

## Article

# Sport Logistics: Considerations on the Nexus of Logistics and Sport Management and Its Unique Features

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**Abstract:** *Background:* This paper is the first-ever discussion of sport logistics as an intersection of the academic disciplines of logistics and sport management. *Methods:* It reviews past literature and states that logistics in sport is widely overlooked in academic literature. It illustrates the importance and pervasive nature of logistics in the sport industry and questions how sport logistics can be positioned at the interface of logistics and sport management science. Both disciplines are contrasted under the common lens of Porter's value chain. *Results:* Operations, organization and marketing are identified along with economics and strategy as areas of sport management (highly) involved with logistics. Sport logistics is defined as a research area dealing with storage and transportation issues in sport organizations. *Conclusions:* Based on a case example from practice, athlete equipment logistics, the authors elaborate on the unique characteristics of managing logistics in sport, e.g., low competition, personal relationships and high demand predictability. They call for a broader discourse on sport logistics in academia.

**Keywords:** logistics; sport; management; supply chain; sport equipment; organization; operations



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## 1. Introduction

Logistics plays a crucial role in many industries and is of great importance for many companies as it offers a holistic perspective on value creation and considers processes as flows in cross-interface networks. If we look at large industries and ask whether they are already taking logistics sufficiently into account, we quickly come to sport and the realization that logistics is still largely neglected here and that a more comprehensive inclusion of logistics know-how would represent a great added value for sport organizations.

Sport management is concerned with issues in practice related to sport organizations. One of the manifold issues that most sport organizations must deal with is the movement of material, people and/or information. Movements in sport take place in a wide variety of contexts: athletes are provided with equipment; hobby sportsmen spend part of their income buying the latest sport articles; manufacturers supply their production to produce sporting goods and then distribute them; sport clubs sell merchandise to their fans; spectators travel to and from stadiums to watch games; at sport events, spectators are provided multiple services that require routing and material supply; athletes and officials need transport to and from venues; tourists travel worldwide for active and passive sport participation; clubs and personal trainers organize daily training sessions (e.g., in fitness centers or sport academies); sport facilities require maintenance and equipment modernization; television stations build mobile studios at sport events.

All of these movements require different sets of functions to be carried out. The most common actions are transport and storage, which constitute the classic physical core of the superordinate functions of procurement, supply, inventory management, order fulfillment, disposition, and distribution [1]. Successful movements require the sophisticated design of

systems, prescient planning, sound control of operations, good quality management, high process (information) transparency, and proper communication.

However, there is no conceptual umbrella for logistics in sport covering all of the tasks and concrete actions described above. Herold et al. [2] and Kauppi et al. [3] offer broader scientific approaches to address these challenges, albeit with clear limitations. Additionally, a few sport management subdisciplines, such as organization, operation or marketing, address logistics issues. However, all of these studies look at specific issues and adopt their own perspective. They do not address the ‘movement problem’ in sport from a global perspective. They do not place issues in the overall context of logistics and sport management. The central question of how to shape the required movements in sport in a reasonable way is neglected.

This paper calls for scientific discourse on sport logistics and centers on the following leading research question:

How are logistics and sport management related?

On the way to answering it, the paper develops along further accompanying research questions: Why is logistics of importance in sport? How can the intersection between logistics and sport management be described and defined from an academic and application perspective? Why does managing logistics in the sport industry differ from other sectors?

The paper starts with a theoretical background of the mother disciplines logistics and sport management and the importance of logistics in sport. Subsequently, it elaborates on the commonalities of logistics and sport management and discusses the intersections of both academic disciplines. Porter’s generic value chain framework is used to compare both disciplines under a common lens. A definition of sport logistics is proposed and an overview of important reviews at the interface of logistics and sport is given, revealing that it is an open space in science. The pervasive nature of logistics in sport is illustrated. Section 4 complements the theory with insights from practice: using the example of athlete equipment, unique characteristics of sport logistics are presented. The paper closes with a discussion of the central findings and identifies approaches for further research.

## 2. Theoretical Background

### 2.1. Logistics

Logistics is a principle pervading all physical things and their movements. At the same time, it is an expression of people’s aspiration to set things in motion [4].

The term ‘logistics’ has a wealth of definitions and synonyms [5,6]. It originated in the military field as a collective term for tasks serving to support the armed forces; from there, it found its way into economics [7]. One of the most common definitions is the flow-oriented definition, which states that logistics comprises all activities to efficiently manage all flows of goods, services and information from a source to a sink [6,8,9]. While flowing, goods, services and information are subject to different transformation processes with regard to time, space, quantity, type, composition, value, shape, and handling properties [6,10].

Depending on where this flow takes place, intralogistics, extralogistics and interlogistics are distinguished [11]. Intralogistics comprises internal (in-company, in-plant) flows [12–15], also referred to as material handling [16,17]. In contrast, extralogistics (transport logistics, transportation) are flows outside of buildings, often using public infrastructure [18,19]. Interlogistics combines intra- and extralogistics in intercompany logistics networks of several participants, i.e., supply chains [9,20–22].

The scope of logistics can be divided into four areas: procurement, operations, distribution, and reverse logistics [23–26]

### 2.2. Sport Management

Sport can be characterized as physical exercise determined by competition in a ‘non-hostile’ manner [27]. Gaining knowledge about sport and communicating it is the goal of sport science [28–30], of which sport management is a sub-field that examines the economic aspects of sport with a focus on business management functions such as planning,

organizing, leading or controlling [31,32]. Topics such as marketing, operations or organization are subject areas on their own within the field of sport management comprising diverse logistics aspects such as the importance of logistics management for the marketing infrastructure [33] or process design for sport club operations [34]. These aspects, however, are often discussed only within one subject area, which does not do justice to the pervasive nature of logistics as a cross-sectional business function.

Sport has ‘emerged as an industrial sector in its own’ with multifaceted obstacles for managerial practitioners ([35], p. 202). Although sport can be clearly distinguished from other sectors of the economy [36], sport management must nevertheless draw on other areas of management research in order to develop its own potential [37]. Chalip [38] embraces this notion, pointing out the importance of linking the sport management discipline to nonsport sectors of the economy wherever linkages are potentially advantageous but currently missing.

### *2.3. The Importance of Logistics, Sport, and Logistics in Sport*

Today, the global logistics market is worth approximately EUR 5.27 trillion (2020) and is expected to increase from 2020 to 2024 at a CAGR of 4.7% [39]. The importance of logistics is steadily increasing, especially in the age of globalization. Logistics has become a crucial success factor for companies [23,40], regardless of whether a company is a manufacturer, wholesaler, retailer, or service provider. In addition to helping increase the sales and profits of businesses, good logistics is key to high customer satisfaction achieved by delivering the ‘right’ service in terms of (i) time, i.e., the time between customer order and delivery; (ii) reliability, i.e., compliance with the agreed delivery time; (iii) readiness, i.e., the ability to fulfill customer orders immediately from stock; (iv) quality, i.e., conformity of the delivery with the order in terms of type, quantity and condition (e.g., undamaged, cooled) of the goods and (v) flexibility, i.e., the ability to respond to customer requests regarding order placement, delivery methods, and information about current orders [23].

Similar to the logistics market, the global sport market is continuously growing. In 2020, global sport was a one trillion EUR global market with 2.7 bn people participating in sport, a figure expected to reach 3.5 bn people in 2025 [41]. Sport has become big business [42], and failing to recognize sport as such will produce poor performance on and off the field [43].

With its doctrines of value- and benefits-oriented thinking, system thinking, total cost thinking, service thinking, and efficiency thinking, logistics can elevate sport organizations to the next level. Professionalization is ongoing at all levels of sport organizations [44–46]. Global sport mega-events are the world’s largest non-military related logistics events and set high requirements for logistics in professional sport [47]. Herold et al. [2] propose four pillars of sport logistics management: venue logistics management, sport equipment logistics management, athletes logistics management, and fan and spectators logistics management. They state that ‘sport logistics management [...] is a heavily under-researched area that provides an abundance of scientific opportunities’ (p. 1). This is all the more true considering the multiple areas of logistics management in sport beyond sport events, e.g., the management and equipping of training facilities, the maintenance of sport equipment, the coordination of multifaceted regular (daily) training sessions, or even areas that derive from other industries with strong logistic influences, such as sport retail, sporting goods production, or sport tourism.

## **3. Scientific Confrontation**

### *3.1. Commonalities of the Sciences of Logistics and Sport Management*

The sciences of logistics and sport, particularly sport management, share a number of commonalities:

They are relatively young. The disciplines’ scientific development started at the end of the last century. In comparison to long-established sciences such as astronomy or philosophy, both sport management and logistics are still ‘new’ [10,38,48–57].

They are interdisciplinary sciences. They integrate subsections from different ‘classic’ sciences as auxiliary sciences, e.g., statistics or economics [10,38,50,52,58–62].

They are typical cross-sectional disciplines. Their fields of action permeate almost all areas of an institution, e.g., organization or information [6,45,52,54,63,64].

They are applied sciences. In addition to fundamental research, both disciplines have a significant focus on practical relevance [38,48,57–59,65–67].

They lack a unified theory. There is no rigorous orientation toward theory development. Instead, divisions between subareas are often used [5,38,40,51,52,58,61,62,68–72].

The commonalities listed show that the logistics and sport management disciplines are not as far from each other as one might think at first sight. In the following, substantive academic intersections of the disciplines of logistics and sport management are discussed after both disciplines are examined by the use of a common lens.

### 3.2. A Common Lens: Porter’s Value Chain

In order to contrast the two areas of logistics and sport management, Porter’s generic value chain framework [73] is used as a common lens. It describes organizations as a collection of activities needed to design, produce, market, deliver and support their products. The physically and technologically distinct activities an organization performs to create a product valuable to its buyers are understood as value activities. They are divided into primary activities and support activities. The primary activities are inbound logistics, operations, outbound logistics, marketing and sales, and service. They are engaged with the creation of the product, its transfer to the buyer, and after-sales assistance. Each of these value activities depends on four support activities to be performed: firm infrastructure, human resource management, technology development, and procurement.

The field of logistics is deeply involved with the value chain activities. This is most obvious for the activities of inbound logistics such as receiving and storing and outbound logistics such as order processing and distribution. However, the remaining three primary activities also clearly contain elements that lie within the core competence of logistics, albeit to a lesser extent, e.g., an assembly line as the core of a manufacturing company’s operations heavily depends on the right provision of the assembly components; an omnichannel retailer must operate a logistically sound network to send the goods through various sales channels; fast and reliable access to spare parts is key to a machinery company’s after-sales service in order to avoid downtimes at their customers.

In contrast to logistics, sport management only partially deals with the activities of Porter’s value chain. Operations as well as marketing and sales are respected subareas of sport management and can be considered to be extensively covered. The context of both areas is strictly in line with Porter. Operations in sport management puts the transformational process in the center of attention that creates, maintains and improves the delivery of sport products and services [74]. In the case of operating a sport facility, for instance, this could involve opening doors on time, having the facilities cleaned or providing athletes, staff and coaches with the equipment needed [74,75]. Marketing and sales in sport management is viewed from two angles: how to market sport products and services to consumers and how to market non-sport products through the use of sport [76]. Focal points often are branding and market positioning (Porter refers to it as advertising and promotion [73]). Service as an activity to ‘enhance or maintain the value of a product’ ([73], p. 40) plays a role in many aspects of sport management, although it is not necessarily seen as a subfield on its own, but integrated, e.g., in the aforementioned [77,78]. The mentioned sport operations focus on maintaining, for instance, comprises mainly aspects of Porter’s service activity. Very little (almost no) coverage is provided by sport management for the activities of inbound logistics and outbound logistics, e.g., Schwarz and Hunter [33] mention the need for a sport organization to position their sport products in the right place and at the right time, considering it a sport marketer’s job and, thus, speak of ‘sport marketing logistics’ ([33], p. 161). A reason for the underrepresentation of Porter’s logistics activities in sport management can possibly be found in the fact that most sport is experienced as a service [76]. However, these services not always are completely

intangible, but often include ‘indirect goods’ ([33], p. 152) and, thus, require logistics handling as much as tangible sporting goods (e.g., game equipment, clothing, footwear) do. Such ‘tangible services’ ([33], p. 152) can comprise, e.g., access to medical equipment or access to food for a competing athlete or for a spectator in a stadium.

In summary, it can be stated that sport management is not yet sufficiently developed to comprehensively reflect Porter’s value chain framework. White spots lie particularly in the logistics activities. Enhancing sport management to include logistics management aspects can thus be of great benefit to sport organizations.

### 3.3. Substantive Academic Intersections

From the list of commonalities and Porter’s value chain as a common lens, the first intersections in terms of content can be derived. The greatest intersection is obviously that on the central stage of logistics and sport management is organizations. Circumstances in organizations are core points of research for both disciplines and thus are the reason why both fields are considered interdisciplinary, cross-sectional and applied [7,49,79–84].

In logistics theory, the aggregation levels of macro, meso and micro logistics are differentiated. Macro-logistics basically refers to all infrastructure of an economy, e.g., roads, waterways, airports, pipelines, and telecommunication networks. Micro-logistics refers to the logistics of single organizations, limited by legal boundaries. Meso-logistics is the level between macro- and micro-logistics, comprising parts of both. This is the case when several organizations cooperate and use parts of the public infrastructure (e.g., wholesalers, retailers and forwarders operate in the same sales channel) [6,11].

Sport management theory adopts the same aggregation levels, although the meaning of the terms is somewhat different. The macro-economic level relates to the overall economic significance of sport (e.g., employment, national income) and the relationships between the sport system and its environmental systems. The micro-economic perspective concentrates on the economic activities of individuals (e.g., consumers, club members). In between macro- and micro-economics, meso-economics in sport focuses on formal organizations and institutions that coordinate the actions of individuals (e.g., clubs, commercial institutions) [32,85,86].

Comparing the aggregation levels of logistics and sport (Figure 1), it becomes obvious that the understanding of the macro level is equal in the two fields, whereas the understanding of the micro and meso levels differs. The lowest level of sport management theory, the focus on individuals, does not explicitly apply in logistics theory, while the meso level of logistics theory, the focus on networks, does not explicitly apply in sport management theory. Both sport management and logistics focus on organizations; however, in logistics theory, organizations are represented by the micro level, while in sport management theory, they are represented by the meso level.

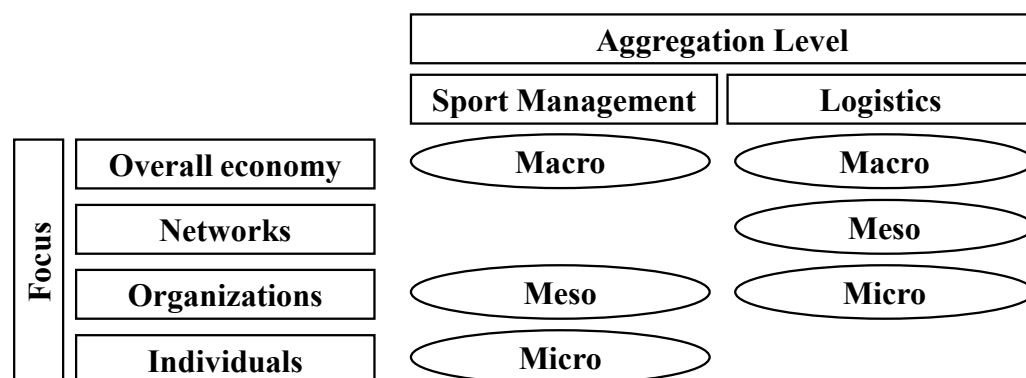


Figure 1. Comparison of aggregation levels.

Sport management comprises several areas of activities that are mainly derived from classic business management fields and have a direct link to logistics. As such, a closer look



is now taken at marketing, economics, strategy, organization and operations. Marketing in sport comprises all activities for the production, pricing, promotion, and distribution of a sport product to meet the needs of customers [87]. On the upstream side, sport marketing logistics meets the customers' needs through purchasing and supply chain management [33]. On the downstream side, the focus is on the physical distribution of sporting goods, e.g., omnichannel delivery [88].

Sport economics considers economic issues in sport from the economic theory perspective, including, among others, the application of macro- and micro-economic theories to economic problems and the concepts of price and market systems [31,89,90]. Human behavior is studied in research examining the tension between an intention and the scarcity of resource alternatives to fulfill it [91]. In other words, economics is concerned with decisions about material goods that humans consider necessary for their well-being [92]. This is where logistics steps in: all material, especially all anthropogenic, manmade material, need to be moved—at least once. Accordingly, logistics science explicitly and implicitly has a place in economic science and contributes to it by interpreting economic systems as networks and interpreting economic processes as flows [59]. Economics, in turn, is an inherent component of the science of logistics (see 'three columns of logistics' in [10]).

Strategy is understood as a paradigm to position an organization to gain a competitive advantage. The process of formulating the paradigm, adapting it and deriving specific measures from it is referred to as strategic management [93]. Two sets of research are distinguished: process research considers how to construct and implement strategies, while performance research seeks to understand the relationship between strategy and performance [94,95]. Process and performance management both play an essential role in logistics. From the strategy perspective, logistics is a management approach to develop, design, control and realize the flow of objects in networks [10]. Based on this fundamental way of thinking, logistics has developed into a strategic design element for organizations. For example, questions of storage strategies (e.g., central/decentral) or distribution strategies (e.g., direct/indirect) are crucial and fundamental to operational arrangements and a company's success [23].

Organizational theory is 'concerned with the structure, processes, and design of organizations and their subunits' ([96], p. x). While the theory was originally structure-oriented, a process-oriented approach eventually developed when Porter [73] stated that 'it is the value chain, which divides a firm into the discrete activities it performs' (p. 26) and enhances competitive advantage. Modern logistics represents a holistic perspective on value creation, from supply to production to distribution and from planning to design to control, and pays special attention to the interfaces of subprocesses and their integration [97]. To this end, in organizational logistics theory, there is a third important component in addition to formal structure and process, i.e., the physical value-adding structure. That refers to physical and geographically deployed but stationary infrastructure as a substantial platform (foundation) of operational performance and an important point of reference for organizational design [68,98–101].

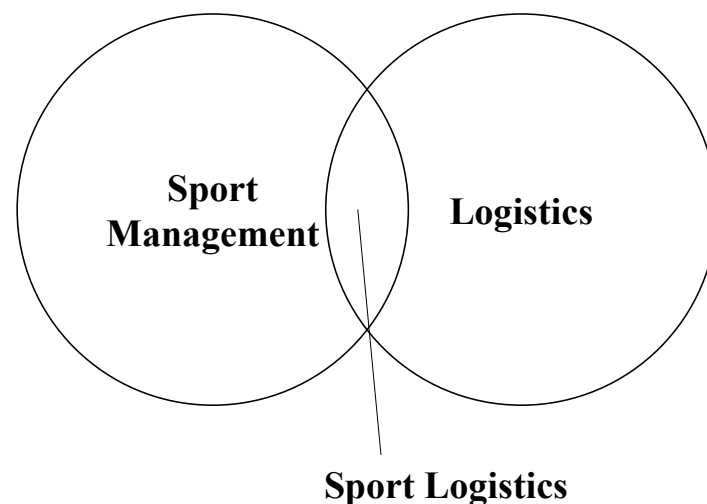
Tying in with placing structures and processes at the center of attention is the approach to see sport organizations as systems of input-throughput-output, and feedback [44]. This view is in line with the perspective of input-transformation-output relationships, a central paradigm of logistics theory [6,10,11,102].

Operations is the area of sport management with which logistics is most closely associated. It is concerned with designing, planning, operating and controlling systems that transform resource inputs into product and service outputs [103–105]. In sport, operations often comprise facility and building management [106–110], merchandising, retail and distribution [35,107,111], event and venue management [35,106,107,109,110,112], performance management [45,107,111–113], and service and quality management [107,114]. The evolutions of operations and logistics have run in parallel, with shifts from mass production to mass customization and from local to global contexts [115,116]. The two disciplines share the input-transformation-output paradigm [6,10,11,102,103,117]. Mentzer et al. [102]

identify logistics as one of three functions of a company's operations (in addition to marketing and production) responsible for transformations of time and place. Gunasekaran and Ngai [116] use the logistics way of thinking in flows to describe the fundamental dimensions of operations management. Finally, operations and logistics have similar key performance indicators, including quality, dependability, flexibility, and cost [103,118].

### 3.4. Sport Logistics: Definition and State of the Art

As described above, logistics is significant for any industry where movements of material, people, and information must be carried out. Accordingly, logistics is important for the sport industry. However, the term 'sport logistics' and its academic examination are not widespread: the Google search engine delivers approx. 50,000 hits, the academic search engine Google Scholar only 80 (search date: 18 February 2023). In this paper, we define sport logistics as the intersection of logistics and sport management (Figure 2).



**Figure 2.** Sport logistics as the intersection of sport management and logistics.

We introduce sport logistics from a scientific point of view as follows:

From the perspective of sport science, sport logistics is about a specific complex of human leisure activities, and from the perspective of logistics science, sport logistics is about the movement of the goods necessary for these activities.

More simply spoken:

Sport logistics deals with storage and transportation issues in sport organizations.

Herold et al. [2] make the first attempt at a scholarly examination of this field. They conduct a systematic literature review, propose a definition of 'sport logistics management', and design a 'sport logistics framework'. Characteristics that shape sport logistics management are derived from sport event management and the supply chain operations reference model (SCOR). Four sport logistics pillars are defined: athletes logistics management, fan and spectators logistics management, sport equipment logistics management, and venue logistics management. In summary, the authors state that 'sport logistics management [...] is a heavily under-researched area that provides an abundance of scientific opportunities' (p. 357), and 'Research of sports logistics management lacks presence in leading academic sports and logistics journals' (p. 375). Of the four defined pillars, this statement applies most closely to sport equipment logistics management, described as the storage and transportation of required equipment for athletes, venues, and fans.

In a detailed survey, Kauppi et al. [3] examine the current state of research in sport operations management (sport OM) along the entire sport industry value chain (cf. [76]) in the government/public, the nonprofit, and the professional sport sector. They understand sport OM as the structured application of operations management theories and tools in sport management. The study comes to the central, overarching conclusion that the research field

is still in its infancy. On the way to this conclusion, the authors divide OM into eleven topics closely involved with logistics: capacity, layout, forecasting, purchasing and supply chain management, distribution, quality, project management, process design, strategy, inventory, and lean/just-in-time. For each topic, they raise new research questions. The authors divide the research opportunities into four units of analysis: organization, league, sector, and industry. For most topics, they see research opportunities in all four units of analysis.

‘The summer Olympic games are considered by many experts to be the greatest, non-defence related, world-wide logistics event’ ([47], p. 621). These authors point out the importance and extent of logistics in sport in their paper on logistics at the Olympic Games in Athens 2004. They elaborate on the central challenges of logistics organization and identify six essential tasks (freight forwarding and customs clearance, warehousing and distribution, venue logistics, delivery coordination, asset tracking, and reverse logistics) and four fields of activity (planning, coordination, service delivery, and control). On this basis, the authors discuss outsourcing options and draft a framework for the design of logistics under the aspects of organization, processes and systems for future Olympics or comparable sport mega-events.

Looking at the academic literature, it can be stated that the field of logistics in sport is largely unexplored thus far: There are neither closed descriptions of the subject nor clear scientific-theoretical positions. Above all, there are no works in which authors consider sport logistics as a cornerstone of their overall research agendas. Although Herold et al. [2] are the first to investigate the state of the art of research that combines logistics and sport in a cross-disciplinary approach, the findings on the topic of sport logistics are not comprehensive. This is most evident in the classification of sport logistics management as a subdiscipline of sport event management. The same classification is used by Minis et al. [47]. Central areas of the sport industry in which logistics tasks are performed, e.g., the production of sporting goods or the regular operation of sport facilities, are not regarded. In the definition of ‘sport logistics management’ according to Herold et al. [2], a connection to the domain of sport can only be abstracted from the word ‘athletes’. Kauppi et al. [3] identify some sport logistics issues in their search for a status quo for sport operations management. Sport OM, however, also comprises topics that are not linked to logistics (e.g., cleaning of sport halls or door services), and logistics comprises topics not linked to sport OM (e.g., flows of sport products in networks) [74]. There is no universal classification of sport logistics in established subject areas following established classification schemes of sport and logistics. Given the high importance attached to sport logistics tasks and functions and the demand for further research, there is a need for a scientific discourse.

A judgment originally formulated by Horch et al. [31] for the field of sport business administration can be applied analogously to the papers considered here with a sport logistics reference: The common characteristic of these works is that they start from the ‘general fundamentals’ of their own subject areas, are very strongly oriented to these areas in their structure and content, and reference the subject of ‘sport’ usually only in an illustrative form, i.e., on the basis of practical examples, as in the case of Kauppi et al. [3] for operations management.

In addition to the fact that sport logistics has not yet been closely examined scientifically either as a discipline or as a concept, there are almost no studies on logistics from the perspective of a single sport organization, such as a club or association. Equally nonexistent are studies that put equipping athletes in a sport organization at the center of the investigation. This circumstance is addressed in Section 4.

From the cases outlined, it becomes obvious that a descriptive knowledge base for sport logistics is still missing. Not to mention the fact that there are no validated assessments, normative explanations or prescriptive recommendations. Knowledge generation in the field of sport logistics must, therefore, start from scratch.

### 3.5. The Sport Industry, Its Products, and Its Logistics

Management is coordination [44], and sport management is ‘a field concerned with the coordination of limited human and material resources, relevant technologies, and situa-



tional contingencies for the efficient production and exchange of sport services’ ([119], p. 15). The central objects of sport management are the products needed for active participation in sport or the passive watching of sport [31]. They can be tangible or intangible [44]. The market in which they are offered is defined as the ‘sport industry’ [120].

Table 1 breaks down the sport industry into four segments following Pitts et al. [120] and Robinson [46]. Table 2 breaks down sport products into four types following Heine-mann [86]. Both tables assess the need for professional logistics for each area. Professional logistics is here understood as logistics activities carried out by (internal or external) professionals or companies with profound knowledge of transportation and warehousing, procurement, distribution and reverse logistics, as well as the organizing and planning of these activities. A need for professional logistics emerges when the logistics job becomes too comprehensive (e.g., too much material to handle, overly complex functions of planning) to be carried out by non-professionals. Each area is assessed on a three-step scale of frequently, frequently to occasionally, and occasionally. It becomes obvious that logistics is an issue deeply interwoven with almost all areas of the sport industry and its products.

**Table 1.** Segments of the sport industry and the need for professional logistics.

Industry Segment	Description	Examples	Need for Professional Logistics
Sport delivery services	The means by which sport is offered to the customer as a participant or spectator	Amateur sport, professional sport, tax-supported sport, non-profit sport organizations, fitness and sport firms	Frequently to occasionally
Sport requirements	Products or services needed to produce or enhance the quality of sport	Fitness trainer, medical care, sport facilities, governing bodies, officials, sport education	Frequently to occasionally
Sport products	Products that contribute to the services of the sport industry	Equipment, clothing, satellite television	Frequently
Sport support services	Products or services that support and promote sport	Merchandising, promotional events, media, sponsorship, endorsement	Frequently to occasionally

**Table 2.** Types of sport products and need for professional logistics.

Type of Product	Product Groups	Need for Professional Logistics
Sport opportunities	Sport facilities, infrastructure, sport milieus, organization	Frequently
Sport equipment	Sport device, sportswear, sport accessories, sport nutrition, operating materials and tools	Frequently
Services	Learning a sport, training, promotion, consulting, supervision, sport events	Frequently to occasionally
Connecting products	Entertainment, information, sponsoring, insurance, betting, medical care, non-marketable products	Occasionally

The industry segment ‘sport products’ (Table 1) covers physical products contributing to sport services. Along the whole (supply) chain from production to provision for use, movements are continuously necessary. Thus, logistics is frequently needed. For the other three industry segments, professional logistics is frequently to occasionally needed, depending on the specific use case. For example, merchandising does not function without professional logistics support, whereas governing bodies do.

For the sport product types (Table 2), sport opportunities and sport equipment cannot be provided without a heavy reliance on professional logistics. For example, continuous

supply and disposal are needed for sport facilities and sport milieus and means and routes of transport are crucial infrastructures. Whether a service frequently or occasionally needs logistics depends on the service; sport events regularly do need logistics, whereas consulting does not. For connecting products, professional logistics is occasionally needed; e.g., medical material might be supplied by logistics professionals.

#### 4. The Uniqueness of Logistics in Sport

Complementing the previous theoretical discussion of logistics in sport, this section intends to illustrate the uniqueness of managing logistics in the sport industry. To this end, a closer look is taken at a specific case of application in sport logistics: equipment logistics. As early as 1995, Slack [53] raised the question of ‘how to maintain inventories of athletic equipment’ (p. 97). However, since that time, this question has never been the center of attention of scientific discourse [2]. In their sport logistics framework, Herold et al. [2] see athletes, venues and fans as equipment recipients. This section expands the framework at the point of athlete equipment logistics. For this purpose, the authors draw on personal professional experience in sport logistics accompanied by secondary data.

##### 4.1. Case Example: Athlete Equipment Logistics

For the European Football Championship in 2012, representatives of the German Football Association (DFB) traveled to the host countries several times to ensure optimal logistics during the tournament. Even before the athletes’ arrival, six trucks with 37 t of material were brought to the accommodations in Poland. This material included jerseys, suits, leisure wear, and shoes but also items not directly needed for playing soccer, such as a pool table. ‘Theoretically, the players could have boarded the plane with only their underpants and sponge bag’ [121].

It has become common practice, especially in professional sport, for athletes to have large parts of their ‘trappings’ taken away from them or taken care of for them by functional teams so that they can fully concentrate on practicing their sport and perform their best on the playing field. This approach follows the view that in top-level sport, marginal gains determine victory and defeat [122]. This development is part of a tension between the perception of sport as a game-centered and social institution and the perception of sport as a business. Logically, it seems that a failure to (also) view sport as a business would negatively impact performance both on and off the field [43]. Accordingly, in parallel to the on-field sector, the off-field sector is experiencing increasing professionalization [123–125], due not least to the continuous increase in interest in sport worldwide and the accompanying sales growth of the global sport market.

Athlete equipment logistics is understood as the supply of athletes with all the materials they need to practice their sport. It also includes the supply of materials needed by the functional teams working with the athletes. Athlete equipment logistics operates along the whole logistics chain, from procurement to distribution and reverse logistics, covering internal and external transports within and between different storage facilities. Table 3 presents typical material handled.

As the overview shows, the heterogeneity of the goods to be handled is high, ranging from light to heavy, from small to bulky, from soft to hard, and from inexpensive to expensive. Goods can have different owners or be perishable. Consequently, for logistics handling, different load carriers are necessary and need different loading and storing devices. For each handling unit, different information needs to be managed, and different experts are responsible for different specialized jobs.

The figures in Table 4 are examples of the extent to which athlete equipment logistics is emerging in the modern world of sport.

**Table 3.** Typical material of athlete equipment logistics.

Equipment Segment	Examples
Sportswear	Shirts, pants, footwear, sweat suits
Casual wear	Shirts, jeans, pullover, footwear
Business wear	Suits, suit shirts, suit shoes
Gaming equipment	Balls, rackets, bikes
Training equipment	Pylons, medicine balls, cross trainers
Medical equipment	Pharmaceuticals, bandaging material
Physiotherapy equipment	Massage benches, taping material, ice barrels
Catering equipment	Drinking bottles, pots, energy bars, fruits
Teaching material	Game analysis cameras, IT, tactic boards, school books
Leisure equipment	Pool table, lounges, video projectors
Private equipment (property of athletes)	Sponge bags, video game consoles
Other	Pennants, referee equipment, volunteer equipment, hospitality gifts

**Table 4.** Key figures reflecting the extent of modern athlete equipment logistics [47,122,126–129].

Figure	Description
30,000,000	Products purchased for Rio Olympics 2016
131,000 m <sup>2</sup>	Warehousing space utilized during Atlanta Olympics 1996
5000	Items packed each away game for the New York Jets NFL team
3535 km	Traveled by 4000 people plus equipment within 3 weeks of Tour de France 2016
6	Jumbo jets to move 50 t of equipment of Formula 1 teams within a 36-h time window
67,000 km	Distance traveled by the Toronto Blue Jays for 173 games in the 2015 MLB season
165,000	Athletes, staff members, and volunteers equipped during Olympic Games 2000

As these examples indicate, professional athlete equipment logistics is important predominantly in professional (or elite) sport, where athletes practice their sport at the highest level. In modern sport, this takes place by the majority in the commercial sport sector (see three sectors of sport in [45,110] and three Es of sport participation in [130]). There is also a need for athlete equipment logistics in nonprofit organizations, for instance, when athletes represent their country and engage in sport under the umbrella of a national sport federation. However, professional equipment logistics makes sense only when the requirements are high enough. When a local youth sport club trains, the kids bring their own outfits and help carry training equipment to the sport ground. After a game, one of the parents takes all of the jerseys home, washes them and returns them on the next game day. In professional sport, though, there is more equipment to handle and store with more frequent access; transportation distances are greater; the value of the goods is higher; special goods need specialists to handle them; and there is enough money to pay for professional logistics services. Such logistics allow athletes to fully concentrate on practicing their sport and not waste time, lose their concentration or risk their fitness by handling equipment.

Different types of stakeholders in a sport organization [45] are involved and have different expectations. The first type of stakeholders includes players, functional teams and sporting directors who want the right equipment at the right time at the right place in the right quantity and of the right quality (see ‘rights of logistics’ in [118]). The shareholders or treasurer of an organization might add the right cost. Second, equipment suppliers and sponsors want awareness, and third, the logistics staff wants to make their own contribution to the organization’s success. A context worth mentioning in the service of providing equipment to athletes is that the person who places and pays for the logistics order (the sporting director) often is not the recipient of the service (the players). This leads to a decoupling of service and costs and leads to the classic dilemma of materials management: the trade-off between high disposability of material and low inventory costs [131].

#### 4.2. Distinctive Features

‘If we are to take seriously the possibility that sport management has distinctive elements, then we need to identify what those elements are and what difference they make’ ([38], p. 4). The same is true for sport logistics and the equipping of athletes. It is accompanied by a unique set of features:

- *No focus on profit-making; low cost pressure:* Sport organizations are not logistics companies that provide logistics services to generate income. Logistics is not the core business of sport organizations. It is a function supporting the core operations, which is to perform sport and compete. As such, the cost pressure is also low, which makes this industry differ significantly from many other industries, where logistics is seen as a cost-saving tool. When athletes are equipped in professional sport, it is most important to provide the right service (‘utility maximization’ [45]). Providing this service at the right cost is of subordinate importance, partly because of the next aspect.
- *No/low competition:* Many sport organizations take care of equipping their athletes themselves. They employ staff to organize and carry out the material movements needed. Depending on the volume and distance involved in material movements, external transport carriers might be called in. In addition, the sector of athlete equipment logistics is small compared to other logistics markets. There are few companies specializing in the job. Competition is correspondingly low. This partly relates to the next aspect, which shows that in equipping athletes, the logistics service provider is not easily replaceable, unlike in many other industries.
- *Personal relationships:* In the equipping of athletes, personal relationships between logisticians and customers often play an important role. Different athletes or teams have different requirements. It is the equipment manager’s job to determine these requirements and ensure the best service level possible. Creating the right environment and conditions for the athletes can be a crucial factor for sporting performance. Therefore, it is common for equipment managers to engage in personal conversations with sporting directors, functional teams and athletes themselves, none of whom should feel hesitant to ask for something that can benefit the athletes’ performance. On match days, in the immediate preparation for and aftermath of the game, all procedures must be optimally harmonized and no confusion must be created by unknown staff in the locker rooms.
- *Highly predictable demand:* In (increasingly) dynamic environments it is the job of logistics to absorb fluctuations in demand [132]. In times of low demand, production surpluses are stored. A high stock level is a precondition for being ready for delivery when demand exceeds production. For the equipping of athletes, the demand is highly predictable because it is geared to schedules planned well in advance, for instance, season match schedules or training schedules. In addition to indicating the time, schedules also determine the place where equipment must be delivered. The quantities are also predictable, as the client base does not change frequently (e.g., a sport team mostly stays together throughout a whole season).
- *High visibility of mistakes:* In professional sport, mistakes in athlete equipment logistics have high visibility because games are attended by thousands of spectators and millions watch the broadcasts. If equipment managers bring the wrong equipment to the match, e.g., training shirts instead of game shirts, it can have lasting consequences. The most severe consequence could be exclusion from the competition. Financial consequences could include penalties from the game-organizing federation or sponsors. Last but not least, this mistake can leave an impression of unprofessionalism on all observers.
- *Low price elasticity:* Although price elasticity is high in sport [114], this is not the case for athlete equipment logistics, for two main reasons: The costs for equipment logistics are low compared to many other costs in sport organizations, and the provision of sound logistics service is highly important for the core business of professional sport

organizations, i.e., sporting competition. For both reasons, a change in the price of an equipping service has a relatively low impact on the demand for it.

- *Closed material flow:* In athlete equipment logistics, the flow of material is closed: Equipment that leaves the sport organization's warehouse as it is provided to its athletes to be used in training or competition is, for the most part, returned to the warehouse afterward. The material flow is closed [10,133], unlike in many other sectors of logistics.

Even though single factors may share similarities with other industries, it is the combination that makes it unique. The features show the distinctiveness of athlete equipment logistics, whose determinants in their entirety differ fundamentally from those of other logistics fields.

## 5. Conclusions and Invitation to Scientific Discourse

Sport management is concerned with the coordination of limited resources for the efficient production of sport services [119]. To this end, material, people, and information must be moved. The coordination of movements is the core of the logistics discipline [134]. However, the analysis of sport management under the lens of Porter's value chain framework revealed white spots, particularly in the logistics activities. Logistics in sport organizations has been neglected thus far even though it affects all segments of the sport industry and its products and sound logistics is becoming increasingly important to sport organizations from both the economic and the sport perspectives [2].

In practice, sport logistics structures have mostly grown historically, they are not strategically developed and aligned. Equally, science has not yet comprehensively considered logistics in sport. To answer the leading research question, the paper provided a concise overview of the sciences of logistics and sport management and noted multiple commonalities. The authors highlighted several intersections of both disciplines. In particular, marketing, operations and organization overlap substantially. The positioning of sport logistics at the interface of logistics and sport management led to the definition that sport logistics deals with the flows of material, people, and information in sport organizations.

By describing insights on athletes equipment logistics from the heart of the professional practice, this specific white spot of sport logistics was discussed for the first time. This also further developed the theory of logistics in sport: The field of equipping professional athletes expands the sport logistics framework [2] as a sub-area of equipment logistics management. In addition, the authors developed a set of characteristics that make logistics in sport unique, e.g., low competition, personal relationships or highly predictable demand.

In the increasingly competitive and global sport market [107], professional logistics can be key to competitive advantages. Therefore, it is necessary to understand the structural arrangement of logistics in sport organizations. While predictability and certainty are not wanted in sporting competition [45], for sport logistics they are desirable. The impact the adoption of central logistics doctrines can have on sport management, though, can go beyond solving movement problems only. Therefore, it is important to understand the pervasive nature of logistics in the sport industry by interpreting its systems as networks and its processes as flows, by taking a holistic perspective on value creation and by focusing on interfaces and integration.

In many sport organizations today, logistics is considered an executive function. It ensures that all required material (e.g., to practice a sport, host an event, or produce sport devices) is moved without missing deadlines or letting costs get out of control [1]. However, logistics gains importance as a differentiator for sport organizations as sustainable logistics concepts are key to the staging of sport mega-events [135], the provision of the right equipment supports sporting success [122], value-added logistics services enhance customer satisfaction in sport equipment e-commerce [41], and customized logistics services enable new sport business opportunities [136]. As sport as business develop in phases [45,107], so might sport logistics. Taking the example of athlete equipment logistics, what is a simple uniform store that hands out equipment in small sport organizations might turn into a



larger depot as the sport organization grows and needs to handle more material. Ultimately, it might turn into a logistics center as the organization continues to professionalize and offers its customers comprehensive and sophisticated logistics services.

This paper analyses sport logistics as a field at the interface of two disciplines, logistics and sport management. The field defines itself by its industry reference. From the perspective of logistics, sport logistics can be understood as a subdiscipline of logistics linked to the sport industry (see industry reference in logistics in [6]). From the perspective of sport management, sport logistics can be understood as a subdiscipline of sport management linked to the logistics industry (see industry reference in sport management in [32]). The authors thus call on logistics and sport management scholars alike to address the topic of sport logistics and to further:

- define and delineate the scope to which sport logistics relates,
- describe the defined subject area of sport logistics, and
- isolate special features of the subject area.

Scientifically, a formation of sport logistics during the development phases of Ries and Kriesi [137] is conceivable. Using logistics as a conceptual framework for sport logistics would represent a common approach to further develop the field of sport management and guarantee the highest credibility [51].

In equal measure, sport logistics offers various opportunities for research with a straight application focus. How is logistics structurally integrated into sport organizations? Which differences exist in sport logistics between different types of sport? What does an industry reference model look like? What are special processes that are not common in other logistics industries?

Likewise, it is conceivable to develop a body of research on topics, that potentially have a strong influence on sport logistics or vice versa, e.g.,

- Sustainability: How can transportation savings and, hence, lower emissions be achieved through better planning and consolidation?
- Technology: Which advancements can the development and application of new information and logistics technologies bring to logistics in sport?
- Safety/emergency management: How can logistics principles be applied in order to prevent or react to emergency cases in sport events?

The paper showed that sport organizations face manifold movement problems. To solve them in the best possible way, logistics principles need to be applied. In the course of this examination of sport logistics, the understanding developed that in sport, the logistics determinants in their entirety differ fundamentally from those in other industries. Hence, the authors call for research that further explores all facets, brings them together, and builds a conceptual umbrella for sport logistics.

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