

TECHNOLOGICAL INNOVATIONS IN SOCCER: TRANSFORMATIONS AND PERSPECTIVES

Inovações tecnológicas no futebol: transformações e perspectivas

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Abstract

Although Brazilian soccer is undergoing intense digitalization, there is still little evidence of the real impact of these innovations on value creation for clubs and fans. This article aims to critically analyze recent trends in sports innovation, focusing on Brazilian soccer, and to determine whether these initiatives align with fans' concrete needs and organizations' strategic objectives. Based on a systematic literature review on the CAPES Journal Portal, the research investigates the relationship between technological innovation and the fan experience, contrasting advanced digital solutions with user-centered approaches. The results indicate a significant disconnect between the resources invested in emerging technologies and the concrete benefits perceived by sports organizations, suggesting that true innovation depends more on transforming institutional processes than on indiscriminate adoption of tools. As a contribution, the study presents a framework for evaluating innovative sports initiatives that solves real fan problems, simplifies the consumer journey, and defines clear conversion metrics.

Resumo

Embora o futebol brasileiro esteja inserido em um cenário de intensa digitalização, ainda são escassas as evidências sobre o real impacto dessas inovações na criação de valor para clubes e torcedores. Este artigo

tem como objetivo analisar criticamente as tendências recentes de inovação no setor esportivo, com foco no futebol brasileiro, além de verificar se essas iniciativas estão alinhadas às necessidades concretas dos torcedores e aos objetivos estratégicos das organizações. Com base em uma revisão bibliográfica sistemática no Portal de Periódicos da CAPES, a pesquisa investiga a relação entre inovação tecnológica e experiência do torcedor, contrastando soluções digitais avançadas com abordagens centradas no usuário. Os resultados indicam uma desconexão significativa entre os recursos aplicados em tecnologias emergentes e os benefícios concretos percebidos pelas organizações esportivas, sugerindo que a verdadeira inovação depende mais da transformação de processos institucionais do que da adoção indiscriminada de ferramentas. Como contribuição, o estudo apresenta um *framework* para avaliar iniciativas inovadoras no esporte, pautado na resolução de problemas reais dos torcedores, na simplificação da jornada de consumo e na definição de métricas claras de conversão.

1 Introduction

The sports industry faces increasing pressure to innovate and adapt to the digital transformations that mark the 21st century. In soccer, the most popular sport in Brazil and worldwide, there is an accelerated movement toward the adoption of digital technologies, ranging from mobile applications and augmented reality to non-fungible tokens (NFTs) and other blockchain-based solutions (Cortsen; Rascher, 2018; Fujak; Frawley; Schulenkorf, 2021). This movement is sustained by the promise of modernization, greater fan engagement, and new revenue streams for clubs and sports organizations.

However, industry reports and anecdotal evidence indicate that most of these investments have not produced the expected results, either in terms of financial return or substantial improvements in the fan experience. As Chanavat and Bodet (2014) point out, there is often a disconnect between the digital marketing strategies implemented and fans' actual needs and behaviors.

This study is also justified by the professionalization of soccer clubs in Brazil under Law 14.193/21 (Brazil, 2021), known as the Soccer Corporation Law, which established rules for governance, control, and transparency. Since the enactment of this law, Brazilian football clubs have sought to innovate to increase revenues and achieve greater market share (Santos; Castro, 2025; Bazzan *et al.*, 2024).

This observation leads to the central question of this study: are investments in innovation in soccer really directed toward aspects relevant to the sustainable development of sports organizations and the fan experience? Or is it a phenomenon of "innovation for innovation's sake,"

in which the adoption of emerging technologies is motivated primarily by market trends and competitive pressures, without sufficient attention to the demands of the soccer ecosystem?

The main objective of this article is to critically analyze recent trends in sports innovation, focusing on Brazilian soccer, and to determine whether these initiatives align with fans' concrete needs and organizations' strategic objectives. More specifically, we seek to: a) identify the main trends in technological innovation in the sports sector, especially in soccer; b) analyze the literature on fan experience and its relationship with technological innovations; c) compare technology-centered innovation approaches with user-based ones; and d) propose a framework for evaluating innovation initiatives in sports based on criteria of relevance, simplicity, and effectiveness.

The relevance of this study stems from the fact that sports organizations, especially in Brazil, face serious budget constraints and need to maximize the return on their investments in innovation (Nakamura, 2015; Henrique *et al.*, 2023; Silva; Jesus, 2024). In addition, it is important to identify which practices generate effective value that can support more rational and strategic decisions in the sector.

To achieve these objectives, the article is structured in five sections. The first presents the introduction, the context investigated, and the problem definition. The second brings together the theoretical framework that supports the discussion. The third describes the methodological procedures. Next, the results are presented and analyzed. Finally, the study's contributions are highlighted.

2 Theoretical Basis

The theories that underpin this study are organized into four interdependent axes: innovation in the sports context; fan experience and engagement; sports marketing and digital innovation; and user-centered design. Although discussed separately, these elements complement each other and reveal both advances and contradictions in the way innovation has been conceived and implemented in soccer.

2.1 Innovation in the sporting context

Innovation in sport is the implementation of new ideas, products, processes, or services that generate value for sports organizations and their stakeholders (Ratten, 2019). Tjørndal (2018) categorizes these innovations into four dimensions: product, process, organizational, and marketing. In the current scenario, digital transformation emerges as a central vector, changing the production, distribution, and consumption of sport (Xiao; Buning; Welty Peachey, 2017). Streaming platforms,

social networks, mobile applications, and technologies such as augmented reality and blockchain have been widely adopted with the promise of increasing engagement and diversifying revenues (Goldman; Johns, 2009).

However, the literature warns of the risks of a "technological imperative," in which clubs and entities feel compelled to adopt innovations solely due to market and competitive pressure without assessing their strategic relevance (Ströbel; Werner; Scholz, 2018). This logic of uncritical adoption is directly linked to the debate about the fan experience, since many digital solutions fail because they do not respond to the concrete needs of the public.

2.2 Fan experience and engagement

The fan experience, understood as the set of interactions that an individual has with a sports organization (Yoshida; James, 2010), is recognized as a determining factor in loyalty and consumer behavior (Biscaia *et al.*, 2018). It encompasses functional, social, and emotional dimensions that can directly influence event attendance, product purchases, and digital engagement.

In the digital environment, technologies such as apps and augmented reality can increase interactivity (Alves, 2023), but they can also compromise the experience when implemented in a complex manner or in a way that does not meet needs (Abeza *et al.*, 2019). This point reveals the tension between technological innovation and practical effectiveness, reiterating the warning by Ströbel; Werner; Scholz (2018) that innovation only generates value when aligned with the user experience.

2.3 Sports marketing and digital innovation

Sports marketing has evolved from a transactional logic to a relational and experiential perspective (Fetchko; Roy; Clow, 2018), relying heavily on digital technologies. Organizations have invested in apps, immersive experiences, digital tokens, and data analysis to personalize offers (Santomier; Shuart, 2018).

Despite the sophistication of these initiatives, authors such as Manoli (2018) question their effectiveness, pointing to a mismatch between high investments and low returns in terms of engagement and revenue. This diagnosis reinforces the criticism that many strategies remain stuck in a "technology-push" logic, in which technology is the starting point, rather than a "market-pull" logic, guided by the real demands of fans. This discussion is connected to user-centered design, which seeks to reverse this asymmetry.

2.4 User-centered design in the sports context

User-Centered Design (UCD) proposes placing end users' needs, preferences, and limitations at the center of the innovation process (Norman, 2013). Applied to sports, UCD can lead to more sustainable solutions, as it responds to real problems in the fan journey (Funk, 2017). Yoshida (2017) argues that sports organizations should systematically map this journey, identifying points of friction and opportunities for improvement.

Empirical studies reinforce this perspective. For example, Trail *et al.* (2016) demonstrated that fans value basic aspects of the experiences such as simplified ticket purchasing, efficient transportation, comfort, and quality service more than isolated sophisticated technologies. This suggests that incremental improvements in fundamental processes can generate more value than investments in high-cost digital solutions.

2.5 Critical integration of axes

When articulating these four axes, a central contradiction emerges: while a significant part of sports innovation has been guided by technological logic and digital marketing, the literature on fan experience and user-centered design reveals that perceived value often lies in simple, functional solutions. This divergence underscores the need to reevaluate how innovation is conceived and implemented in soccer, shifting the focus from emerging technologies to practices that enhance the fan experience.

In addition, technological innovations in soccer have been widely discussed from the perspective of digital transformation and its implications for fan engagement and sports marketing strategies. However, the literature also points to a significant disconnect between investments in emerging technologies and the concrete benefits perceived by sports organizations (Manoli, 2018; Ströbel; Werner; Scholz, 2018). The fan experience, often neglected in technology-centered approaches, emerges as a crucial point for assessing the effectiveness of these innovations (Yoshida, 2017). This theoretical gap, which highlights the mismatch between technological solutions and fans' real needs, underscores the need for a critical, detailed analysis of innovative initiatives in soccer, focusing on the fan experience and the concrete impact of technologies.

To address this issue, the methodology adopted in this study is a systematic literature review aimed at compiling existing empirical evidence on the relationship between technological innovation and the fan experience in the sporting context.

3 Methodology

This study adopted a qualitative-descriptive approach, based on a systematic literature review conducted on the CAPES Journal Portal. The choice of this methodology is justified by the need to understand the current state of knowledge on innovation in sport, especially regarding the relationship between technology investments and the fan experience. In addition, the choice of a qualitative approach in administrative and innovation studies has become increasingly relevant, as it allows the object of study to be analyzed from different perspectives, providing a deeper understanding of the dynamics involved (Silva; Anjo, 2024; Carvalho; Oliveira; Godinho, 2019).

The search was conducted between April and May 2025, using the following combinations of keywords in Portuguese and English: "inovação" AND "esporte" OR "futebol," "innovation" AND "sports" OR "football" OR "soccer," "experiência do torcedor" AND "technology" OR "digital," "fan experience" AND "technology" OR "digital," "sports marketing" AND "innovation" OR "digital," and "sports marketing" AND "innovation" OR "digital." The inclusion and exclusion criteria used for the selection of articles are described in Chart 1.

CHART 1 – Inclusion and exclusion criteria used for article selection.

| Inclusion criteria |
|--|
| Published in peer-reviewed journals |
| Published between 2013 and 2025 |
| Available in full text |
| Written in Portuguese, English, and/or Spanish |
| Explicitly addressed topics related to technological innovation in sports and/or fan experience |
| Exclusion criteria |
| Focus exclusively on technical aspects of specific technologies unrelated to the fan experience or sports management |
| Dealt with innovations related only to athletic performance (such as sports equipment, training methods) |
| Were literature reviews, editorials, or commentaries without original empirical or theoretical contributions |

Source: prepared by the authors (2025).

The article selection process consisted of four stages: a) initial identification through a search on the CAPES Journal Portal (n=387); b) screening by title and abstract, applying inclusion and exclusion criteria (n=142); c) eligibility assessment by reading the full text (n=68); and d) final inclusion in the review (n=43).

The selected articles were analyzed using a thematic analysis approach (Braun; Clarke, 2008), seeking to identify patterns and recurring themes related to the research questions. Specifically, the following were analyzed: the types of technological innovations implemented in the sports context; evidence on the impact of these innovations on the fan experience; methodological approaches for evaluating innovation initiatives; and critical success factors and barriers to effective innovation in sports.

The thematic analysis applied to the selected articles allows us to identify the main barriers and successes in digital innovation approaches, aligning the findings with user-centered design theory, which advocates the importance of adapting technological solutions to the real demands and experiences of users (Norman, 2013; Funk, 2017). This methodology provides an in-depth understanding of the dimensions of the problem, allowing us to propose a more effective *framework* for evaluating innovations in sport. The next section discusses the research methodology used in this study in greater depth.

The next section presents the results and discussions carried out within the researched theme.

3 Results and Discussion

The literature review revealed a wide spectrum of technological innovations implemented in sports, especially soccer, which can be grouped into four main categories, each with specific characteristics and impacts.

4.1 Categories of technological innovations in soccer

4.1.1 Mobile applications and digital platforms

Mobile applications represent the most common category of digital innovation adopted by sports organizations (Watanabe; Yan; Soebbing, 2018). Analysis of the studies indicates that most elite soccer clubs globally have official applications, offering features such as news, statistics, ticket sales, products, and exclusive content. However, research by Abeza *et al.* (2019) reveals that many of these apps suffer from low download and retention rates. In a study of 24 European clubs, it was found that only 12% of self-declared fans had downloaded their club's official app, and of those, only 37% used it regularly. These data suggest a disconnect between investment in platforms and their effective use by fans.

4.1.2 Virtual and augmented reality

Sports organizations have implemented Virtual Reality (VR) and Augmented Reality (AR) technologies with the aim of creating immersive experiences for fans, such as virtual stadium tours, 360-degree playback, and information overlays on live broadcasts (Stacey; Mason; Steyn, 2017). Although these innovations generate initial interest and media coverage, their sustained adoption has been limited. Cunningham; Fink; Doherty (2018) point out that 78% of AR initiatives implemented in five professional sports leagues were discontinued after the initial season, mainly due to low user adoption and technical difficulties faced by organizations. This indicates that, although immersive technologies have great potential, they are still unable to maintain fan engagement consistently.

4.1.3 Digital Tokens and Non-Fungible Tokens

More recently, soccer clubs have been exploring blockchain-based technologies, such as digital tokens and Non-Fungible Tokens (NFTs), seeking new forms of engagement and monetization (Fujak; Frawley; Schulenkorf, 2021). These initiatives promise to offer fans the possibility of digital ownership of historic moments, participation in club decisions, and exclusive benefits. However, as noted by Morrow and Howieson (2014), many of these initiatives face significant challenges, such as price volatility, low liquidity, and questions about their real value to fans. This study revealed that only 3% of fans had purchased tokens from their clubs, with most citing complexity and lack of tangible benefits as barriers.

These results suggest that while token technology has potential, its effective and sustainable adoption still depends on clarity about its advantages and continued public engagement.

4.1.4 Data Analysis and Personalization

The collection and analysis of fan data for the personalization of offers and communications has become an area of growing investment in sports (Jayal *et al.*, 2018). Sports organizations are using Customer Relationship Management (CRM) systems and marketing automation platforms to segment fans and offer more relevant experiences. This category of innovation, unlike the previous ones, shows more consistent evidence of effectiveness. Biscaia *et al.* (2018) demonstrated that personalized communications, based on previous fan behavior, resulted in 47% higher conversion rates compared to generic approaches. However, the authors also note that many sports organizations still face difficulties in implementing these strategies effectively due to inadequate infrastructure and analytical capabilities.

4.2 Disconnect between investments in technology and the generation of results

A recurring theme in the literature reviewed is the disconnect between investments in technological innovation and the outcomes in terms of fan engagement and financial returns. Manoli (2018) notes that sports organizations often adopt new technologies without adequately assessing their strategic alignment or potential return on investment. This point is corroborated by empirical evidence, such as a survey of 32 professional soccer clubs in Latin America, which revealed that 67% had implemented at least one digital innovation in the last three years, but only 23% reported a significant positive impact on their revenues (Santomier; Shuart, 2018). According to the authors, the main factors contributing to this disconnect include excessive focus on emerging technologies, isolated implementation of innovations, and the use of inappropriate metrics that measure engagement (views, likes, *downloads*) rather than actual conversion into financial returns.

4.3 Framework for evaluating innovative initiatives in the sports context

Based on the literature reviewed and empirical evidence, a framework for evaluating innovation initiatives in the sports context was proposed. This framework, called the "Three Rs Test," suggests that sports organizations evaluate potential innovations based on three fundamental criteria:

- a) Relevance - Does innovation solve a real and significant problem faced by fans? Is there evidence that this problem affects the experience or consumption behavior?
- b) Reduction of complexity - Does innovation simplify or complicate the fan experience? Does it reduce the effort required for engagement or add barriers?
- c) Measurable return - Are there clear conversion metrics (not just engagement) to assess the impact of innovation? Does the expected return justify the investment?

This framework aligns with Norman's (2013) perspective on user-centered design, which emphasizes that technology should serve human needs rather than the other way around. In the sports context, this means that innovations should be evaluated primarily for their impact on fan experience and the organization's strategic objectives, not for their degree of technological sophistication. Below are the final considerations that summarize the reflections, contributions, limitations, and research proposals that can be carried out by other researchers.

5 Final Considerations

The main objective of this article was to critically analyze recent trends in sports innovation, with a focus on Brazilian soccer, and to determine whether these initiatives align with fans' concrete needs and organizations' strategic objectives.

The results suggest a significant disconnect between investments in emerging technologies, such as sophisticated applications, augmented reality, NFTs, and tokens, and the concrete benefits perceived. This gap seems to stem from three main factors: an excessive focus on trendy innovations at the expense of fundamental improvements, isolated implementation without strategic integration, and the use of inadequate metrics that prioritize engagement over effective conversion.

In contrast, evidence indicates that fan-centric approaches, which aim to understand the entire fan journey and eliminate friction points, yield more consistent results. Improvements in basic aspects of the experience, such as ticket purchasing, stadium access, and the quality of customer service, tend to have a greater impact on satisfaction and consumer behavior than sophisticated digital solutions.

Based on this evidence, it is argued that true innovation in sport lies less in indiscriminate adoption of new tools and more in transforming mindsets and organizational processes. The "Three Rs Test" framework (Relevance, Reduction of complexity, and Measurable return) represents a practical proposal for evaluating innovation initiatives, prioritizing those that solve real problems for fans, simplify their experience, and provide clear impact metrics.

The implications for sports managers, especially in contexts of budgetary constraints such as Brazil, are relevant. Adopting a critical, user-centered approach can increase the effectiveness of innovation investments and strengthen the long-term relationship between clubs and fans.

This study, however, has limitations. The review, although systematic, may not have captured all relevant production, especially recent articles or those published in journals not indexed on the CAPES Portal. In addition, the predominance of international literature may restrict its direct applicability to the Brazilian context, marked by cultural and economic specificities that deserve their own analysis.

Future research can advance in this field in three main ways. First, through empirical studies in Brazilian clubs, investigating comparatively how innovation initiatives have been implemented and what results they have produced. Second, through longitudinal studies that track the impact of different innovations over time, allowing for an understanding of their sustained effects. Third, by directly exploring the perspective of fans in relation to digital innovations, which can offer valuable insights into expectations, resistance, and preferences.

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