transparent, accountable, and environmentally sustainable ICT services (Delacroix & Lawrence, 2019). The TRUSTEE platform is shown in the Figure 7:

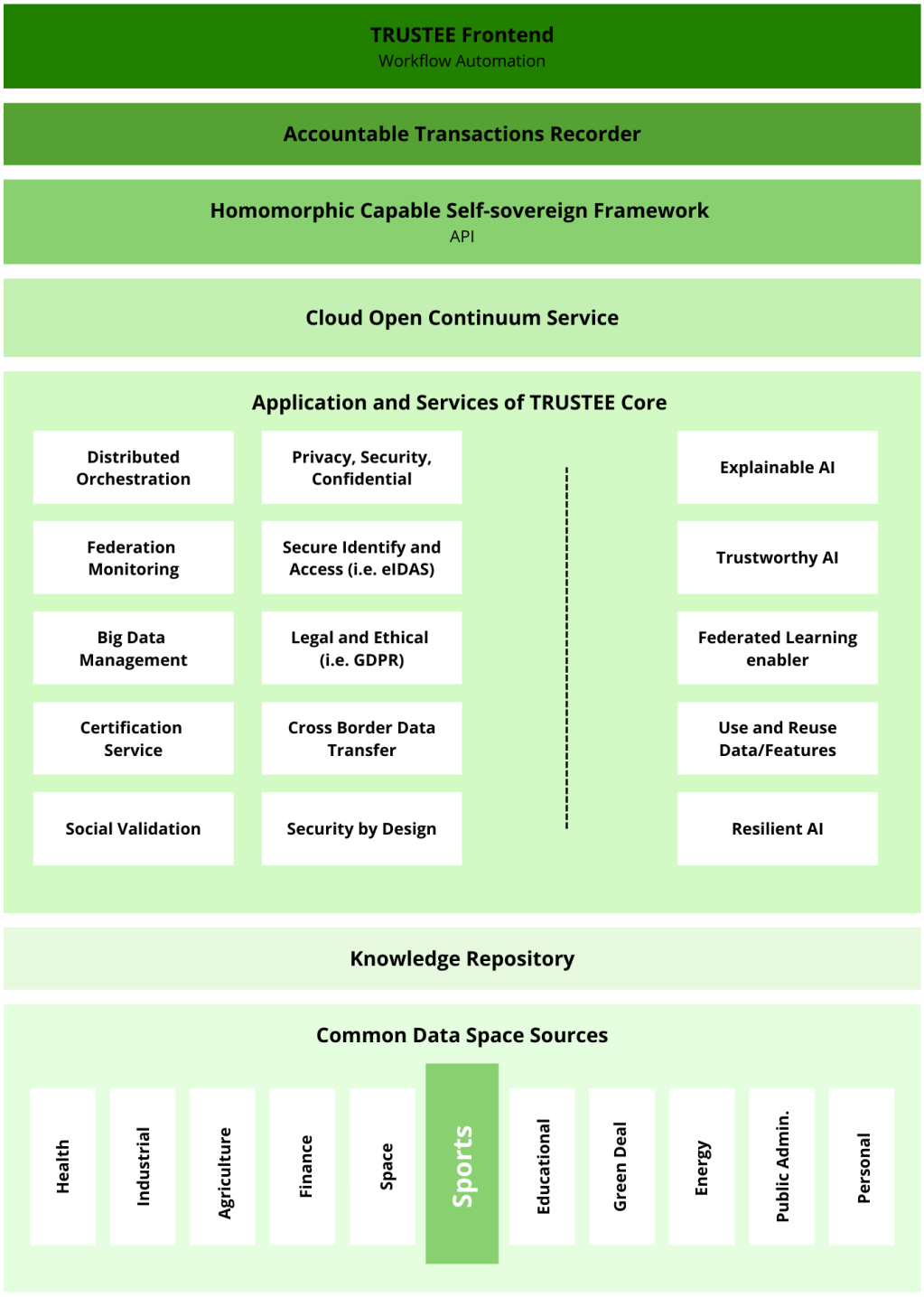

Figure 7 – TRUSTEE Framework – (Sayeed et al., 2023)

TRUSTEE is architecturally divided into seven layers:

1. **Front-end devices, users, and federated service access layer:** This layer supports individuals, services, and devices for data processing, ensuring effective communication and interoperability with digital, open platforms (GAIA-X) and the European Open Science Cloud (EOSC) to seamlessly exchange existing and future FAIR data.

    a. **Sports Companies Adaptation:** In sports companies, this layer will enable seamless interaction between various stakeholders, including athletes, coaches, management, and fans, ensuring secure and efficient access to data.
2. **Accountable transaction layer**: This layer comprises the implementation of the blockchain platform. It is based on a permissioned blockchain providing an audit trail of the recorded transactions from every component, fully compliant with GDPR, offering an additional security feature at the chain code level, providing access to data only to privileged entities along with data deletion options.
    a. **Sports Companies Adaptation**: This ensures the integrity and security of sensitive data such as player performance metrics, financial transactions, and fan engagement data, providing a secure audit trail for compliance and transparency.
3. **Homomorphic capable self-sovereign framework layer**: This layer guarantees high-level data protection by complying with the legal requirements enforced in the EU, bound with all the security measures to determine the credibility of personal data.
    a. **Sports Companies Adaptation**: Ensures the protection of personal and sensitive data, such as health records of athletes, adhering to stringent data protection regulations.
4. **Cloud open continuum service layer**: This layer comprises a cloud continuum scenario offering services for novel management strategies, enabling coordinated and efficient management of resources, from the edge up to the cloud.
    a. **Sports Companies Adaptation**: Facilitates the management of large volumes of data generated from various sources such as sensors, wearables, and IoT devices used in training and performance monitoring.
5. **Application and services of trustee core layer**: This layer offers an advanced and comprehensive approach to enhance situational and contextual awareness in EU-data common spaces, including methods for data processing such as fusion, harmonization, analytics, anomaly detection, governance, and AI/ML workflows.
    a. **Sports Companies Adaptation**: Provides robust data analytics and AI capabilities to derive insights from data, enhancing decision-making in areas such as player performance optimization, injury prevention, and fan engagement strategies.
6. **Knowledge repository layer**: This layer fuses data obtained from diverse sources, leveraging data homogenization and semantic alignment toolkits for effective cross-domain data search, retrieval, and sharing.
    a. **Sports Companies Adaptation**: Enables comprehensive data integration from various sources such as training logs, match statistics, and fan interaction data, facilitating a holistic view and analysis.
7. **Common Data Space Sources**: The bottom layer comprises various data collection sources, including data repositories and significant tools/interfaces for data persistence and assessment.
    a. **Sports Companies Adaptation**: Includes data from multiple sources such as biometric sensors, video analysis systems, and social media platforms, ensuring comprehensive data collection and analysis.

By focusing on the four categories and using the TRUSTEE framework, sports companies can transition to and maintain regular DG operations effectively.

Understand Data:

- Leverage the front-end devices layer to gather comprehensive data from all relevant sources.
- Use the knowledge repository layer to aggregate and harmonize data for better understanding and insights.

Identify Pain Points and Areas for Improvement:

- Utilize the accountable transaction layer to track and audit data flows, identifying inefficiencies or security gaps.
- Apply the application and services layer to analyze data, detect anomalies, and pinpoint areas requiring improvement.

Implement Data Projects:

- Use the cloud open continuum service layer to deploy and manage data projects efficiently, from edge devices to cloud resources.
- Facilitate data projects using AI/ML tools from the application and services layer to drive innovation and improvement in operations.

Monitor Data Development:

- Ensure continuous monitoring and auditing of data through the accountable transaction layer.
- Maintain regular operation and reconciliations between data spaces, leveraging the knowledge repository layer for up-to-date data insights and developments.

Transitioning to the regular operation of DG is the final phase in establishing a robust DG strategy in sports companies. By utilizing the TRUSTEE framework, sports companies can ensure that DG practices are not only implemented but also sustained effectively, driving continuous improvement and strategic alignment with organizational goals. This structured approach ensures that DG becomes an integral part of the organization's operations, facilitating better decision-making, enhanced performance, and improved stakeholder satisfaction.

Implementing a comprehensive DG strategy is crucial for organizations aiming to maximize the value of their data while ensuring compliance, security, and operational efficiency. This strategy is composed of several key phases, each designed to progressively build and refine the organization’s DG capabilities. The phases include determining the organizational structure, developing a process model, and transitioning to regular operation of DG. The culmination of these efforts leads to a robust framework that integrates DG into the fabric of the organization’s daily operations.

The first phase involves choosing the appropriate organizational structure, whether it be a Line Organization or a Matrix Organization. Each structure has its advantages and disadvantages, and the choice depends on the company's specific needs and existing organizational setup. Line Organizations offer clear hierarchical structures, which can simplify management but may hinder interdepartmental communication and cooperation. In contrast, Matrix Organizations facilitate better interdepartmental collaboration and quicker problem-solving but require more complex communication efforts and management.

Next, the Process Model phase operationalizes the DG framework through a series of steps: Design, Implement, Scale, Control, and Optimize. Each step is crucial in building a scalable and efficient DG

system. The process begins with designing the data strategy, roles, and structures, followed by implementing data processes and ensuring data quality. The model then scales these efforts across the organization, monitors data quality, manages data projects, and continually optimizes processes through automation and innovation.

The Process Model also includes a secondary set of steps to anchor the logic of data spaces and governance roles into the company's operations. This involves onboarding DG staff, achieving data transparency, trimming data spaces, training data spaces, and ensuring regular operation. Each step focuses on integrating DG deeply into the organization's operational routines, thereby ensuring that data management practices are not only implemented but also sustained and continuously improved.

Finally, the transition to and maintenance of regular operation marks the completion of the strategy's implementation. This phase is crucial as it signifies the shift from setup to actual data work, where the focus is on the value creation of data. It involves continuous training, identifying and implementing data projects, and ensuring seamless communication and collaboration between data spaces. This ongoing process ensures that the organization remains agile and responsive to new data challenges and opportunities.

To support this transition, the TRUSTEE framework is employed. This framework provides a structured approach to handle federated and FAIR data through a private structure of public and private organizations. TRUSTEE is designed to meet end-user requirements for secure, reliable, transparent, accountable, and environmentally sustainable ICT services. It is architecturally divided into seven layers, each addressing different aspects of DG, from front-end devices and users to cloud services and knowledge repositories. The framework ensures comprehensive data management, facilitating seamless data exchange, robust security, and continuous improvement.

By focusing on understanding data, identifying pain points and areas for improvement, implementing data projects, and monitoring data development, the TRUSTEE framework ensures that the DG strategy is not only implemented but also maintained effectively. This structured approach allows organizations to derive maximum value from their data, enhance decision-making, and achieve their strategic goals.

In conclusion, implementing a DG strategy is a complex but essential undertaking that requires careful planning, execution, and continuous improvement. By following the outlined phases and leveraging frameworks like TRUSTEE, organizations can establish a robust DG system that drives operational efficiency, enhances data quality, and supports strategic objectives. This comprehensive approach ensures that DG becomes an integral part of the organization's culture, enabling sustained success in the ever-evolving data landscape.

4.3. DEMONSTRATION – USE CASE

IMS FC stands as a prestigious soccer club known for its rich history and commitment to excellence on and off the field. As the club continues to evolve in a rapidly changing sports landscape, the need for effective data management and governance has become increasingly apparent. To maintain its competitive edge and elevate performance both on the pitch and in organizational operations, IMS FC has embarked on a journey to implement a comprehensive DG strategy.

This use case outlines how IMS FC will systematically adopt and integrate the designed DG strategy, tailored specifically to its unique needs and challenges. By leveraging structured phases and innovative frameworks, IMS FC aims to enhance decision-making processes, optimize resource utilization, and ensure compliance with regulatory standards. The implementation will not only streamline internal operations but also foster a culture of data-driven insights and continuous improvement within the club.

Through this strategic initiative, IMS FC seeks to align its data management practices with industry best practices while harnessing the power of data to drive innovation and achieve sustainable success in the competitive world of professional soccer.

Phase 1: Determine Organizational Structure

Step-by-Step Implementation:

1. Assessment of Current Structure:
    a. **Current Situation:** IMS FC currently operates under a traditional Line Organization structure typical in many sports clubs. This structure features functional departments (e.g., coaching staff, marketing, finance) reporting hierarchically to senior management.
    b. **Challenges Identified:** Communication barriers between departments, delays in decision-making processes, and limited cross-functional collaboration.
    c. **Decision:** After evaluating the challenges of the Line Organization structure, IMS FC decides to transition to a Matrix Organization.
2. Consideration of Matrix Organization:
    a. **Benefits Considered:** The Matrix Organization structure offers advantages such as improved agility in decision-making, enhanced collaboration across functional areas (e.g., coaching, analytics, scouting), and better resource allocation.
    b. **Decision:** IMS FC opts for a Matrix Organization to facilitate quicker problem-solving, better integration of DG practices across departments, and enhanced operational efficiency.

Phase 2: Process Model Implementation

Step-by-Step Implementation:

1. Design Phase:
    a. **Data Strategy:** Develop a comprehensive data strategy aligned with IMS FC's strategic goals. Define objectives for data utilization, data security measures, and compliance with data protection regulations (e.g., GDPR).
    b. **Roles and Structure:** Assign key DG roles such as Data Owners (e.g., head coach for player performance data), Data Stewards (e.g., analytics department for match statistics), and Data Administrators (e.g., IT department for data infrastructure).
    c. **DG Services and Operating Model:** Establish governance frameworks, policies, and procedures for managing data across the organization. Define how DG will be integrated into the Matrix Organization's structure.

d. **Decision:** IMS FC designs a structured DG framework tailored to the Matrix Organization, ensuring clear roles, responsibilities, and governance protocols are in place.

2. Implementation Phase:
    a. **Data Processes and Data Spaces:** Implement standardized data processes for data collection, validation, storage, and dissemination. Establish data spaces for critical data domains such as player performance metrics, match analysis, and fan engagement data.
    b. **Data Quality:** Institute mechanisms for ensuring data quality through regular audits, data cleansing procedures, and adherence to data standards.
    c. **Decision:** IMS FC begins implementing data processes and establishes initial data spaces to ensure consistent and reliable data management practices.
3. Scale Phase:
    a. **Adapting Other Data Areas:** Extend DG practices to cover additional data areas such as youth development, marketing analytics, and corporate partnerships.
    b. **Decision:** IMS FC scales the DG framework across all relevant departments and data domains, ensuring uniformity and compliance with established DG protocols.
4. Control Phase:
    a. **Monitoring Data Quality:** Implement monitoring mechanisms to track data quality metrics, identify anomalies, and address data discrepancies promptly.
    b. **Managing Data Projects:** Initiate data projects aimed at optimizing data processes, improving data insights, and supporting strategic decision-making within IMS FC.
    c. **Decision:** IMS FC establishes robust controls and governance mechanisms to ensure ongoing data quality and effective management of data projects.
5. Optimize Phase:
    a. **Automation:** Explore opportunities for automating routine data management tasks, data validation processes, and reporting mechanisms.
    b. **Process Optimization:** Continuously refine data processes based on performance metrics, stakeholder feedback, and emerging best practices in DG.
    c. **Decision:** IMS FC adopts automation tools and implements process optimizations to enhance efficiency, reduce manual efforts, and improve overall DG effectiveness.

Phase 3: Transition to Regular Operation of Data Governance

Step-by-Step Implementation:

1. Tailored Data Spaces:
    a. Refine data spaces based on insights gathered from the Control and Optimization phases. Customize data spaces to align with evolving DG requirements and strategic objectives.
    b. **Decision:** IMS FC tailors data spaces to ensure they effectively support ongoing DG initiatives and meet specific departmental needs within the Matrix Organization.
2. Data Responsibility Assignment:
    a. Assign clear responsibilities for data management and governance roles (Data Owners, Data Stewards) across departments within the Matrix Organization structure.

b. **Decision:** IMS FC designates accountable individuals for each data domain and ensures clear lines of communication and decision-making authority regarding DG matters.

3. Regular Data Projects:
    a. Identify and prioritize ongoing data projects aimed at enhancing data processes, leveraging data insights, and supporting strategic initiatives.
    b. **Decision:** IMS FC initiates regular data projects to maintain momentum in DG improvements, address emerging data challenges, and capitalize on opportunities for data-driven innovation.
4. TRUSTEE Framework Integration:
    a. Utilize the TRUSTEE framework to strengthen data security, transparency, and interoperability across all data operations within IMS FC.
    b. Enhanced Data Security: Utilizes permissioned blockchain technology to secure data transactions. IMS FC can ensure GDPR compliance by providing audit trails and restricting data access to authorized entities.
    c. Trust and Transparency: Establishes trust through transparent data transactions, ensuring that all data exchanges and transactions are accountable and traceable.
    d. Data Protection: Ensures high-level data protection compliant with EU regulations. IMS FC can securely manage and process personal data while maintaining data sovereignty and privacy.
    e. Compliance Readiness: Adheres to legal requirements for handling sensitive data, protecting against data breaches, and ensuring data integrity throughout its lifecycle.
    f. Scalability and Flexibility: Offers a scalable cloud continuum scenario for managing resources from edge to cloud. IMS FC can efficiently manage and scale its data infrastructure based on demand, supporting dynamic data processing needs during peak times (e.g., match days, transfer windows).
    g. Operational Efficiency: Streamlines data management processes, enhances resource utilization, and supports novel management strategies critical for optimizing sports operations and fan engagement.
    h. Advanced Data Processing: Provides comprehensive tools for data processing, analytics, and management. IMS FC can leverage AI/ML workflows, anomaly detection, and analytics toolkits to derive actionable insights from data.
    i. DG and Federation: Facilitates effective DG practices, including data federation, integration, and governance automation. IMS FC can centrally manage DG policies, ensuring consistency and compliance across all data spaces.
    j. Data Integration and Sharing: Integrates data from diverse sources and domains, facilitating effective cross-domain data search, retrieval, and sharing. IMS FC can harmonize data from player performance, scouting reports, fan engagement metrics, and more, enabling comprehensive analysis and decision-making.
    k. Decision Support: Empowers IMS FC with decision support capabilities by providing insights derived from integrated data repositories. Supports strategic decision-making in player recruitment, performance optimization, and fan engagement strategies.
    l. Data Persistence and Assessment: Serves as the foundational layer for data storage, persistence, and assessment. IMS FC can securely store and access critical data assets, including historical match data, player profiles, and operational metrics.

m. Infrastructure Support: Provides essential tools and interfaces for managing data repositories and ensuring data availability and reliability across the organization.
n. **Decision:** IMS FC integrates TRUSTEE framework layers to ensure compliance with data protection regulations (e.g., GDPR), enhance data accessibility, and facilitate seamless data exchange and collaboration.

Implementing the DG strategy at IMS FC involves a systematic approach across organizational restructuring, process implementation, and transition to regular operation. By adopting a Matrix Organization structure and leveraging the TRUSTEE framework, IMS FC aims to enhance data management capabilities, improve decision-making processes, and ensure compliance with data regulations in the dynamic sports industry. Each phase is carefully executed to align with IMS FC's strategic objectives, fostering a data-driven culture that supports continuous improvement and operational excellence.

4.4. EVALUATION & DISCUSSION

In this chapter, I will evaluate the DG strategy developed for sports enterprises, incorporating insights and feedback from the expert interviews conducted with Experts Interviewed EI1, EI2, and EI3. This evaluation will highlight the strengths, weaknesses, and areas for improvement in the strategy, as well as discuss how expert recommendations were integrated to refine the approach.

The initial assumptions of the strategy were centered around the challenges faced by small and medium-sized sports enterprises in managing data. These challenges included issues related to data quality, privacy, security, and the overwhelming volume of data. Additionally, the lack of clear roles, such as Chief Information Officers (CIOs) and Data Protection Officers (DPOs), in these organizations was highlighted as a significant barrier.

EI1 confirmed these challenges, emphasizing the difficulty small enterprises face in navigating DG due to limited resources and expertise. EI2 expanded on this by pointing out that the rapid technological evolution necessitates continuous adaptation, which many companies struggle with due to outdated legacy systems. EI3 supported these views, stressing the importance of understanding the company's maturity in DG and tailoring the strategy to their specific needs and readiness.

The strategy proposed assessing whether the organization operates in a line or matrix structure, as this would influence the implementation approach. A line organization, with its hierarchical structure, would require a specialized department for DG, while a matrix organization, characterized by cross-functional teams, would incorporate DG into existing processes.

EI1 appreciated the differentiation but noted the need for more visual aids to help companies understand these structures better. EI2 agreed and suggested focusing on the matrix structure, as it often aligns better with the dynamic needs of sports enterprises. EI3 also favored the matrix approach but recommended justifying this preference by linking it to the specific needs and dynamics of sports companies, providing a solid rationale for why matrix organizations are more suitable in this context.

The process model was divided into two main phases: design and implementation. The design phase involves defining the data strategy, roles, structure, DG services, and the operational model.

EI2 and EI3 both emphasized the critical importance of the design phase. EI2 suggested placing more emphasis on this phase as it involves assessing the current state, identifying gaps, and mapping out data flows. This phase sets the foundation for a successful implementation. EI3 agreed and highlighted the need for action-oriented descriptions of activities, ensuring clarity and understanding of each step. Both experts stressed the iterative nature of this phase, where continuous feedback and adjustments are crucial.

The implementation phase includes data processes, data spaces, and ensuring data quality. This phase is followed by a pilot project to test the strategy on a smaller scale before scaling it up.

EI1 appreciated the structured approach to implementation but suggested ensuring that the responsibilities and roles are clearly defined and communicated during this phase. EI2 stressed the importance of pilots, recommending that the strategy should highlight the iterative process where pilots might need several iterations to succeed. This involves learning from each pilot and making necessary adjustments before scaling up. EI3 supported this view, emphasizing the need to manage expectations and prepare for potential setbacks during the pilot phase.

After successful implementation, the strategy moves to control and optimization, which involves monitoring data quality, managing data projects, automating processes, and fostering innovation.

EI2 and EI3 both stressed the importance of continuous improvement and optimization. EI2 recommended focusing on how the strategy will facilitate ongoing monitoring and improvement of data quality and governance processes. EI3 emphasized the need to incorporate feedback loops to ensure that the strategy remains dynamic and adaptable to changing needs and conditions.

Regular DG operations include understanding data, identifying improvement potentials, implementing data projects, and monitoring data development. The strategy proposed using a framework called TRUSTEE, which includes layers addressing ethics, security, monitoring, privacy, and the use of machine learning and AI to enhance processes.

EI1 highlighted the importance of aligning the TRUSTEE framework with the specific needs and maturity levels of the organizations. EI2 and EI3 both recommended ensuring that the framework is not overly complex for the company and that it can be adapted to their specific requirements. EI2 also emphasized the need to conduct thorough assessments to understand the current capabilities of the organization and tailor the TRUSTEE framework accordingly.

Integration and interoperability of data systems are crucial aspects of DG. The strategy must ensure that data is transferred securely and efficiently between applications.

EI1 pointed out the need for robust data integration solutions to support interoperability. EI2 and EI3 agreed, emphasizing that DG is not just about technology and processes but also about how data is transferred between systems. Ensuring secure and efficient data transfers is essential for maintaining data integrity and performance.

The feedback from EI1, EI2, and EI3 has been invaluable in refining the DG strategy for sports enterprises. Their insights have underscored the importance of a robust design phase, the iterative nature of pilots, the need for continuous control and optimization, and the critical role of integration and interoperability. By addressing these aspects, the strategy can better meet the needs of sports enterprises, helping them navigate the complexities of DG and enhancing their overall efficiency and effectiveness in the digital age.

4.5. REVISED STRATEGY

Based on the insights and recommendations provided by the experts during the interviews, several refinements have been made to the initial data governance strategy. These revisions aim to address identified gaps, enhance the strategy's applicability, and ensure it effectively meets the unique needs of sports organizations. This chapter outlines the adjustments and improvements made to the original strategy, reflecting the expert feedback and aligning with best practices in data governance.

It should be noted that each change will be assigned a number according to the phase of the modified strategy, as shown in Figure 8.

Therefore, in the global strategy of the operational model, one of the changes that immediately stands out is the fact that we initially analyzed the maturity of the sports company, rather than classifying it as a line or matrix organization. This change was adopted because it makes it easier to classify companies according to their level of maturity, in order to be able to distinguish those that should be subject to a specialized department (high) from those that should only be subject to a DG process or project (low) **(1)**. Moreover, it should be noted that the choice of this change is based above all on the way in which companies are organized, since although they are usually presented as a matrix or online, this is not imperative, i.e. it may not happen.

On the other hand, another conclusion reached is that once you reach the stage of defining a project or process, the evolution of the strategy should not be linear, but circular. This means that once the last stage of the "Regular Operation of Data Governance" strategy has been reached, you should return to the intermediate "Define Project or Process" step so that the potential results are continuously improved **(2)**.

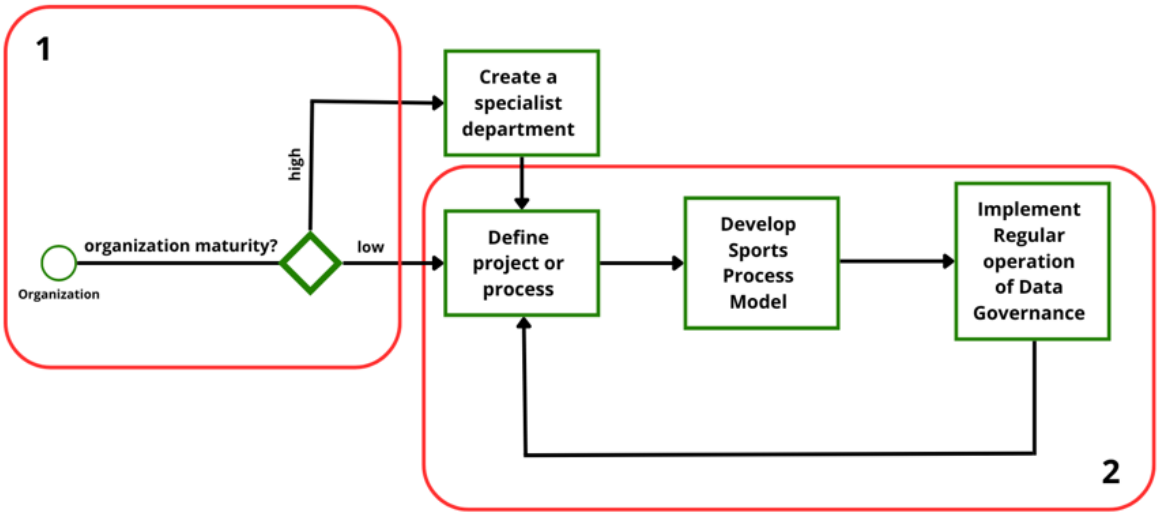

Figure 8 – Revised Global Strategy for the Operating Model

Following is the importance that should be attached to the "Design" phase **(3)**. This phase assesses the current state of DG in a sports organization, including a complete mapping of data flows, identification of gaps and the robust operational set-up before moving on to the pilot phase. This phase is thus structured to ensure a comprehensive assessment of the existing data environment, which allows for the identification of specific needs and challenges unique to the organization. This enhanced focus ensures that the foundation for DG is solid and tailored to the organization's context, increasing the likelihood of successful implementation and sustainability.

From the analysis of the interviews conducted, it became clear that this phase in the strategy was being slightly discredited, since what was intended here was being transposed to the "Implement" phase. In this regard, the establishment of data processes and the creation of data spaces and the definition of mechanisms to guarantee high data quality are specified, which will then be implemented in the next phase.

Another point to note is that the initial design of the strategy did not consider the hypothesis that implementation does not produce the expected results in relation to the strategy defined in the Design. For this reason, it is clear that, considering the results obtained in the "Implement" phase, what is obtained should be handled differently **(4)**. In the event that the results are as desired, the strategy continues as previously defined; in the event that the results are not as desired, the Design phase must be returned to so that a new strategy can be drawn up, redefining the step that caused them, and the Implementation phases applied again to the pilot in question. Points **(3)** and **(4)** are associated with Figure 9.

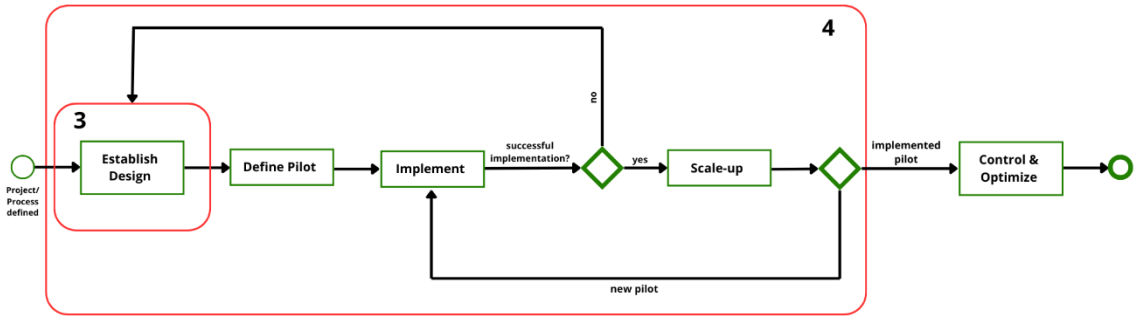

Figure 9 – Revised Process Model

Finally, one aspect that proved to be relevant was the level of maturity of companies in implementing certain tools from the TRUSTEE framework. By this, we mean that in companies with a very low level of maturity, it may be difficult or even impossible to adopt certain proposed measures (for example, artificial intelligence, given the costs it entails and the financial disposition of these companies). In the same vein, the framework doesn't apply completely, as the needs of each company have to be considered, and as such there are tools that don't make sense to apply to certain business realities.

5. CONCLUSION

5.1. SYNTHESIS OF DEVELOPED WORK

This research aimed to define a data governance (DG) strategy to improve the effectiveness of sports organizations in the age of sports information. Through a comprehensive literature review, the study provided a solid foundation for understanding current practices and trends in DG within the sports sector. The investigation highlighted the gaps and challenges faced by small and medium-sized sports organizations, particularly in comparison to larger, monopolistic entities. Factors influencing the effectiveness of DG were identified, allowing for a nuanced understanding of the industry's landscape.

Key best practices for DG were identified and adapted for sports organizations. The impact of these practices on strategic decision-making processes was assessed, leading to the formulation of a comprehensive DG strategy. This strategy was then validated and analyzed, yielding insights that can significantly contribute to the further development of DG in professional sports.

Based on the insights and recommendations from expert interviews, the strategy was refined to address gaps, enhance applicability, and ensure it meets the unique needs of sports organizations. Notably, the strategy now includes an initial assessment of the organization's maturity level, a more circular and iterative approach to project and process evolution, an enhanced focus on the "Design" phase, and a flexible response to implementation outcomes. These adjustments reflect the experts' emphasis on adaptability, continuous improvement, and tailored approaches to DG.

The findings emphasize the critical role of DG in enhancing data-driven decision-making, optimizing fan experiences, managing athletes, and efficiently allocating resources. By addressing these aspects, the research provides valuable insights that can help sports organizations achieve a competitive edge and adapt to the dynamic nature of the sports market.

5.2. LIMITATION

While the research offers significant contributions, it is essential to acknowledge its limitations. One primary limitation was the scarcity of existing works specifically focused on DG in the sports field. This necessitated adapting practices and frameworks from other fields of study, such as general business and information technology governance. While these adaptations provided valuable insights, they may not perfectly align with the unique challenges and dynamics of sports organizations.

Additionally, the study relied on existing literature and theoretical frameworks, which may not entirely capture the practical realities and nuances of DG implementation in diverse sports organizations. The practical application was demonstrated through a case study of a fictitious company, which, while illustrative, may not fully represent real-world complexities and challenges. Feedback from experts EI1, EI2, and EI3 highlighted the importance of understanding the specific needs and maturity levels of individual organizations, suggesting that a one-size-fits-all approach may not be feasible.

The rapid evolution of technology and data management practices also poses a limitation, as some insights and recommendations may become outdated with new developments. Continuous updates and adaptations will be necessary to ensure the relevance and applicability of the proposed DG strategy. Additionally, the iterative nature of pilots and the need for ongoing adjustments, as

emphasized by the experts, indicate that the strategy must be flexible and adaptive to remain effective over time.

5.3. FUTURE WORK

Future research should aim to expand the scope of this study to provide a more comprehensive understanding of DG across the entire spectrum of the sports industry. Empirical studies involving real-world organizations would be valuable in validating and refining the proposed strategy. These studies should consider the feedback loops and iterative processes highlighted by the experts, ensuring that the strategy can be adapted based on practical experiences and outcomes.

Exploring the ethical implications of DG, particularly concerning fan data privacy and security, is another crucial area for future investigation. Developing clear guidelines and best practices for balancing personalization with privacy will be essential as sports organizations increasingly rely on data-driven approaches. This aspect was emphasized by EI1, who pointed out the need for robust data integration solutions to support interoperability and maintain data integrity.

Furthermore, examining the long-term impact of DG on organizational performance, fan engagement, and overall competitiveness would provide deeper insights into the strategic value of effective data management. Collaboration with industry practitioners and stakeholders can facilitate the development of more practical, scalable, and adaptable DG frameworks. Incorporating the iterative feedback and continuous improvement processes suggested by EI2 and EI3 can help ensure these frameworks remain relevant and effective.

A promising direction for enhancing the proposed DG strategy is the integration of the COBIT (Control Objectives for Information and Related Technologies) framework. COBIT provides a comprehensive and globally recognized framework for IT governance and management, which can offer valuable structure and depth to the DG strategy. By incorporating COBIT principles, future research can explore how its detailed guidelines and best practices can be tailored to the specific needs of sports organizations, thereby enhancing the robustness and effectiveness of DG implementations.

By addressing these areas, future research can build on the foundation established by this study, contributing to the continuous improvement and innovation of DG practices in the sports sector. Ensuring that the strategy remains adaptable, practical, and aligned with the evolving technological landscape and organizational needs will be critical for its long-term success.

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APPENDIX A – SPECIALIST INTERVIEW I

Gonçalo Filipe (GF): The basic idea I had was to create a strategy that would help sports companies, particularly small and medium-sized enterprises (SMEs), within the sports industry.

GF: This strategy aimed to give these companies a competitive advantage by applying data governance to help them improve.

GF: The goal was to develop a data governance strategy specifically for SMEs. I identified several assumptions and problems during my analysis. The first issue I found was the lack of information on data governance specifically for sports companies. Therefore, I used theses and articles from other fields and applied their insights to the sports industry.

GF: SMEs face challenges in making strategic decisions due to the large volumes of data, with particular issues in data quality, privacy, security, and accuracy. Companies often struggle with working on their data, whether it's about quality, privacy, security, or accuracy.

GF: Additionally, companies have difficulties with data governance decisions, especially concerning ethical, practical, and legal issues in managing sports data, such as applying GDPR.

GF: I also observed that companies are forced to adapt technologically within the context of digital transformation, which is often expensive and challenging for them.

GF: Many companies use old legacy systems, and there is resistance from employees to integrate new technologies because they are accustomed to the old systems and do not want to change.

GF: Finally, I found that the definition and role of the CIO are often unclear, involving old systems, risk management, security, and data governance. These challenges face resistance from stakeholders, high costs, and the need for technologies to handle large amounts of data.

GF: I attempted to create a strategy based on one or two that I had seen. The strategy involves determining the type of organization the company has: whether it is a line or matrix organization. Implementing data governance is supposedly easier in a matrix organization than in a line organization. However, it is possible to do it both ways. In a line organization, we need to create a special department responsible for data governance. In a matrix organization, we define a project or process with a team from different areas to facilitate the implementation of data governance. After this, we move on to a process model, which involves the introduction and application of data governance, followed by regular data governance operations.

GF: Let me explain the process model. It will have a structure where we go through all these phases, starting with the design phase. This includes the data strategy, roles, structure, data governance services, and the operating model.GF: We then have a combined phase of pilot, implementation, and scale. We choose an existing company process as a pilot and implement data governance in it. Once successful, we increase the scale, create another pilot, and repeat the process until all company processes are covered. During this, implemented pilots move to the control and optimization phase. Control involves monitoring data quality and managing data projects, while optimization automates and improves implemented processes using innovation and competence groups.

GF: In the onboarding phase, we address process competence, organizational competence, and contact persons and networks. This is where we explain how everything will work and organize competencies. Next is the data transparency phase, involving the identification of systems, data, and data domains. After data transparency, we move to trim data spaces, where we tailor data spaces, assign data responsibilities, and define data governance roles.

GF: The final crucial phases are train data spaces, which involves training in data spaces and initial data projects, and coordination with other data spaces. Finally, we transition to regular operations of data spaces, ensuring their regular functioning and ongoing data projects.

GF: Basically, the pivot is a cycle that is created and implemented whenever we scale up. By successfully implementing this process, we can move on to regular data governance operations. This involves daily tasks, where the company receives data, understands it, identifies potential improvements, implements data projects, and monitors the data. To do this, I plan to use the TRUSTEE framework. This framework covers everything from data privacy and security to ethical and legal issues, data transition, innovation, and big data management. Using this framework, we can perform regular data governance operations. In a nutshell, that's my idea. Now, I'll pass the word to you for any questions you might have.

Expert Interviewed One (EI1): Is your idea to apply this in a practical way, or is it more about defining a model?

GF: My idea was more about defining a model. Initially, I wanted a more applied approach, and for my thesis, I'm doing a use case where I try to apply this strategy to a fictional company.

GF: However, I found it somewhat difficult to find an applied form, so it would be more of a model.

EI1: What's important is to clarify the scope of your work. Many topics you mentioned are valid and related to governance. Defining a specific scope for your thesis is the most important step. This is crucial because what you've shared could represent years of study. Demonstrating an understanding of the overall landscape is essential. For instance, you barely mentioned sports teams, indicating some incoherence in defining the scope. The title should reflect the theme, objective, and scope. Everything discussed should align with this.

EI1: Your approach should be clear regarding the concrete objective. For data governance, there are numerous objectives. The context, especially when addressing sports companies, is important because their challenges can differ significantly. This context will give specificity to your chosen theme. The objective should be based on an analysis.

EI1: Knowing who the stakeholders are is crucial. Ask yourself, who will read my thesis in the end? It could be anyone in a football club, from the locker room staff to the president.

EI1: All of them can benefit from data governance. Therefore, it's essential to be very clear about which stakeholder you're targeting. By characterizing a typical sports organization, you can identify strengths, weaknesses, opportunities, and threats. In doing so, you will also recognize the expected benefits of improved data governance for each type of stakeholder, which is very important.

EI1: When dealing with information and the cycle that concludes with decision-making, it's vital to know who will make better decisions with the data provided. If this isn't clear, you might end up creating an excellent product that no one wants. You should continuously zoom in and out. Zoom out: Identify the types of decision-makers in a football club. Zoom in: Understand what decisions they need to make. This helps to identify use cases.

EI1: Each stakeholder has different types of decisions to make. You should create a table listing stakeholders and their typical decisions, categorizing them into situational, scenario-based, and high-level decisions.

EI1: Always do this exercise: Identify five stakeholders and their ten typical decisions, then prioritize and focus on one. Determine how data governance can help this decision-maker make better decisions.

EI1: Create motivation and relevance for why this is important. Stabilizing this part is fundamental. It helps create narratives of motivation and viability, determining why this is relevant. This step will also guide whether you need to focus more or less on sports organizations. If this part is well established, you could apply the same example to any other industry, like a shoe factory, and determine the main stakeholders, their decisions, and how to classify them. It works the same way.

EI1: Next, you need to refine what you'll work on by understanding the current state of data governance in an organization. You'll have to define a data governance framework, which is a complex exercise.

EI1: This complexity arises because you're not dealing with a sophisticated company but rather trying to implement data governance in a small or medium-sized enterprise (SME). Data governance exists within a broader spectrum of information and technology, which in turn exists within an organization. So, you're not addressing the initial level.

EI1: If you were dealing with a company that already has this foundation, you'd be talking to a Chief Data Officer (CDO) who is already working on these topics. But in an SME, many of the roles you mentioned don't exist. You'll have to clarify these roles for them to be relevant. Technically correct themes might not have practical viability. Your thesis's relevance will depend on the choices you make.

EI1: For SMEs, it's challenging because they might not have a Chief Information Officer (CIO) or CDO, or even an IT strategy. How can you work on a detailed data strategy without an IT strategy? These are the constraints you need to consider.

EI1: If your thesis is more conceptual, you need to create a narrative that assumes certain premises. Show a model of a typical organization, assuming various dimensions, and then discuss data governance.

EI1: Even large organizations might not be focusing on data governance, let alone small ones, due to numerous issues. Discussing roles and functions can be challenging in this context.

EI1: Stabilize your definitions, make assumptions, and proceed step by step. Once you reach data governance, your strategy might be interesting and implementable.

EI1: Data governance is not done in isolation; it's part of a broader information and technology cycle. Documenting good practices at various stages is crucial. When implemented, understand the synergies between data governance and other areas like security, compliance, and risk.

EI1: Look at COBIT. COBIT addresses how an organization creates value from information and technologies. It's broad, covering all themes related to information and technologies. It documents, defines, and identifies these themes.

(Brief explanation of the COBIT framework)

EI1: Check if COBIT fits your needs. If you have any questions, you can message me.

GF: OK, great, thank you very much.

APPENDIX B – SPECIALIST INTERVIEW II

Gonçalo Filipe (GF): So, the basic idea is to have a data governance strategy to improve the efficiency of sports enterprises in this era of sports information, where we have a lot of information, a lot of data, and sometimes companies don't know how to implement it.

GF: The first thing I want to show you is the problems I identified by analyzing articles. I can tell you that I didn't find it very easy to create the strategy in the sports world. Why? Because there is very little information available at the sports level. So, I found some assumptions that I thought would be interesting to address and create the strategy accordingly.

GF: The assumptions are small and medium-sized companies face challenges in strategic decision-making due to the large volume of data, highlighting difficulties in data quality, privacy, security, and accuracy. Secondly, companies face challenges in data governance decisions, leading to ethical, practical, and legal issues in managing sports data, such as GDPR compliance.

GF: Then, sports companies are required to adapt technologically in a context of digital transformation. As we have ever-evolving technology, companies must find a way to be in constant adaptation.

Expert Interviewed 2 (EI2): Yes, this is very relevant. I work a lot with the transformation from legacy system architecture to more modular system architecture. This allows for business scalability and flexibility because legacy systems are monolithic, meaning everything is embedded in the code. Whenever a change is needed, it doesn't allow for that flexibility and scalability. That's why there is a need for a shift to modular architecture for achieving flexibility.

GF: Fourth point, the use of legacy systems, as you mentioned, requires modernization, which can present conflicts during the process of replacing and integrating new technologies. The last point is the often-unclear role of the CIO, which may not even exist in small to medium enterprises. This can involve high costs and complex technologies to handle large amounts of data.

GF: This relates to the company where we want to implement a data governance strategy. As I mentioned, many don't even have data governance and have no idea what it entails, much less have a CIO.

EI2: They often also lack a DPO, which is a Data Protection Officer. The CIO tends to be a board executive with a broader vision of all information and data flows, whereas the DPO is a specialized department focused on creating norms and rules for data protection and transfer. It's important to understand the DPO's responsibilities, as companies with a mature data governance level often have both a CIO and a DPO. This distinction is more common in developed and mature companies.

GF: OK. Moving on to my strategy, I've formed something like this, where we initially determine the type of organization, whether it's a line organization or a matrix organization.

GF: A line organization is a hierarchy where someone working in a department has a team leader, who then reports to someone else up to the executives. In a matrix organization, you have teams working by processes, with specialists from each area collaborating to deliver the best possible outcome. Depending on the chosen organization type, you either create a specialized department for data governance in a line organization or implement a project/process for data governance in a matrix organization.

GF: Moving on to the next step, the process model is the entire process I follow to implement data governance before regular operations.

GF: For implementing the strategy, my process model is explained in two steps: this process that you see here, which I will explain, and then a second part that includes pilot, implementation, and scaling. We define the pilot, then what we want to implement in that pilot, and finally scale it up.

GF: The second part is the pilot, which has several steps within it.

GF: So, in the first part of the process model, the design phase is when we define the data strategy we want to implement, the roles of each person, each process, the entire structure, data governance services, and the operational model.

GF: In implementation, the implementation pilot is basically the data processes, data spaces, and the quality of the data spaces.

GF: Then, the scaling step is very simple: if you have a pilot running well, you apply it on a larger scale.

GF: After implementation across all company processes, you move to control and optimization. However, once a pilot is successfully implemented and scaled, you can proceed to control and optimization for the previously implemented pilot. These phases don't necessarily depend on each other to move forward.

GF: Control involves monitoring data quality and managing data projects. Optimization includes automation, process optimization, innovation factors, and competency groups.

GF: The pilot is divided into several steps necessary for implementing a new pilot. These steps include onboarding, where you establish process competence, organizational competence, and contact persons. Depending on the stakeholders, you define the responsibilities within this process.

GF: Next is data transparency, where you identify the systems, data you want to use, and data domains.

GF: Then, in the trim data spaces step, you adapt data steps, assign data responsibilities, designate data domains, and allocate data governance roles to project managers.

EI2: This might belong in the design phase. It's crucial because the design includes defining the strategy and operational model, which dictates the implementation. In my view, during the design phase, you should map the data and understand the current situation. In the pilot phase, you should assess responsibilities based on the design. Initially, you analyze the current situation and define strategies and the operational model.

EI2: Because this is your process for defining data governance in a company, right? Whether it's line or matrix?

GF: I usually prefer a matrix organization.

EI2: OK, that's important to mention to ensure understanding.

EI2: I think you are focusing too much on the pilot, and I believe the most crucial part of this process is the design phase. It's in the design phase that you assess the current situation and identify gaps, which is very important, especially for companies with existing processes looking to improve. Initially, you

need to map out all the data flows. After that, you define the strategy and operational model to implement the strategy. Then, you create a pilot based on what you defined in the design phase.

EI2: Creating the pilot also involves defining a roadmap, specifying the stages, and determining when they will be executed. Once you have the pilot, you implement it and evaluate its success. If it works well, you scale it; if not, you revisit the design to adjust the strategy. It's essential to show that pilots often don't succeed on the first try and need to be redefined and improved based on lessons learned.

EI2: Additionally, I would change the activity names to include more action verbs. Looking at the process, it's not immediately clear what will happen. Use verbs and be straightforward, as activities should translate into actions.

GF: OK, continuing, in this step of training data spaces, we first define the data spaces where the datasets fit. Then, we train and create initial data projects.

GF: Finally, we move to regular data governance operations. This involves understanding the data, identifying improvement potentials, implementing data projects, and monitoring data development. This cycle needs to be implemented in the company for effective data governance. I use a framework called TRUSTEE, which has seven layers, each addressing different aspects such as ethics, security, monitoring, and privacy, and it uses machine learning and artificial intelligence to enhance company processes.

EI2: You need to understand how to compare the capabilities of the framework with your needs. It seems quite complex, and it's important not to overwhelm the company. It's crucial to identify the gaps and opportunities by analyzing the current state of your organization and mapping out the services or applications that are lacking. Determine if the organization will have big data management and map out the opportunities for improvement. This framework serves as a base reference. You also need to assess the company's maturity to see if there is room and capacity to implement data governance.

EI2: You understand this in your mind, but not all companies will understand data governance. You need to reflect this somewhere, assess the company, understand the strategy, IT vision, and general strategy of the company. Understand if it's a business in the sector, whether it deals with critical data or not, and the volume of data transactions. Not all companies will need this, and many people won't have the capacity for it. That's why you're showing this model.

EI2: Another thing, you decided to focus on line and matrix organizations. However, what you showed next was only matrix. So, I don't know if in your thesis you will talk about both or not.

GF: I have the explanation of both, but I state that I prefer a matrix organization.

EI2: You prefer matrix? It could be that in the sports sector, companies might lean more towards a matrix structure, but you need to justify and link this to sports to justify why you're focusing on matrix. Try to find a justification for matrix because sports use matrix more, making the transition to sports more seamless.

EI2: Another thing, when you mentioned matrix and line, I think it would be interesting to have something more visual in the presentation. Show the structure of a matrix organization and a line organization, highlighting the specialist department.

EI2: There are not only these two types of organizational structures. You need to state that, based on all existing structures, you defined two. If you don't do this in your thesis, try to categorize the different

structures into these two macro categories you mentioned. There are many structures, and it might be better to justify why you chose these or allocate others to these categories for simplicity.

EI2: Important to understand the integration between applications. Data governance involves more than just technology and processes; it also includes data integration and interoperability, which is how data is transferred between applications to ensure security, performance, and other factors.

GF: OK. Thank you for your availability and help; it was very useful.

APPENDIX C – SPECIALIST INTERVIEW III

Gonçalo Filipe (GF): So, the basic idea behind this project is to develop a data governance strategy to enhance the efficiency of sports enterprises in the current era of sports information. We have an abundance of data, and many companies struggle with how to implement effective data management.

GF: To start with, I identified several key issues while analyzing various articles. Creating a data governance strategy in the sports industry is not straightforward due to the limited amount of specific information available. Here are some assumptions I made that guided the development of the strategy.

GF: Firstly, small and medium-sized companies face challenges in making strategic decisions due to the overwhelming volume of data. They struggle with data quality, privacy, security, and accuracy. Secondly, they encounter challenges in data governance decisions, leading to ethical, practical, and legal issues in managing sports data, such as GDPR compliance.

GF: Sports companies also need to adapt technologically in a constantly evolving digital landscape. As technology evolves, companies must continuously adapt to stay relevant. Another point is the use of legacy systems, which require modernization and can present conflicts during the process of replacing and integrating new technologies. Finally, the role of the CIO is often unclear or nonexistent in small to medium enterprises. This can result in high costs and complex technologies needed to manage large data volumes.

GF: So, in my strategy, initially, we determine the type of organization, whether it's a line organization or a matrix organization. In a line organization, there's a hierarchy where each department reports up to the executives. In a matrix organization, teams work by processes, with specialists from each area collaborating. Depending on the chosen organization type, you either create a specialized department for data governance in a line organization or implement a data governance project/process in a matrix organization.

GF: Next is the process model, which involves the steps I follow to implement data governance before regular operations begin. The process model is explained in two steps. First, the design phase, where we define the data strategy, roles, structure, data governance services, and operational model. Second, the implementation phase, which includes the data processes, data spaces, and ensuring the quality of these data spaces.

Expert Interviewed 3 (EI3): This design phase needs to be emphasized, as it is crucial for assessing the current state and identifying gaps. Mapping out data flows and defining the strategy and operational model should be prioritized before moving to the pilot phase.

GF: That's a good point. Then we have the scaling step. If the pilot runs well, we apply it on a larger scale.

EI3: Highlight that pilots often require multiple iterations. Not all pilots succeed initially, and it's important to refine them based on lessons learned. This iterative feedback loop should be clearly articulated in your strategy.

GF: I'll make sure to emphasize that. Once implemented across all company processes, we move to control and optimization. After a successful pilot, we can scale up or move directly to control and

optimization. These phases don't necessarily depend on the implementation of the other pilots. Control involves monitoring data quality and managing data projects. Optimization includes automation, process optimization, fostering innovation, and building competency groups.

EI3: You should ensure that the names of activities in your process model are action-oriented and clear. Use verbs to describe what each activity entails, making it straightforward and understandable.

GF: Ok, sure. The pilot phase includes several steps necessary for implementing a new pilot, such as onboarding, establishing process competence, identifying stakeholders, and defining responsibilities. Then, the data transparency involves identifying systems, data to be used, and data domains.

EI3: Emphasize the importance of data integration and interoperability. Data governance is not just about technology and processes but also about how data is transferred between applications securely and efficiently.

GF: Absolutely. The trim data spaces step adapts data steps, assigns responsibilities, and designates data domains and governance roles.

GF: Finally, regular data governance operations involve understanding data, identifying improvement potentials, implementing data projects, and monitoring data development. This cycle must be implemented to ensure effective data governance. I use a framework called TRUSTEE, which has seven layers addressing various aspects such as ethics, security, monitoring, and privacy, utilizing machine learning and AI to improve processes.

EI3: Ensure that the TRUSTEE framework is not too complex for the company. Compare its capabilities with the company's needs and identify any gaps. It should serve as a reference and be adaptable to the company's maturity level. Also, provide a solid justification for preferring matrix organizations, especially in the sports sector. Link this preference to the specific needs and dynamics of sports companies.

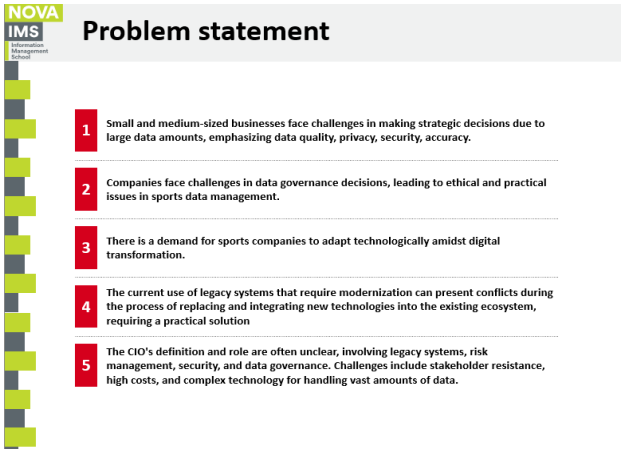
GF: I will. And I'll also clearly articulate how the continuous improvement cycle works in regular operations. Explain how you will identify improvement potentials, implement data projects, and monitor development to ensure ongoing effectiveness in data governance.

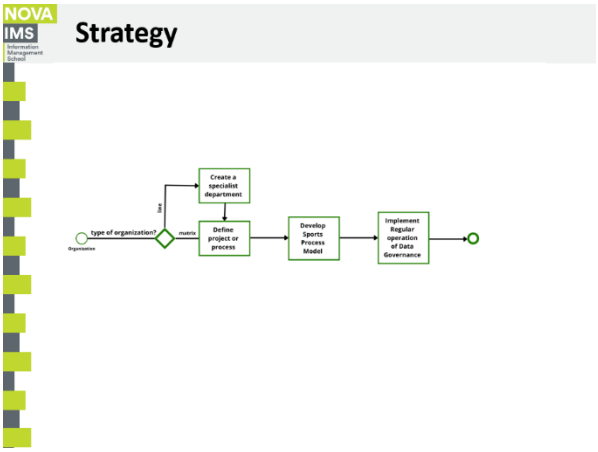
EI3: Exactly. Your strategy is comprehensive and well-structured. Addressing these points will make it even stronger and more practical for implementation in sports enterprises.

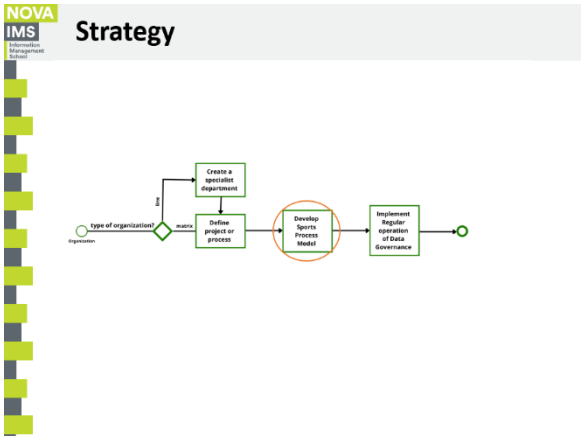
GF: Thank you for your valuable feedback and recommendations. This has been extremely helpful.

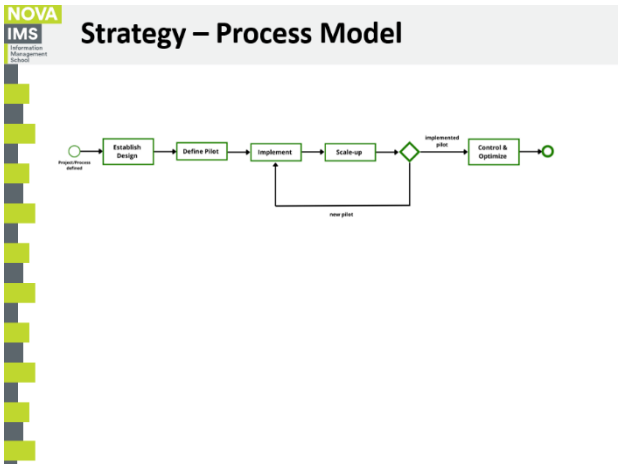
ANNEX

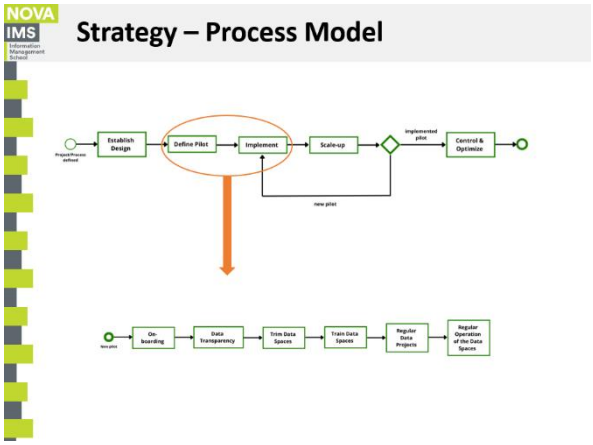
The annex slides included in this thesis present the detailed content and key points from the presentations conducted during the expert interviews, providing a visual summary of the strategies and discussions that informed the research findings.

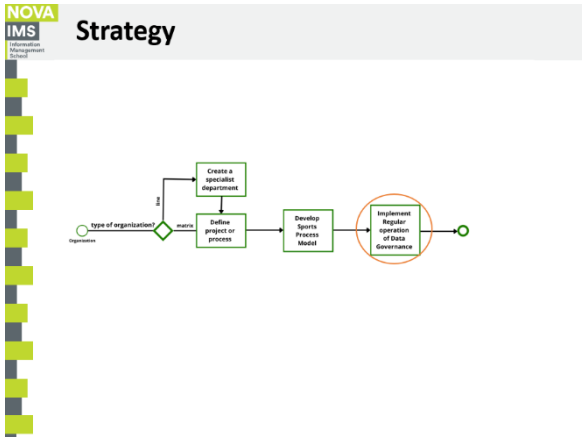




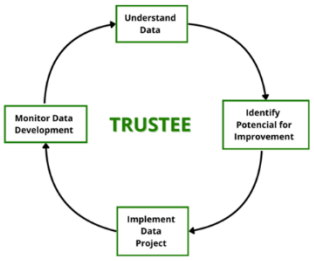








Strategy – Regular Operation of DG



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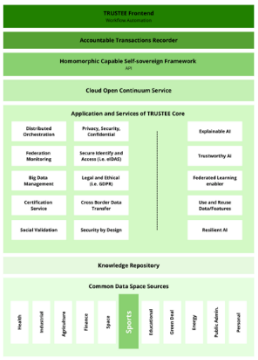

Interview Questions

1) Do you consider the proposed strategy as useful and why? If not, why do you believe it is not?
2) Do you have any criticism towards the proposed strategy? Please explain.
3) Would you consider to implement the proposed strategy? Please clarify why/ why not.
4) Do you have any recommendation or suggestions for further improvements of the proposed strategy?

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