

Thirty years of sports innovation: A bibliometric analysis

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ABSTRACT: This study describes a systematic bibliometric analysis of sports innovation research, examining its evolution and intellectual structure over 30 years. Adhering to the PRISMA guidelines, the analysis identified 708 relevant SSCI-indexed articles from the Web of Science database. The research employed the VOSviewer and the Bibliometrix package in R to perform co-citation analysis, keyword co-occurrence mapping, thematic evolution tracking, and three-field plot visualization. Findings reveal accelerated growth in the field since 2017, with research organized around three primary thematic clusters: strategic entrepreneurship and organizational innovation, identity-driven consumption and fan engagement, and innovation for health outcomes and programmatic value. The analysis uncovers both foundational theories and emerging research directions, particularly noting the rise of consumer-focused and impact-driven investigations in the field. The interpretation positions the following clusters as essential components of the sports innovation ecosystem: organizations that develop innovations, consumers who influence their adoption, and societal benefits that demonstrate their value. This study identifies underdeveloped areas in management model innovation and recommends the greater use of mixed-methods approaches to better understand stakeholder perspectives. These insights may guide researchers, sports organizations, and policymakers in navigating the developing landscape of sports innovation and establishing future research priorities in this field.

KEYWORDS: Innovation, Sports, Bibliometric study, Review article

JEL CODES: O33, L8, Z20

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1. Introduction

The highly competitive nature of the sports industry provides fertile ground for innovation and entrepreneurship, with technological and scientific advancements significantly influencing athlete performance and the execution of sporting events (Ratten – Ferreira 2017a; 2017b). As new technologies emerge, innovation has become a critical driver of success for individuals and teams, necessitating organizational resources such as time, funding, sponsorship, and managerial expertise for effective implementation (Ratten 2019). Despite its growing importance, particularly in the technology sector, research on the specific processes and dynamics of innovation in sports is limited (Giannoulakis 2015). This gap is further exacerbated by the rapid yet fragmented expansion of sports management research over the past decade, which has complicated efforts to assess the field's current state and identify the factors driving its progress (Pellegrini et al. 2020). The globalization and commercialization of sports in recent years have elevated sports innovation to a prominent area of academic inquiry (Potts – Ratten 2017). Initially rooted in health and exercise, the sector has undergone a significant transformation owing to technological advancements (Ratten 2017a). Innovations in ICT, particularly social media, have reshaped the competitive landscape of sports and revolutionized how athletes and organizations engage in self-promotion (Zhou – Xiong 2024). Consequently, the role of innovation in sports has gained increasing recognition, underscoring the transformative influence of media and technology (Ratten 2019). These developments have captured the attention of both academics and industry professionals, underscoring the need to trace the evolution of sports innovation research to understand its trajectory and future potential.

Policy initiatives to foster entrepreneurial ecosystems in the sports industry have further emphasized innovation in products, processes, services, and technology (Glebova et al. 2024; Ratten 2017b). These regulatory changes have amplified the focus on sports innovation in both academic research and practical applications. Understanding the historical development and future directions of sports innovation research is essential for evaluating such shifts.

This study employs a systematic bibliometric analysis to examine the development of sports innovation research over the past 30 years. The analysis was designed to achieve the following specific objectives:

- a) To profile the historical development and scholarly impact of the field by analyzing the temporal evolution of publications, identifying the most influential journals, authors, and foundational documents, and assessing its growth trajectory and academic resonance.
- b) To delineate the intellectual and conceptual structure of the research domain through co-citation and keyword co-occurrence cluster analyses,

identifying and interpreting foundational thematic schools of thought and prevailing research fronts.

- c) To synthesize the research landscape and identify emerging opportunities by integrating thematic map and three-field plot analyses, which illustrate relationships between key topics, authors, and sources, and highlight well-developed motor themes.
- d) To identify critical gaps and underexplored domains within the literature to establish a concrete agenda for future research directions in sports innovation.

The sequence of these objectives progresses from mapping the field's historical and current intellectual structure to synthesizing its overarching landscape, culminating in the application of this synthesis to chart future research avenues.

For over a decade, scholars have emphasized the critical role of innovation in sports, with foundational researchers such as Ratten (2016) and Tjønndal (2016; 2017) calling for more structured and organized investigations into this fragmented yet rapidly growing field of sports. While recent studies have explored specific areas such as technology in sports education (Putra et al. 2024) and sustainable entrepreneurship (González-Serrano et al. 2020), the literature remains divided across specialized or dedicated niches without a unifying framework. Our study builds on the work of Ciomaga (2013) and Ferreira et al. (2020), who have emphasized the need for a comprehensive, up-to-date analysis of the evolving research landscape, particularly as new technologies such as AI continue to shape the sports field. By systematically mapping the development of sports innovation research, identifying emerging trends, and highlighting underexplored or emerging areas, this review article integrates previously disconnected discussions. It establishes a clearer foundation for future academic and practical efforts and implications in the field.

2. Method

This study employs a systematic bibliometric literature review to ensure a comprehensive, transparent, and reproducible analysis of sports innovation literature. Bibliometric analysis provides a robust framework for assessing research trends by applying quantitative and statistical methods to scholarly publications and their citation, co-citation, and co-occurrence networks (Mutschke et al. 2011). The investigative process was designed in accordance with the established protocols of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al. 2009). This approach integrates quantitative bibliometric techniques within a structured review framework to map the

intellectual structure and historical evolution or development of the sports field, thereby directly addressing the stated research objectives. The methodological process or technique was organized into three distinct phases or stages: (1) planning and data collection, (2) screening and eligibility assessment, and (3) bibliometric analysis and synthesis.

2.1. Review protocol: Planning and data collection

A review protocol was established to ensure a rigorous and replicable search or exploration strategy. The Web of Science (WoS) Core Collection database was selected as the primary data source. This decision was predicated on the database's curated index of high-quality, peer-reviewed journals, which provides a reliable and authoritative foundation for systematic reviews within the social sciences (Vanderstraeten 2025; Pranckutė 2021). Its selectivity mitigates the inclusion of lower-quality sources, offering a coherent view of core scholarly work and facilitating efficient citation tracking and bibliometric analysis (Pranckutė 2021).

The search strategy was meticulously designed to capture the interdisciplinary scope of sports innovation. The query incorporated a combination of title (TI) and abstract (AB) searches to balance comprehensiveness with semantic precision. The search string was constructed as follows:

(TI= (“sport* innovat” OR “sport entrepreneur” OR “innovativ sport”)) OR (AB= (“sport” OR “athlet” OR “football” OR “soccer” OR “olympic” OR “physical activit” OR “esport”) NEAR (“innovat” OR “technological change” OR “disrupt” OR “novelty” OR “design thinking” OR “open innovation” OR “absorptive capacity” OR “R&D” OR “research and development” OR “new product” OR “process innovation”)))

The search string incorporated the broad root term sport* alongside terminology denoting specific contextual applications of innovation. To ensure the retrieved records treated the constituent concepts as intrinsically linked, the NEAR operator was employed in place of a Boolean AND. This operator requires a degree of semantic proximity between the search terms, thereby significantly enhancing the thematic relevance of the resulting dataset by excluding publications in which the terms co-occur but are not conceptually related. The search was conducted in February 2025, yielding an initial corpus of 4,646 records.

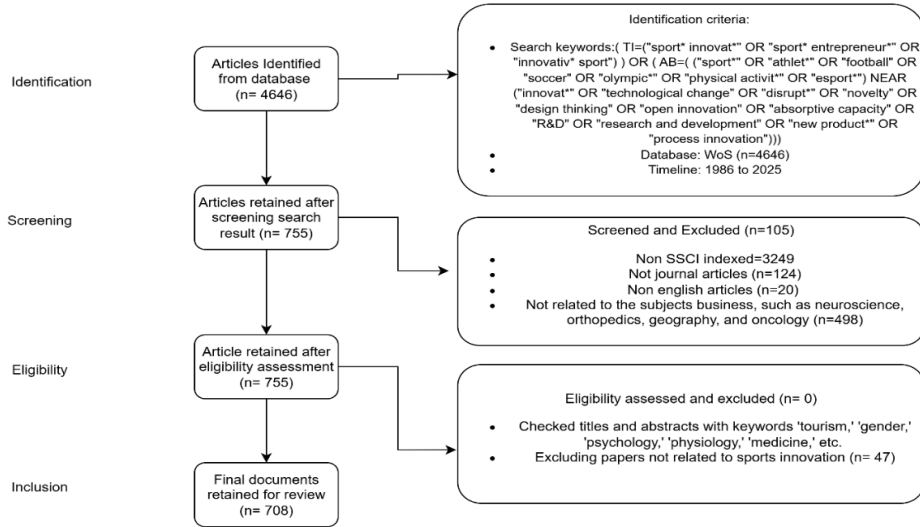
2.2. Screening process and eligibility criteria: the PRISMA workflow

The screening process strictly adhered to the PRISMA framework to ensure transparency and reproducibility. The identified records were refined through a multi-stage screening process based on pre-defined eligibility criteria.

First, the dataset was refined through a systematic screening process. (i) Only English-language SSCI-indexed journal articles were retained to focus on high-impact social science research and ensure consistency in data quality and accessibility. (ii) Documents from unrelated scientific disciplines (e.g., neuroscience, orthopedics, pediatrics) and non-article publication types (e.g., conference proceedings, editorials) were excluded. (iii) At the eligibility stage, one author conducted a database (title and abstract) search using Zotero, a piece of reference management software, after importing the data file, with keywords such as “tourist/tourism”, “gender”, “psychology”, “endorsement”, “journalism”, and “physiology”. The author then meticulously examined the titles and abstracts to filter out articles unrelated to sports innovation. Manual screening removed 47 papers that, despite passing the algorithmic search, focused on adjacent topics (e.g., sports tourism marketing, exercise physiology) without links to innovation, management, or technology. Exclusion was based on the primary focus rather than keyword presence; for instance, studies on gender in physiological adaptation were excluded, while those on gender in innovation adoption were retained, explaining the latter’s prominence.

This process resulted in a final analytical corpus of 708 publications. The systematic screening process was conducted according to the PRISMA guidelines to ensure complete transparency and replicability, with the results detailed in Figure 1.

Figure 1. Flowchart for document selection using PRISMA guidelines



Source: Authors.

2.3. Bibliometric analysis: Techniques and rationale

Following the systematic retrieval of the final corpus, a suite of complementary bibliometric techniques was employed to address the specific research objectives. The analysis was performed using VOSviewer (version 1.6.20) and the Bibliometrix package in R. Each technique was selected for its distinct ability to illuminate different facets of the research landscape (Table 1).

Table 1. Framework of bibliometric techniques and their application

Research Objective	Analytical Technique	Purpose and Rationale	Planned Outcome
(a) Profile historical development and scholarly impact	Descriptive statistics and citation analysis	To quantify the field's growth, identify influential journals, authors, and documents, and assess the growth trajectory and academic resonance.	Figures 2, 3, 4, and 5

Research Objective	Analytical Technique	Purpose and Rationale	Planned Outcome
(b) Delineate intellectual structure	Co-citation analysis	To identify groups of foundational publications frequently cited together, revealing the field's seminal works and intellectual schools of thought (Small 1973). A minimum threshold of 15 co-citations was applied to focus on the most influential works.	Figure 5, Table 2
(b) Delineate conceptual structure	Keyword co-occurrence analysis (keywords plus)	To map the relationships between current research topics and identify central themes and their connections within the research front. Keywords plus provided a more comprehensive content representation than author keywords (Zhang et al., 2016). A minimum threshold of 8 occurrences was applied.	Figure 7, Table 3
(c) Synthesize the research landscape	Thematic map analysis	To classify themes based on their density (development) and centrality (relevance), identifying motor themes, niche themes, and emerging or declining areas (Cobo et al. 2011).	Figure 9
(c) Visualize key relationships	Three-field plot	To illustrate the diachronic relationships between authors, their keywords, and their publication sources, highlighting dominant research streams.	Figure 8

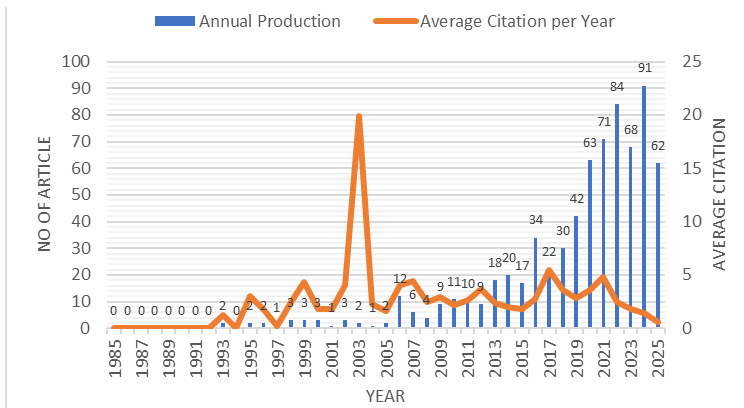
3. Results

3.1. Evolution of publications

The historical development of the field, addressed in Objective (a), reveals a clear and accelerating growth trajectory. As illustrated in Figure 2, consistent scholarly output began in 2005. Although the first relevant publication appeared in 1985, consistent academic production did not start until after 2005. Between 1985

and 2010, 71 articles were published. In contrast, the following decade and a half (2011-2025) witnessed an explosive increase, with 637 articles published, representing a nearly ninefold rise. This growth peaked sharply in 2023, with 91 publications, underscoring the field’s rapidly ascending prominence in recent years. The average number of citations per year also shows a clear upward trend, particularly since 2017, indicating that research is increasing in volume, academic impact, and relevance.

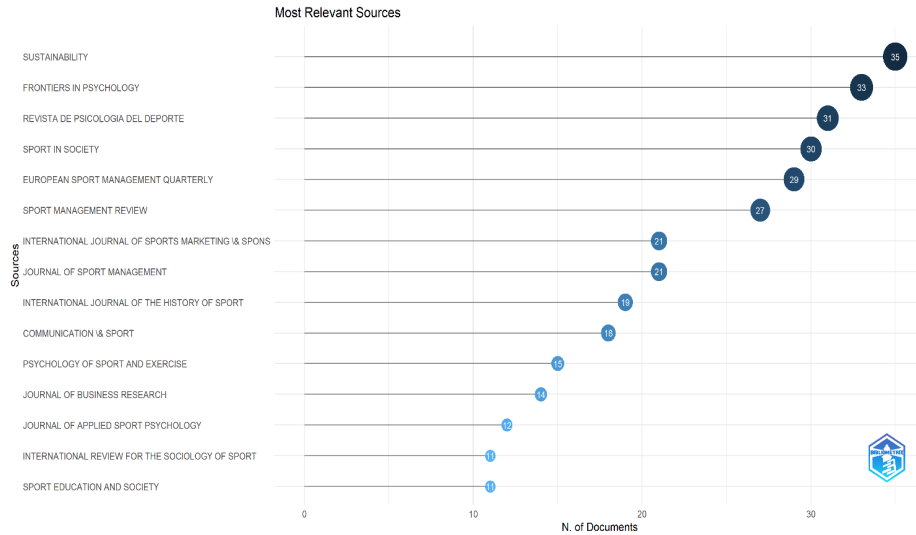
Figure 2. Evolution of articles and citations



Source: Authors.

The most prolific publication outlets reflect the field’s strong interdisciplinary nature. As shown in Figure 3, journals such as *Sustainability* (35 articles) and *Frontiers in Psychology* (33 articles) lead in research output, followed by *Revista De Psicologia Del Deporte* (31 articles) and *Sport in Society* (30 articles). The prominence of journals at the intersection of psychology, sociology, and sustainability highlights the strongly interdisciplinary nature of sports innovation research.

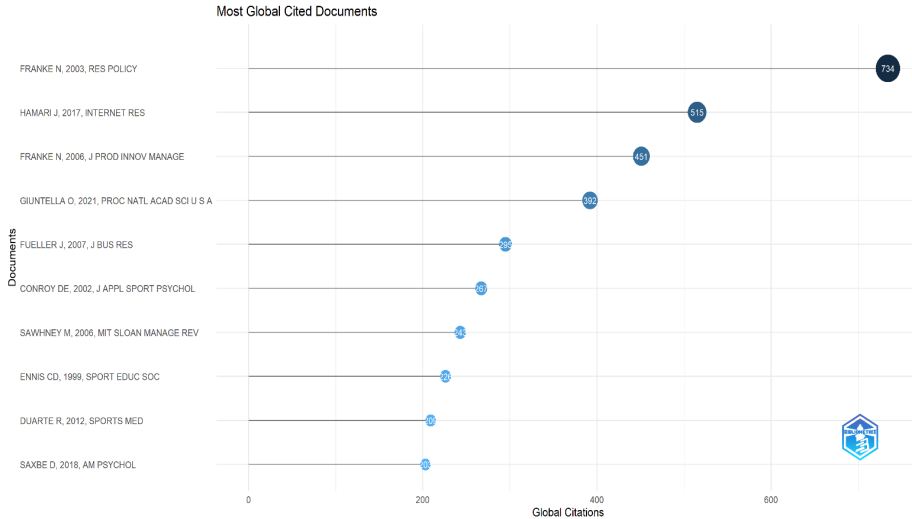
Figure 3. Sources with the most publications



Source: Authors.

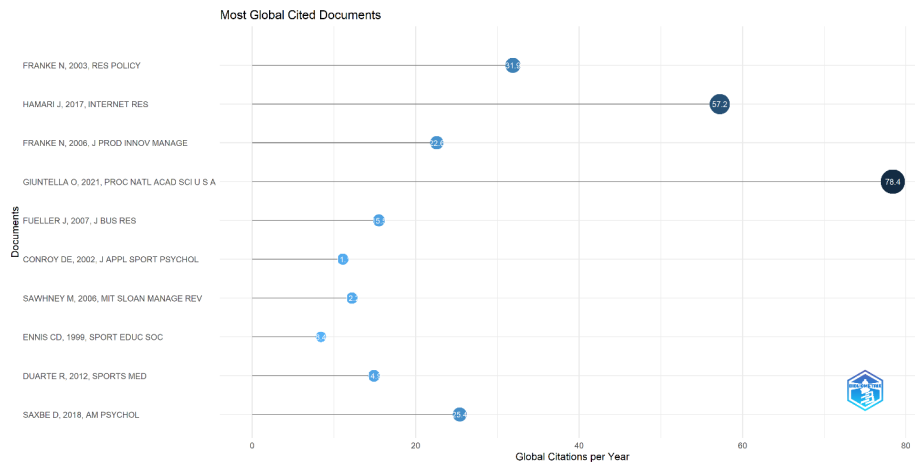
Foundational works that have shaped the discourse on sports innovation are identified by their global citation counts. Figure 4 reveals that the most-cited publication is Franke-Shah (2003), in *Research Policy*, with 734 citations, establishing it as a cornerstone of sports innovation research. This followed by Hamari and Sjöblom (2017) in *Internet Research* (515 citations), Franke et al. (2006) in the *Journal of Product Innovation Management* (451 citations), and Giuntella et al. (2021) in the *Proceedings of the National Academy of Sciences* (392 citations). This ranking demonstrates the enduring influence of early-2000s research on user innovation and communities, while also revealing the rapidly growing impact of contemporary studies examining the intersection of sports, technology, health, and digital platforms, reflecting the field's dynamic evolution.

Figure 4. Most globally cited documents



Source: Authors.

A nuanced understanding of scholarly impact emerges when considering the articles that achieve the highest yearly citation rates (Figure 5). The most influential publications on this metric are led by Franke-Shah (2003) in *Research Policy*, followed by Hamari and Sjöblom (2017) in *Internet Research*, Franke (2006) in the *Journal of Product Innovation Management*, Giuntella et al. (2021) in the *Proceedings of the National Academy of Sciences*, and Füller et al. (2007) in the *Journal of Business Research*. The prominent placement of Giuntella’s 2021 study alongside these foundational works indicates that sports innovation is a dynamic research field in which contemporary investigations can achieve rapid and substantial academic impact, reflecting the area's evolving nature and growing scholarly importance.

Figure 5. Top articles based on citations per year

Source: Authors.

The data reveal a field that has transitioned from a niche interest to a mature and rapidly expanding domain of academic inquiry. The dominance of interdisciplinary journals and the high impact of studies linking sports with technology, business, and psychology underscore their multidisciplinary nature and growing relevance.

3.2. Co-citation network analysis and conceptual clustering:

We employed co-citation analysis to delineate the intellectual structure of the sports innovation domain [Objective b]. This method identifies foundational publications that are frequently cited together, revealing the seminal works in the field and intellectual schools of thought. This study prioritized publications with a minimum of 10 co-citations, resulting in 58 impactful articles for analysis. A minimum threshold of 10 co-citations was applied to focus the study on the most influential and foundational publications that demonstrably shaped the field's intellectual structure (Van Eck – Waltman 2010). The results of this analysis are presented in Table 2 and Figure 6. Table 2 highlights the most frequently co-cited publications, including Ratten (2011) with 28 co-citations, Fornell and Larcker (1981) with 28, Hoeber and Hoeber (2012) with 27, Braun and Clarke (2006) with 25, and Hair et al. (1998) with 23 publications. Within the co-citation network, an article's total link strength represents the sum of its connection weights to all other items, quantifying its overall connectivity and influence (Van Eck – Waltman 2010). A high total link strength, such as that of

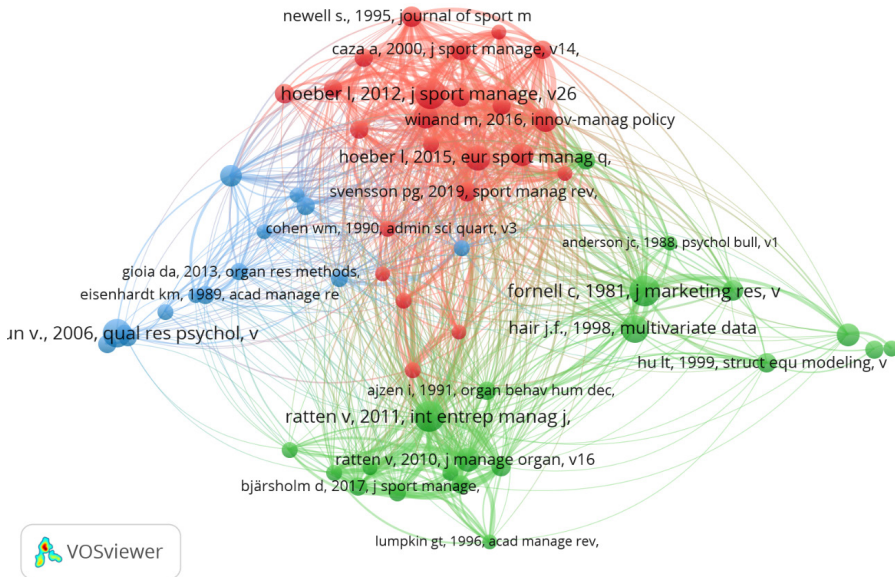
Hoeber and Hoeber (2012), indicates a publication that is frequently co-cited and serves as a pivotal hub, centrally connected to numerous other influential works in the field. These works represent key methodological and theoretical contributions that have significantly shaped the analytical frameworks and research approaches in sports innovation.

Table 2. Top co-citation references and counts

First author	Year of publication	Citations	Total link strength
Ratten V.	2011	28	170
Fornell C.	1981	28	117
Hoeber I.	2012	27	208
Braun V.	2006	25	16
Hair J.F.	1998	23	69
Hoeber I.	2015	21	180
Winand M.	2013	19	176
Ratten V.	2010	19	126
Rogers E.M.	2003	18	90
Zikmund W.G.	1998	13	32

Source: Authors.

The network of these influential works, visualized in Figure 6, reveals three distinct clusters of interrelated research, showing how foundational references are conceptually grouped. The network demonstrates the interdisciplinary nature of the field, with connections spanning management theory, research methodology, and sport-specific applications.

Figure 6. Co-citation cluster analysis

Source: Authors.

Ward's hierarchical cluster analysis was employed to categorize these intellectual relationships, complemented by the thematic analysis framework proposed by Liñan and Fayolle (2015). This dual approach grouped the co-cited references into three primary clusters. This method groups publications based on the strength of their bibliographic connections, placing frequently co-cited references into the same cluster. The resulting groupings were then analyzed and labeled according to their shared thematic content to identify the major research streams in the field.

The Red Cluster – Quantitative Measurement and Modeling – centers on methodological foundations, particularly quantitative marketing and psychometric techniques essential to sports innovation research. This cluster comprises foundational contributions to structural equation modeling and the assessment of measurement validity (Fornell – Larcker 1981), multivariate data analysis (Hair et al. 1998; Zikmund 1998), and innovation diffusion theory (Rogers 2003). These methodological works provide the essential analytical framework for research examining sports consumers and stakeholders. They supply the core tools for constructing customer satisfaction models, validating psychometric scales, and applying advanced statistical techniques, thereby forming the empirical foundation for studies on fan engagement, service quality perceptions, and the adoption processes for new sports technologies.

The Green Cluster – Institutional and Entrepreneurial Contexts –, encapsulates research examining sports innovation through institutional and social theoretical lenses. Its constituent studies investigate how entrepreneurial orientation and organizational culture collectively shape innovation processes within sports organizations, drawing upon foundational frameworks from sports entrepreneurship theory (Ratten 2010; 2011). Methodologically, this body of work frequently employs qualitative case studies and organizational-level analysis to explore how entities ranging from community-based clubs to professional franchises navigate the interplay between commercial and social objectives. A central finding unifying this cluster is that managerial attitudes and proactive entrepreneurial strategies are identified as the principal catalysts of innovation (Hoeber – Hoeber 2012; Winand 2013).

The Blue Cluster – Innovation Process and Adoption –, is characterized by its focus on the internal dynamics and sequential stages of the innovation process within sports environments. It integrates scholarship dedicated to identifying the critical factors that determine the successful implementation and subsequent adoption of novel technologies and practices (Braun – Clarke 2006; Hoeber et al. 2015). The scope of this research examines the complete innovation lifecycle, from initial development through to widespread diffusion. Consequently, it emphasizes the multifaceted roles of individual adopter perceptions, organizational readiness, and external contextual barriers that collectively govern the effective integration of innovations into the sports ecosystem.

3.3. Keyword co-occurrence and cluster analysis

We conducted a keyword co-occurrence analysis to map the conceptual structure and prevailing research fronts within the field (Objective b). This technique identifies and visualizes relationships between frequently co-occurring keywords, thereby revealing the central themes and their interconnections. The analysis employed Keywords Plus, a method that prior research indicates offers a more comprehensive representation of a journal article's content than author-supplied keywords alone (Zhang et al. 2016). This approach mitigates author bias or negligence in keyword selection and ensures a more objective, standardized basis for network construction or speculation. To ensure a focus on significant and recurring themes, the analysis was restricted to keywords appearing in a minimum of eight different publications, resulting in a final set of 66 keywords for examination. A minimum threshold of eight was set to ensure a robust and meaningful analysis of the central research themes, balancing comprehensive coverage with analytical clarity and focus. The examination focused on occurrence frequency and total link strength, a metric that quantifies how

frequently each keyword co-occurs with others, indicating its connective importance within the research network. The results, which show the most frequent keywords and their connections, are presented in Table 3 and visualized in the network map in Figure 7.

Table 3. Co-occurrences of keywords (Keyword Plus) hierarchy

Keyword	Occurrences	Total link strength
Performance	81	163
Sport	65	116
Management	54	134
Health	35	66
Innovation	28	68
Exercise	27	54
Physical Activity	27	54
Organizations	25	56
Education	24	48
Technology	20	52
Identity	16	46
Satisfaction	16	46
Gender	16	32
Football	15	30
Children	14	33
Perceptions	14	32
Culture	13	37
Knowledge	13	34
Media	13	31
Experience	13	23

Source: Authors.

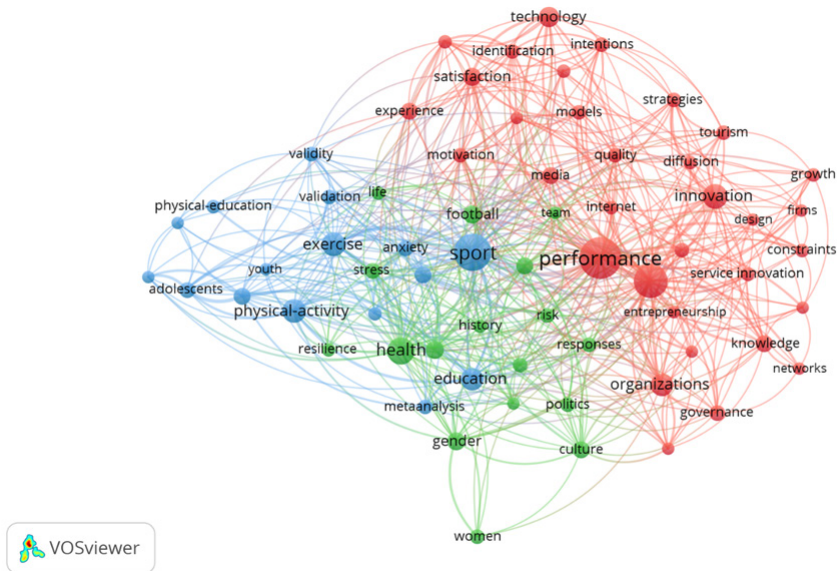
Table 3 lists the top keywords, considering keyword co-occurrences and subsequent link strength. “Performance” emerged as the most central concept (81 occurrences, link strength: 163), indicating its dominant role as both a research focus and a connective theme. “Sport” (65, 116) and “Management” (54, 134) form additional core pillars, reflecting the field’s strong orientation toward organizational and administrative perspectives. The substantial link strength of “Management” suggests its powerful integrative function across subdomains.

Notably, “Health” (35, 66) and “Innovation” (28, 68) show strong connective importance despite moderate occurrence rates, indicating their role as bridging concepts between traditional sports research and innovation. “Technology” (20,

52) maintains an innovation focus. Simultaneously, the cluster demonstrates a field evolving from technological innovation toward broader organizational performance, health outcomes, and human-centric factors in sports contexts.

Initial clustering of co-occurring keywords was performed algorithmically in VOSviewer, which grouped keywords according to the objective strength of their co-occurrence relationships. Simultaneously, the algorithm provided a foundational grouping of frequently co-occurring terms; the final definition and labeling of the thematic clusters required author judgment and value determination. The clusters were refined and named through an interpretive process that involved analyzing the semantic relationships between the keywords within each algorithmic group to identify the core research stream that they collectively represented. This ensured that the cluster definitions accurately reflected the underlying intellectual themes in the data. The results are shown in Figure 7.

Figure 7. Network of co-occurring keywords



Source: Authors.

Cluster 1 (marked in red in Figure 7) – Strategic Entrepreneurship & Organizational Innovation – forms the nucleus of sports innovation research, focusing on the deliberate strategies and internal capabilities that sports organizations cultivate to drive growth, competitive advantages, and value creation. The keywords (innovation, entrepreneurship, management, governance, technological innovation, and strategies) point to a research domain concerned with the systemic business of innovation within the sports sector.

This cluster emphasizes the human capital required for innovation, exemplified by research on intrapreneurship. Lara-Bocanegra et al. (2025: 7) address this directly by designing and validating the COINDE instrument to identify employees with intrapreneurial behaviors within sports organizations, framing them as a “fundamental pillar in the growth and development of innovation.” This internal focus is complemented by research on external structural facilitators such as policy and digital infrastructure. For instance, Zhang et al. (2024) demonstrate that macro-level green financial reform and digital transformation serve as powerful catalysts for regional industrial innovation and entrepreneurship, with direct applications in sports, including funding for low-carbon campus renovations and the use of digital technologies to enhance innovation in the sports industry. Furthermore, von Schomberg et al. (2025) dissect the innovation process in a case study of a football academy, revealing that successful innovation is not merely a function of formal structures but of their interplay with informal networks, highlighting the importance of knowledge management and organizational learning for implementing new ideas that align with core values. This aligns with the cluster’s keyword, service innovation, indicating a broad view of innovation encompassing new fan experiences and business models, not just products.

Cluster 2 (green) – Identity-Driven Consumption & Fan Engagement – situates innovation within the socio-cultural context of consumption, examining how evolving identities, cultures, and digital platforms reshape engagement models and create new market opportunities for sports businesses to explore. Keywords such as “gender,” “identity,” “culture,” “consumption,” and “media” signal a research stream focused on understanding the consumer to drive innovative marketing and community-building strategies.

A critical business imperative is leveraging new digital spaces for engagement. Hussain et al. (2025: 1091) analyze metaverse marketing, arguing that effective branding in this space provides “a solid appeal to this tech-savvy youth” of Generation Z, transforming brand experiences into gamified systems that significantly influence affection and loyalty towards sports brands. This reflects innovation in marketing channels and experiential offerings. Simultaneously, research in this cluster critically examines cultural constraints and opportunities for innovation. Pringle and Adams (2025) deconstruct traditional gender norms in sports, an analysis crucial for businesses seeking to innovate in inclusive and socially sustainable ways, ensuring that products and campaigns resonate across diverse demographics. Furthermore, the cluster underscores the need for inclusive innovation to expand market reach. The work of Wood et al. (2025) on the experiences of neurodivergent athletes underscores a significant segment of the market whose needs are often overlooked, presenting both a moral imperative and a potential frontier for innovative product design, facility management, and fan experience services that cater to a broader audience.

Cluster 3 (blue) – Innovating for Health Outcomes & Programmatic Value – addresses innovation in the design, delivery, and validation of sports programs, with a pronounced focus on initiatives that yield health and educational outcomes. This domain represents a crucial business segment for sports organizations, governing bodies, and public health partners, wherein demonstrating program value and empirical efficacy is paramount. The associated keywords, including physical-activity, youth, validation, education, and prevalence, indicate a sustained research priority on developing evidence-based interventions and scalable program models.

A primary concern in this domain is the development of robust metrics to validate interventions, which is essential for securing funding and demonstrating their impact. Sharma et al. (2025) tackle this directly by evaluating outcome measures in a sport-for-development (SFD) “living lab”, highlighting the iterative process needed to create reliable tools that can capture the nuanced impacts of programs on youth outcomes. This methodological innovation is a prerequisite for the credibility and growth of the sector. Beyond measurement, the cluster explores novel delivery methods for these compounds. Friedrich (2025) evaluated virtual reality as an innovative off-ice training tool for athletes, assessing its impact on engagement and motivation. This study intersects sports technology, performance business, and participant retention. This reflects a broader trend of using technology to enhance training efficiency and product offerings in the sports sector. Finally, innovation in psychological support systems is a key theme. Murdoch et al. (2025) investigate how structured self-reflection can help elite athletes develop coping insights and resilience, representing an innovation in mental skills training that contributes to athlete performance and well-being, a critical asset for any high-performance sports business.

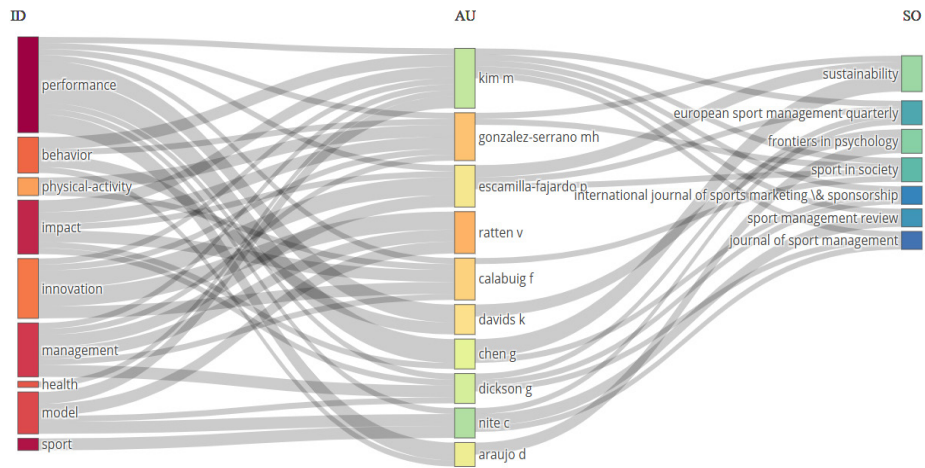
Co-occurrence analysis revealed that sports innovation in the business context is a multidimensional endeavor. It is driven by strategic organizational capabilities (Cluster 1), consumer-informed, and focused on engaging evolving identities through new media (Cluster 2), and validated through rigorous, outcome-based programmatic delivery that demonstrates tangible health and social value (Cluster 3).

3.4. Three-field plot analysis

The intellectual structure of the field is illustrated in Figure 8 through a three-field plot analysis, which maps the relationships among three core elements: Keywords Plus (ID), contributing authors (AU), and their publication sources (SO). The size of each node is proportional to the frequency of its occurrence, and the connecting lines represent the strength of the association between them.

The analysis identified “performance,” “behavior,” and “physical activity” as the predominant research themes. Key researchers actively publishing on these themes include Kim (associated with performance), Gonzalez-Serrano (linked to behavior and physical activity), and Ratten (connected to innovation). The primary academic outlets for this research are *Sustainability*, the *European Sport Management Quarterly*, and *Frontiers in Psychology*.

Figure 8: Three-field plot analysis



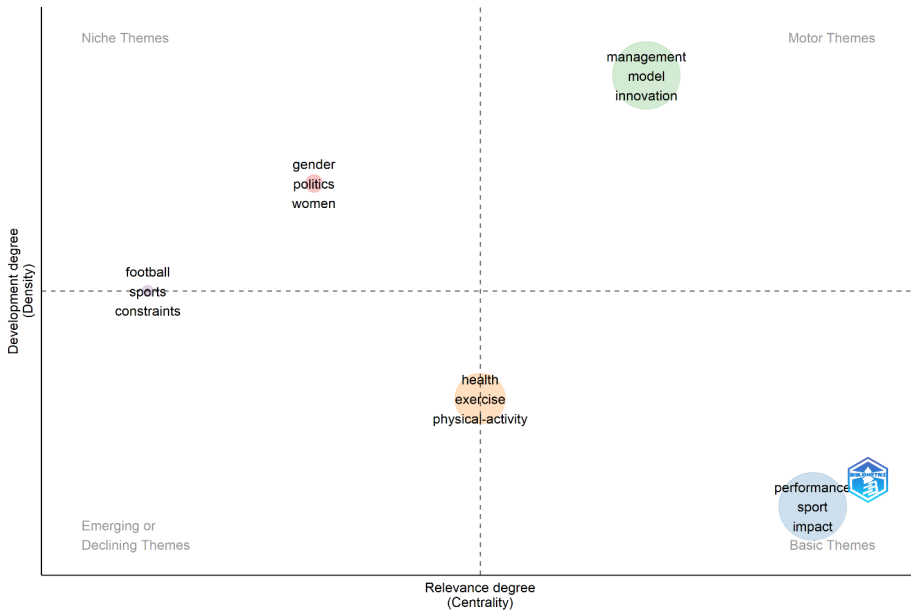
Source: Authors.

3.5. Thematic map analysis

Finally, we performed a thematic map analysis to synthesize the research landscape and identify both well-developed and emerging themes [Objective c] (Figure 9). This method classifies themes by their density (development) and centrality (relevance) within the field, enabling identification of niches, motor themes, and emerging trends. The thematic map shows that well-established motor themes, such as performance, sport, and impact, dominate the field. In contrast, specialized niche themes, such as football-related constraints and gender politics, reflect deep, focused inquiries. In contrast, the theme of management model innovation is positioned as emerging and peripheral (Ladik et al. 2025; von Schomberg et al. 2025). This placement is critical, as it indicates that, although innovation is recognized, research into new organizational, business, and governance models for sports remains underdeveloped and poorly integrated with core performance outcomes (Lara-Bocanegra et al., 2025; Zhang et al., 2024). This presents a significant opportunity, suggesting that future

research focused on innovating management models—and explicitly connecting them to established themes such as athlete performance and social impact—could address a crucial weakness and drive the field forward. For instance, applying innovative governance models could directly enhance the effectiveness of gender equity policies (a niche theme) or optimize the performance impact of new technologies (a motor theme), moving this concept from the periphery to the core of sports research.

Figure 9. Thematic map



Source: Authors.

4. Discussion

While co-citation analysis effectively maps the field’s intellectual foundations, revealing the seminal theories and methodological pillars upon which sports innovation research is built, the interpretation of keyword co-occurrence clusters is prioritized in this discussion to directly address our objective of synthesizing the current research landscape and identifying emergent frontiers. Co-citation analysis looks backward, clarifying the influential past; in contrast, keyword co-occurrence analysis captures the conceptual structure of the research front, pinpointing the active themes and terminology that define contemporary scholarly dialogue. By focusing on these keyword clusters, we

shifted the analytical lens from the field's origins to its present trajectory and future direction.

The findings from this bibliometric analysis map the intellectual structure and evolution of sports innovation research over 30 years. This field has demonstrated considerable growth, especially since 2017, transforming from a specialized interest into a distinct interdisciplinary area of scholarship. The analysis identifies three primary research clusters: "strategic entrepreneurship and organizational innovation", "identity-driven consumption and fan engagement," and "innovating for health outcomes and programmatic value". These domains reflect the core components of the contemporary sports ecosystem: the organizations that develop innovations, the consumers who influence and adopt them, and the broader societal benefits that anchor their values.

The identification of the "strategic entrepreneurship and organizational innovation" cluster reinforces earlier assertions by Ratten and Ferreira (2017a) that entrepreneurship is a central mechanism for growth and competitive dynamics in sports. The findings build upon this by demonstrating that this area has matured into a well-established research theme. The frequent co-occurrence of terms such as "management," "governance," and "strategies" suggests a shift from the theoretical foundations of entrepreneurship (Ratten 2011) toward examining the organizational capabilities and structures that enable innovation. This development is consistent with recent studies that identify intrapreneurship as vital for organizational development (Lara-Bocanegra et al. 2025), marking a transition from conceptualizing sports entrepreneurship to implementing it in practical managerial contexts.

Similarly, the "identity-driven consumption and fan engagement" cluster expands upon a trend that was only beginning to surface in previous reviews. Ferreira et al. (2020) observed the growing significance of technology and media, and our current keyword analysis confirms that this has developed into a primary research domain. However, these findings introduce a necessary refinement: innovation in this area is increasingly driven not only by technology but also by how it intersects with identity, culture, and consumption patterns. This cluster extends beyond the study of technology adoption to examine its sociocultural effects, including how gender (Pringle & Adams 2025), neurodiversity (Wood et al. 2025), and digital environments (Hussain et al. 2025) reshape market engagement. This represents an evolution in the literature, redirecting attention from the supply of innovation to consumer-driven factors influencing its adoption and impact.

The third cluster, "innovating for health outcomes and programmatic value", underscores a focus on mission-oriented innovation that expands the field's relevance beyond commercial applications. This aligns with earlier policy-related discussions on the societal role of sports (Ratten 2017b; Potts – Ratten 2017). The

current analysis indicates that this discourse is now closely linked to empirical validation, as reflected in the use of terms such as “validation,” “education,” and “prevalence.” This shift implies a growing emphasis on measuring program effectiveness, which is essential for demonstrating impact and securing sustained investment.

Compared with earlier reviews, this study highlights a persistent gap. Although Ferreira et al. (2020) provided an initial bibliometric overview, an updated analysis incorporating recent publications reveals that management model innovation remains underrepresented and peripheral (Von Schomberg et al. 2025; Ladik et al., 2025). This is an important observation: while innovation principles are increasingly accepted, research on novel organizational forms, business models, and governance structures specific to sports is still emerging. Addressing this gap could define a new trajectory for future research, encouraging scholars to apply general management theories to sports and develop sport-specific innovation models. Beyond this conceptual gap, our analysis identifies a methodological shortfall. The field would benefit from more mixed-methods studies that can capture the complex stakeholder perspectives within sports environments and deepen the application of theoretical frameworks to address the contextual challenges.

The field of sports innovation has coalesced around three interconnected domains that mirror its interdisciplinary nature. The results affirm earlier predictions about the roles of entrepreneurship and technology (Ratten – Ferreira 2017a; Ferreira et al. 2020), capturing their subsequent evolution. More significantly, this analysis extends previous work by clarifying the role of identity-driven consumption, measuring health outcomes as key themes, and identifying management model innovation as an underexplored but promising area. This refined framework may help guide subsequent research on both established and emerging topics.

Theoretically, this study contributes to sports innovation by validating and refining the core entrepreneurial domains proposed by earlier scholars (Ratten – Ferreira 2017a; Ferreira et al. 2020), while introducing critical new dimensions. It moves the theoretical conversation beyond its foundational roots by establishing identity-driven consumption – encompassing gender, culture, and digital community formation – as a central lens for understanding innovation adoption. Furthermore, thematic map analysis identifies management model innovation as a critical yet underdeveloped theoretical frontier, revealing a significant gap in our understanding of the organizational structures and governance frameworks that enable innovation. By integrating these perspectives, this research provides a more nuanced and comprehensive theoretical model that captures the interplay among organizational strategy, consumer identity, and societal impact, setting a new agenda for future scholarly inquiry.

5. Contributions to international business and practical implications

This analysis provides strategic insights for global sports entities and policy-makers by translating research trends into actionable business intelligence. The identified clusters highlight the distinct pathways to international competitive advantage.

The “strategic entrepreneurship and organizational innovation” cluster offers a blueprint for scaling operations on a global scale. This demonstrates that systematic investment in organizational capabilities – such as intrapreneurship (Lara-Bocanegra et al. 2025) and alignment with regional digital transformation policies (Zhang et al. 2024) – enables standardized yet adaptable innovation across markets, from sustainable infrastructure to digital fan engagement platforms.

The “identity-driven consumption and fan engagement” cluster provides a critical framework for entering the cultural market. It emphasizes that successful global expansion requires innovation tailored to local demographic and cultural norms. Research on metaverse marketing (Hussain et al. 2025), gender inclusivity (Pringle – Adams 2025), and neurodiversity (Wood et al. 2025) offers strategies for transforming global diversity into a brand advantage by developing authentically resonant products and campaigns.

Furthermore, the “innovating for health outcomes and programmatic value” cluster positions sports innovation as a vehicle for measurable corporate social responsibility and ESG alignment in new market segments. Evidence-based program validation (Sharma et al. 2025) and innovative training technologies (Friedrich 2025) provide tools to simultaneously build local community trust, enhance brand reputation, and develop talent pipelines.

Finally, the identified gap in management model innovation (Von Schomburg et al. 2025; Ladik et al. 2025) represents a strategic frontier for future research. It signals an imminent competitive advantage for organizations that pioneer new governance structures and international partnership frameworks ahead of the field.

These findings provide a strategic roadmap for resource allocation, market-specific innovation, and leadership in the next generation of the global sports business.

6. Limitations and avenues for future research

While this study provides a comprehensive mapping of the sports innovation literature, several limitations inherent to the bibliometric method must be acknowledged to contextualize the findings and guide future scholarly efforts.

First, while justified for its quality and citation data, the study's reliance on the Web of Science Core Collection inherently limits the scope of the publications analyzed. Relevant research indexed in other databases, such as Scopus or discipline-specific repositories, may have been excluded from this review. This database selection criterion, combined with the restriction to English-language, SSCI-indexed articles, introduces a potential geographic and institutional bias. Consequently, the findings may underrepresent innovative research published in non-English journals, books, or conference proceedings, particularly from non-Western contexts, which could offer valuable alternative perspectives on sports innovation research.

Second, the analytical approach is constrained by its dependence on metadata, particularly on Keywords Plus. While superior to author keywords for broad content representation, these system-generated terms can sometimes lack nuance or misrepresent a paper's core focus. Although informed by robust algorithms and author interpretation, clustering and thematic mapping remain a product of semantic associations between keywords. They effectively map the research landscape but may not capture the full depth and subtlety of individual scholarly contributions.

Third, bibliometric analysis excels at revealing structural patterns and quantitative impact but is less suited for qualitative appraisal. This study identifies dominant themes and influential works but does not assess the theoretical soundness, methodological rigor, or practical validity of the publications included. The "impact" measured through citations is a proxy for academic influence. However, this does not necessarily imply quality or practical significance and may be influenced by trends and self-citation practices.

Finally, citation-based analyses are inherently temporally biased. Seminal works from the early 2000s have had more time to accumulate citations, thus solidifying their status as foundational. Conversely, much more recent publications (e.g., from 2024-2025), which may represent cutting-edge trends, are necessarily underrepresented in citation and co-citation networks owing to their novelty. This can skew the analysis towards established knowledge at the expense of emerging, potentially disruptive ideas.

These limitations inform specific future research directions. Subsequent reviews should incorporate a multi-database approach to overcome this bias. To move beyond mapping, future work should employ a systematic content analysis of the dominant clusters identified here to perform a qualitative and critical synthesis of the findings and methodologies. The promising but underexplored themes highlighted in the thematic map, such as management model innovation, present opportunities for empirical primary research. Investigating these areas through case studies, mixed-methods designs, or qualitative approaches is essential to build on the structural framework provided by this bibliometric

review and to develop a deeper, more nuanced understanding of innovation processes within the global sports ecosystem.

7. Conclusion

This study described here mapped the intellectual structure and evolution of sports innovation research through a systematic bibliometric analysis of three decades of scholarship. The field has matured significantly, evolving from nascent inquiry into a robust interdisciplinary domain defined by three core research streams: strategic entrepreneurship within sports organizations, identity-driven fan engagement, and the design of health-oriented sports programs. These clusters reflect a field grappling with the commercial, cultural, and societal dimensions of innovation in sports.

The findings confirm the growing academic and practical relevance of sports innovation, while revealing critical gaps. Notably, research on innovative management models and governance structures remains underdeveloped, representing a significant frontier for future research. Furthermore, the field requires a stronger embrace of mixed-methods approaches to better capture the complex perspectives of athletes, consumers, and organizational stakeholders.

This study offers a clear framework for strategic actions for practitioners and policymakers. The identified clusters highlight priority areas for investment: building entrepreneurial capabilities within organizations, leveraging digital platforms for deeper fan connections, and developing evidence-based programs that generate verifiable health outcomes. Fostering innovation requires collaborative ecosystems that connect sports organizations, government bodies, educational institutions, and investors.

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