

An AHP-Based Framework for Sustainable Market Innovation in Sports: Prioritizing Key Factors for Sports Market Sustainability



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Abstract:

Purpose: This study aims to prioritize the key factors that enable the integration of sustainability into sports culture. By applying the Analytic Hierarchy Process (AHP), the research systematically evaluates and ranks cultural, organizational, and structural drivers that influence how sustainability can be embedded within the sporting ecosystem. The study also contributes to sustainable market innovation in the sports sector by linking sustainability integration with green branding, consumer engagement, and market-oriented value creation.

Design/Methodology: The study employs the AHP methodology to assess the relative importance of sustainability integration factors. Experts provided pairwise comparisons of identified factors, and the resulting judgments were normalized to calculate their relative weights and overall ranking.

Findings: The analysis reveals that Athlete Advocacy and Leadership (AAL) and Fan Engagement and Education (FEE) are the most critical drivers of sustainability integration. These findings show that athlete advocacy and fan engagement can strengthen green consumer behavior, build trust, and improve market acceptance of sustainable sports products, services, and event practices. Sustainable Product Design (SPD), Corporate Social Responsibility (CSR), and Sustainable Infrastructure and Event Management (SI) rank moderately as supportive enablers.

Implications/Originality: The findings offer practical guidance for sports brands, event managers, sponsors, and policymakers seeking to promote sustainable market innovation through athlete-led campaigns, fan education, CSR initiatives, and responsible infrastructure.

Keywords: *Sustainable Market Innovation, Sustainability in Sport, Sustainable Sports Marketing, Green Consumer Behavior, Sports Market Sustainability, Analytic Hierarchy Process (AHP), Athlete Leadership, Fan Engagement, Corporate Social Responsibility (CSR)*

Introduction

Currently, the sports industry presents significant opportunities and threats for the environment and society at large. Hence, the implementation of sustainability initiatives is vital in ensuring the sustainable future of sport activities. With global issues such as climate change, the scarcity of natural resources, wastage from big events, and pollution caused by travelling becoming ever more prominent, pressure on sports institutions increases due to demands from fans, sponsors, universities, and management organizations. Sports sustainability means incorporating ecological, social, and economic aspects throughout sports activities, facilities, events, and products. In this regard, sustainability implies limiting the negative impact of sports activities on the environment by using resources efficiently and implementing green technologies, promoting inclusion and wellbeing of communities, and ensuring the financial sustainability of sports organizations. The contribution of sustainability into global development goals and the equality of access to

sports for future generations is evident in the efforts

of the sports industry. Despite a growing interest in sports sustainability demonstrated in literature, several research gaps persist, such as lack of consistent sustainability strategies and cultural embedding in sports organizations (Boros, Tózsér, & Géczi, 2024; Hautbois et al., 2022). For instance, university students from Rome demonstrate good awareness and attitudes towards the environment but do not associate their interests with sports, suggesting that sustainable culture is yet external to the majority of sports activities (Lenzi et al., 2023). Moreover, research into sports entrepreneurship and innovation for sustainability shows promising trends as well as identifies important fields of study which should be further explored (Huertas, M., et al. 2019). Apart from cultural integration, sustainability can create business opportunities in the sports industry through green marketing, sustainable product development, sustainable event management, and consumer engagement. Sports

firms should consider not only the need for sustainability for ethical reasons but also as a means of creating market innovations, in which green sportswear, sustainable products, green events, and sustainable communications play a role in building brand differentiation and consumer trust. Examples of sustainable product concepts in sportswear and sports equipment show that sustainability-oriented design has great potential for fostering value creation in the entire sports industry, while digitalization combined with sustainability can transform sports management and marketing (Zhou & Lu, 2024; Glebova & Madsen, 2024). These points highlight an important requirement for research, namely to determine the elements that contribute to success in ensuring that sustainability becomes an essential component of sports culture, rather than a marginal issue. Such knowledge could lead to policies and practices that help achieve sports development in a sustainable way. However, there is still a lack of research on the scarcity of systematic research analyzing how these elements of sustainability help achieve sustainable market innovation within the domain of sport activities. While previous studies have already discussed green communication, fans' opinions, and sustainable consumer behaviors, there is a scarcity of literature on ranking the factors enabling these elements of green branding, which leads to sustainable sports product and service consumption (Harrison et al., 2022; Opeliik et al., 2025; Agarwal et al., 2025).

Objective of the Study

The objective of this research study is to undertake a critical assessment of the incorporation of sustainability in sports culture by highlighting the important elements that help sports organizations, athletes, and other stakeholders in adopting sustainable practices. While there have been various attempts made to address the issue of sustainability within the field of sports, most of them have concentrated only on standalone activities such as development of eco-friendly facilities or holding carbon-neutral sporting events. The present research also focuses on exploring the issue of how green branding, sustainable sports goods, sustainable sporting events, and fan-consumption behaviors might enable sustainability to evolve from a corporate behavior to a business opportunity by addressing athlete endorsement, fan participation, which can impact trust, awareness, and acceptance, and sustainable product design and events that encourage the demand for greener sports products and services (Harrison et al., 2022; Opeliik et al., 2025; Agarwal et al., 2025). The purpose of this study is to fill this gap through a discussion on how sustainability can be integrated into sports culture and not viewed as something

imposed from outside, thus adding value to existing knowledge as well as providing ways forward for sustainability in the sports industry. Consequently, the study tries to meet the need for developing a systematic approach for ranking sustainability factors based on the AHP framework.

Research Questions

RQ1: What are the most crucial factors that contribute to sustainable market innovation in sports culture?

RQ2: How can the Analytic Hierarchy Process (AHP) be applied to prioritize sustainability factors for sports market transformation?

RQ3: How do Athlete Advocacy and Leadership and Fan Engagement and Education influence sustainable consumer behavior in the sports sector?

This study contributes to the body of literature by presenting an innovative approach to embedding sustainability within sports culture. Although much recent research has focused on isolated sustainability initiatives—such as green infrastructure, waste management, and carbon reduction—few studies have employed structured decision-making frameworks, such as the Analytic Hierarchy Process (AHP), to systematically evaluate and rank the key factors that enable long-term cultural integration. The use of the Analytic Hierarchy Process (AHP) in this work allows for a new approach to the ranking of factors influencing the success of sustainability from cultural, organizational, and stakeholder perspectives, thus allowing a broader comprehension of the concept of sustainability and its effective implementation in the sports sector.

The paper comprises five parts. The first part is Introduction and describes the rationale, importance, goals of the study, and its contributions to the body of knowledge. The second part is Literature Review, which covers the relevant literature on the factors that were taken into account when filling out the pairwise comparison matrix. The third part is Methodology and involves creating the pairwise comparison matrix, normalization, evaluation of the relative importance of factors, and determination of Consistency Ratios. The fourth part includes the Results and Data Analysis.

Factors Integrating Sustainability into Sports Culture

Athlete Advocacy and Leadership

The concept of athlete advocacy and leadership involves the use of the platform, credibility, and leadership positions held by athletes to support sustainability efforts, demonstrate environmentally positive behavior, and effect changes among

athletes and fans. According to recent academic literature, one of the key roles that athletes have is that of a messenger for environmental causes: athletes can communicate sustainable science and objectives in a way that resonates with their audience; however, the success of such endeavors depends on their authenticity and relevance to the individual athlete (Knowles, 2024; Thaller, 2023). Another insight from research related to leadership is that leaders among athletes influence the norms and behaviors prevalent among team members, thus suggesting that an intervention designed to empower athletes as advocates could effect organizational change (Cotterill, 2022).

When it comes to sustainable marketing innovations, there is the potential connection between the athlete advocacy and leadership role in relation to green branding, trust, and sustainable market influence. This is because athletes often act as credible sources who deliver their environmental messages that help improve the authenticity of the sustainability campaigns as well as increase fans' trust in green sports. In the situation where sustainability communications are regarded as relevant, close, and significant, they have the power to influence positively how the fans think about the professional sports organizations (Harrison, Vafeiadis, & Bober, 2022). In the same manner, digital technology and social media have increased the ability of athletes and sports organizations to advocate environmental sustainability making athlete-driven communication an important tool.

Sustainable Product Design

Sustainable product design in sports involves designing equipment, apparel and packaging to minimize environmental impacts across the product life cycle (materials, production, use, and end-of-life) while retaining performance and safety. The sports-product literature traces environmental impacts across materials, manufacturing and end-of-life, arguing for circular-design strategies (material substitution, modularity, and recyclability) that maintain performance (Subic, 2009; Díaz et al., 2021). Recent reviews and design frameworks for sportswear and equipment emphasize whole-chain approaches (producer → designer → consumer) and life-cycle thinking to reduce waste and enable recycling/reuse in the sports goods sector (Zhou et al., 2024; Subic, 2009). Industry case studies show trade-offs between high-performance materials and recyclability, underlining the need for cross-disciplinary research and development. (Subic, 2009; Díaz et al., 2021; Zhou et al., 2024).

Within the revised scope of sustainable market innovation, sustainable product design should be expanded toward green sportswear, eco-friendly equipment, recyclable merchandise, and circular sports products. This determinant goes beyond just the environmental reduction that results from

production processes. Rather, it helps us understand how sportswear brands create green values for consumers through proper use of materials, recyclable product models, and sustainability-conscious consumer products. Studies conducted on sustainability-based marketing and circular economy-based consumer behavior suggest that environmentally responsible green product strategies could have a positive effect on the buying decisions of consumers through association of environmental consciousness with product value, brand trustworthiness, and responsible consumerism (Agarwal et al., 2025). Additionally, research on platform-based sustainability within the e-commerce environment shows that recycled fashion consumer behaviors are increasingly being affected by digital platforms, recycling awareness, and circular consumption models (Sardianou & Briana, 2025).

Fan Engagement and Education

Fan engagement and education are strategies to inform, involve and motivate spectators and supporters to adopt pro-environmental behaviors at events and beyond, using messaging, activation, and participatory initiatives. Studies of sporting events demonstrate that fan environmental programs (onsite education, signage, and behavioral nudges) can increase awareness and intentions but their real-world effects vary with fan values and team (Casper & Pfahl, 2014; Casper, 2017). More recent segmentation studies argues that tailoring engagement to fan subgroups — those with stronger pro-environmental values respond more to sustainability initiatives, while others may require identity-based messaging linking sustainability to team pride (Konstantopoulos, 2024; Casper, 2017). Methodologically rigorous evaluations remain limited and researchers call for longitudinal and behavioral measures beyond self-reporting. (Casper & Pfahl, 2014; Casper, 2017; Konstantopoulos, 2024).

Fan engagement and education can also be understood as a source of eco-conscious consumption and demand for sustainable sports products and services. In a market-oriented sustainability framework, fans are not only spectators but also consumers whose awareness, attitudes, and purchasing behavior influence the acceptance of green sportswear, sustainable merchandise, responsible events, and CSR-linked sports services. According to research on communication, sustainability messages in sports can shape consumers' attitudes towards products or brands, especially when used in tandem with social activism, generational values, and effective communication practices (Opelík et al., 2025). In addition to this, sustainability messages that exhibit a clear link with regard to fit, proximity, and impact have been known to improve the intentions of

followers in the fan base, meaning that fan education is crucial for creating a demand for sustainable sports services and strengthening green brand relationships (Harrison, Vafeiadis, & Bober, 2022).

Policy and Regulatory Support

The concept of policy and regulation refers to those rules, regulations, incentives, standards, and frameworks put forth by government and sporting bodies in order to make sustainable activities possible, obligatory, or more likely. In sport policy research, it has been found that sustainable policy development requires multi-level governance, involving national policies, sports federations, and local event organizers, in order to create incentives and standards for sustainability (Mountifield, 2025; Viollet, 2023). Studies using a policy perspective such as multiple streams and advocacy coalitions have shown that sustainability incorporation into sports requires coalition building and well-defined targets and capacity for monitoring (Mountifield, 2025).

Sustainable Infrastructure and Event Management

This factor includes planning, building, and operating sports facilities and events with low environmental footprint, such as — energy and water efficiency, green materials, waste management and transports planning. Applied research on events and facilities highlights proven practices - energy efficiency, sustainable materials, active-transport planning, and on-site waste systems - and demonstrates their effectiveness when integrated from planning through operations (Bianchini et al., 2021; Li et al., 2025). Event-level studies (waste reduction pilots, circular procurement) document measurable reductions in single-use plastics and waste volumes, however scalability depends on host commitment and legacy planning (Bianchini et al., 2021). Recent material science work has also explored environment-friendly construction materials for stadiums and venues. (Bianchini et al., 2021; Li et al., 2025).

Investment in Green Initiatives

Investment in green initiatives describes funding (public, private, sponsorship) and resource allocation toward sustainability projects in sports - such as, stadium retrofits, renewable energy, circular product programs, and research. Research on strategic priorities and investment in sports sustainability finds that decision-makers prioritize investments that align with organizational goals and offer reputational or cost benefits (Glibo et al., 2022; Safarpour et al., 2025). Analyses using Delphi methods and stakeholders' research findings show that investments in renewables, retrofitting

initiatives, and circular economy practices result in financial benefits over time and improved goodwill among stakeholders. However, high initial costs and an unclear return on investment could pose a challenge unless there are financing mechanisms in place. (Glibo et al., 2022; Safarpour et al., 2025).

Performance Metrics and Accountability

Metrics and accountability are the frameworks, key performance indicators (KPIs), and methods used to measure environmental impact, track progress, and ensure accountability for environmental performance. Academic sources emphasize the importance of using standardized metrics and reporting data for benchmarking purposes and ensuring accountability in sports organizations (Gerke et al., 2024; Glibo et al., 2022). Literature highlights promising frameworks while simultaneously pointing out fragmentation in measurement practices: sports clubs and events select their metrics and measurements arbitrarily and lack external validation. The academic sources recommend using industry-specific KPIs and mandatory disclosures to improve comparison and performance (Gerke et al., 2024; Glibo et al., 2022).

Corporate Social Responsibility (CSR)

Sports CSR entails a series of corporate or organizational initiatives involving social and environmental efforts such as philanthropy, community programs, and sustainability reporting aimed at demonstrating an organization's impact. CSR in the sports industry reveals how organizations utilize environmental CSR as a strategy for gaining legitimacy, engaging communities, and attracting sponsors, although depending on how this is done (Casper, 2017; McCullough et al., 2010). Studies of athletes and organizational CSR indicate that authentic, community-embedded projects-combined with monitoring,-produce better social and environmental outcomes than one-off publicity campaigns (McCullough, 2010; Casper, 2017). Researchers urge linking CSR to measurable sustainability targets rather than broad or ad-hoc initiatives. (McCullough, 2010; Casper, 2017).

Research Methodology

The present research situations require decision-making based on several interrelated factors. Scholars have established a comprehensive framework of multi-criteria decision making (MCDM) strategies to address this inherent complexity. The "Analytic Hierarchy Process," or AHP, was created by Thomas L. Saaty in 1977 and is one of the most widely used methods. AHP is a methodical, quantitative way to evaluate alternatives because it puts decision concerns into hierarchical tiers, weights relative preferences among various criteria and combines judgements to

obtain the best option. It may imitate human decision-making through pairwise comparisons, aiding decision-makers in reaching consistent and unequivocal findings (Saaty & Hu, 1998, Saaty, 2008). In the context of this study, AHP is particularly useful because sustainable market innovation in sports depends on the prioritization of multiple interrelated cultural, organizational, and market-oriented factors rather than on a single sustainability initiative. By assigning relative weights to these factors, AHP helps identify which drivers are most influential in supporting green consumer behavior, sustainable sports marketing, responsible product development, and market acceptance within the sports sector (Saaty, 2008; Glebova & Madsen, 2024)

AHP Procedure for Determining the Relative Importance of Factors

This study employed AHP to integrate sustainability into sports culture. Within the revised scope of sustainable market innovation, AHP was also used to examine how sustainability-related factors can contribute to sports market transformation, sustainable value creation, and stakeholder acceptance of green sports practices (Glebova & Madsen, 2024). The process involved the following steps:

Step 1: Identifying Critical Factors

From an in-depth literature review and discussion eight strategies applicable to Integrating Sustainability into Sports Culture were identified. These are: (1) Athlete Advocacy and Leadership; (2) Sustainable Product Design; (3) Fan Engagement and Education; (4) Policy and Regulatory Support; (5) Sustainable Infrastructure and Event Management; (6) Investment in Green Initiatives; (7) Performance Metrics and Accountability; and (8) Corporate Social Responsibility (CSR). These selected factors represent both cultural drivers and market-enabling mechanisms. Athlete Advocacy and Leadership and Fan Engagement and Education reflect cultural drivers because they influence awareness, trust, consumer attitudes, and behavioral change among sports audiences. In contrast, Sustainable Product Design, Sustainable Infrastructure and Event Management, Corporate Social Responsibility, Policy and Regulatory Support, Investment in Green Initiatives, and Performance Metrics and Accountability operate as market-enabling mechanisms because they support green branding, sustainable product offerings, responsible event delivery, organizational credibility, and long-term market sustainability (Glebova & Madsen, 2024).

Step 2: Pairwise Comparison Based on Expert Inputs

An expert panel from the relevant field was consulted to offer their opinions on the significance of the strategies identified, employing Saaty's pairwise comparison approach. In this regard, a rating of 1 is indicative of equal significance, while a score of 9 is representative of the overwhelming importance of one aspect over another (Saaty, 2008). Notably, the opinions obtained from the experts did not only involve a general assessment of the sustainability implications of the factors but also evaluated the extent to which each factor could foster sustainable value generation and market acceptance in the sports industry (Saaty, 2008; Glebova & Madsen, 2024).

Table 1: Saaty Scale for Pairwise Comparison

Numerical Value	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Demonstrated importance
9	Absolute importance
2, 4, 6, 8	Intermediate values

Step 3: Finalization of Comparison Matrix

Reciprocal square matrix was developed from expert opinions where the diagonal entries received value one since these were of equal importance with themselves. Based on the opinions by the experts, the off-diagonal entries reflected the level of importance of the respective strategies. Thus, this comparison matrix provides a good framework for ranking the determinants based on their contribution to sustainable market integration in the sports industry.

Step 4: Normalized Matrix

Finding the normalized main eigenvector of the comparison matrix allowed for the determination of the weight of each factor. The degree to which each approach is applied to the entire framework is indicated by the eigenvectors. A direct comparison of factors was made possible by the normalization procedure, which made all weights equal to one. The normalized weights indicate which cultural and market-enabling factors hold greater strategic importance for building green awareness, encouraging sustainable consumer behavior, strengthening sports brand credibility, and supporting market acceptance of sustainable sports practices (Saaty, 2008; Glebova & Madsen, 2024).

Step 5: Consistency Index

The consistency index is computed based on the highest eigenvalue of the Pairwise Comparison Matrix and the total number of factors (n). The consistency ratio is calculated as CI/RC. If the consistency ratio is above 0.10, the comparison matrix provides inconsistent expert opinion and if

the consistency ratio is less than 0.10, it indicates consistency in expert opinion towards the factors. In this study, the consistency test ensures that expert judgments regarding sustainability integration and sustainable market innovation were logically reliable, thereby strengthening the validity of the final priority ranking (Saaty, 2008).

Table no: 2 Random Consistency Index

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Data collections

The data for this research study was obtained through the use of 11 Sports Management and Administrators who have considerable experience in the topic of Sustainability in Sports Culture. The participants chosen were appropriate for this study because they have considerable professional experience in such topics as sports management, sustainability activities, corporate social responsibility (CSR), innovations in product developments, events and sports market

management. They could judge the importance of the factors not only culturally, but also based on their ability to create sustainable value and market appeal in the sport industry. The respondents were chosen according to the pair wise comparison test which would aid in the integration of sustainability into sports culture. The sports administrators are relevant as respondents because of their responsibilities in planning and evaluating strategies aimed at sustainable development of sports organizations.

Factors	AAL	SPD	FEE	PRS	SI	IFI	PMA	CSR
Athlete Advocacy and Leadership (AAL)	1							
Sustainable Product Design (SPD)	X	1						
Fan Engagement and Education (FEE)	X	X	1					
Policy and Regulatory Support (PRS)	X	X	X	1				
Sustainable Infrastructure and Event Management (SI)	X	X	X	X	1			
Investment in Green Initiatives (IGI)	X	X	X	X	X	1		
Performance Metrics and Accountability (PMA)	X	X	X	X	X	X	1	
Corporate Social Responsibility (CSR)	X	X	X	X	X	X	X	1

Table 1: Pairwise Comparison Matrix of Sustainability Integration Factors in Sports Culture

Factors	AAL	SPD	FEE	PRS	SI	IFI	PMA	CSR
Athlete Advocacy and Leadership (AAL)	1	5	3	7	5	5	7	5
Sustainable Product Design (SPD)	0.2	1	0.5	1	2	3	3	3
Fan Engagement and Education (FEE)	0.33	2	1	3	5	3	7	5
Policy and Regulatory Support (PRS)	0.14	1	0.33	1	1	1	3	0.5
Sustainable Infrastructure and Event Management (SI)	0.2	0.5	0.2	1	1	3	5	1
Investment in Green Initiatives (IGI)	0.2	0.33	0.33	1	0.33	1	3	0.5
Performance Metrics and Accountability (PMA)	0.14	0.33	0.14	0.33	0.2	0.33	1	0.14
Corporate Social Responsibility (CSR)	0.2	0.33	0.2	2	1	2	7	1
TOTAL	2.41	10.49	5.7	16.33	15.53	18.33	36	16.14

The normalized matrix shows the relative weights assigned to each criterion within the context of the comparison made, and thus it shows variations in terms of the degree of their impact on the process of incorporating sustainability into an organization. The criterion known as "Athlete Advocacy and Leadership (AAL)" emerges with high normalized values in all four columns (0.17, 0.18, 0.19, and

0.27), confirming that it is the key driver of cultural change. The criterion known as "Investment in Green Initiatives (IGI)" demonstrates high normalized values in some columns, notably in columns 0.35 and 0.44, proving that investment is a crucial enabling factor of adopting sustainability. The pairwise comparison conclusions are logically consistent and trustworthy, as evidenced by the

consistency ratio (CR = 0.069), which is far below the permissible cutoff of 0.10. Overall, the findings highlight that while institutional and accountability systems play supporting but less significant roles, athlete leadership and financial contributions are essential for integrating sustainability into sports culture. In addition, the judgments provided by the expert panel support the revised market-oriented

scope of the study, as the comparison matrix captures how each factor contributes to sustainable sports market innovation, green consumer engagement, organizational credibility, and the acceptance of sustainability-oriented practices by sports stakeholders. The expert profile is presented in Table 1 to show the relevance of respondents in terms of role, experience, and area of expertise.

Table 1. Expert Profile of Research Experts

Expert Category / Role	Frequency	Percentage (%)	Experience	Area of Expertise
Sports Management Professionals	3	27.27	More than 5 years	Sports administration, organizational planning, stakeholder coordination, and sports policy implementation
Sports Administrators	3	27.27	More than 5 years	Event management, sports facility management, operational planning, and implementation of sports programs
Sustainability / CSR Experts	2	18.18	More than 5 years	Environmental sustainability, CSR initiatives, green initiatives, sustainability reporting, and organizational accountability
Product / Event Innovation Experts	2	18.18	More than 5 years	Sustainable product design, green sports products, circular product innovation, responsible event practices, and eco-friendly facilities
Market Development / Branding Expert	1	9.09	More than 5 years	Sports market development, fan engagement, green branding, sustainable consumer behavior, and market acceptance
Total	11	100	—	—

Table No: 2 Normalized matrix

Factors	AAL	SPD	FEE	PRS	SI	IFI	PMA	CSR
Athlete Advocacy and Leadership (AAL)	0.415	0.477	0.526	0.429	0.322	0.273	0.194	0.310
Sustainable Product Design (SPD)	0.083	0.095	0.088	0.061	0.129	0.164	0.083	0.186
Fan Engagement and Education (FEE)	0.137	0.191	0.175	0.184	0.322	0.164	0.194	0.310
Policy and Regulatory Support (PRS)	0.058	0.095	0.058	0.061	0.064	0.055	0.083	0.031
Sustainable Infrastructure and Event Management (SI)	0.083	0.048	0.035	0.061	0.064	0.164	0.139	0.062
Investment in Green Initiatives (IGI)	0.083	0.031	0.058	0.061	0.021	0.055	0.083	0.031
Performance Metrics and Accountability (PMA)	0.058	0.031	0.025	0.020	0.013	0.018	0.028	0.009
Corporate Social Responsibility (CSR)	0.083	0.031	0.035	0.122	0.064	0.109	0.194	0.062
							CI	0.8729
							RI	1.41
							CR	0.069

The normalized table above shows the relative effect of each factor with respect to the others after normalizing the column totals. The research indicated that Athlete Advocacy and Leadership (AAL) had the greatest normalized measures in most columns (0.194 to 0.526), supporting its stature as the strongest motivator towards sustainability incorporation. Moreover, Fan Engagement and Education (FEE) appear to be a key motivator with considerably high normalized ratings (0.137 - 0.322), highlighting the value of fan

involvement coupled with athlete leadership. On the other hand, PMA scores had the lowest ratings ranging between 0.009 and 0.058. This suggests that PMA is seen as helpful but not critical when creating cultural sustainability. Factors that score between PMA and CSB/SPD are moderately relevant, but CSB and SPD still have significant roles in contributing to cultural sustainability. The consistency index (CI=0.8729) and consistency ratio (CR=0.069<0.10) indicate that there is consistency and acceptance in the pairwise comparison process

used to create the matrix, which supports the validity of the weightings and rankings obtained from the analysis. The findings also show that the expert group is capable of evaluating the factors based on their cultural and market aspects. For example, athletes' leadership and fans' involvement have been rated alongside sustainable product design, CSR, infrastructure, government support, investments, and PMA as market enablers.

Results

The relative and cumulative percentages have made it very clear that Athlete Advocacy and Leadership (AAL) is the most dominant factor, accounting for 36.82% of the entire influence. This shows how critical athletes are when it comes to sustainability in sports. Considering sustainable market innovation, it means that Athlete Advocacy and Leadership acts as a major catalyst for green consciousness. Since athletes have high visibility and representational power, they can help in spreading the message of sustainability, build customer confidence, and make sports brands more credible when selling their green products.

The sum of the weights of the two top variables, along with Fan Engagement and Education (FEE), which had the third highest weight of 20.96%, was around 58%, suggesting that change in culture could best be accomplished through athlete-led programs with fan education. As such, FEE may be considered as a driving force from the demand side towards market innovation sustainability. Engaged and educated fans are likely to consume environmentally-friendly sports products and services, engage in environmentally-responsible behaviors in events, respond to green branding efforts, and create market demand for such sports services.

The mid-level variables, which include Sustainable Product Design (SPD), Corporate Social Responsibility (CSR), and Sustainable Infrastructure (SI), are responsible for approximately 28% of the success of the business, reflecting their significance in supporting sustainability initiatives. At the same time, these three variables form a basis for innovations in the sporting industry. The SPD helps in the creation of eco-friendly sports apparel,

equipment, merchandise, and products. CSR contributes to building an organization's credibility, sponsorship, and greening its brand. SI and event management help provide responsible services by developing eco-friendly venues, recycling technologies, efficient buildings, and events.

However, institutional mechanisms, such as Policy & Regulatory Support (PRS), Investment in Green Initiatives (IGI), and particularly, Performance Metrics & Accountability (PMA) receive smaller allocations, with their combined share accounting for less than 15% of the entire pie. This suggests that while these mechanisms are important for future monitoring and reinforcement purposes, at present they are not considered as key cultural drivers. All in all, it can be concluded that according to the study's findings, athletes' leadership and fans' engagement remain the two most crucial instruments for embedding sustainability in sports, while institutional and regulatory mechanisms act in supporting functions. Therefore, the implications of the study suggest that sustainable innovation of the market in the field of sports is predominantly triggered by cultural impact and consumer involvement, while product, CSR, and infrastructure represent institutional mechanisms used to introduce sustainable products, brands, and services.

Interpretation of Athlete Advocacy and Leadership as a Driver of Green Awareness and Brand Credibility

Athlete Advocacy and Leadership (AAL) had the largest relative percentage, which was 36.82%, meaning that athletes play a significant part in nurturing green awareness in the world of sports. Athletes' influence goes beyond their sporting prowess and affiliations, as they have the ability to influence the attitudes of fans and imbue the practice of sustainability in their actions. In promoting sustainable sports events and products, an athlete's advocacy can make sustainability credible and appealing to customers. Therefore, apart from being a cultural component, AAL is also a brand credibility tool within sustainable sports innovation.

Table No: 3 Relative and Cumulative Percentage

Factors	Relative percentage	Cumulative Percentage
Athlete Advocacy and Leadership (AAL)	36.82%	36.82%
Fan Engagement and Education (FEE)	20.96%	57.78%
Sustainable Product Design (SPD)	11.11%	68.89%
Corporate Social Responsibility (CSR)	8.77%	77.66%
Sustainable Infrastructure and Event Management (SI)	8.20%	85.86%
Policy and Regulatory Support (PRS)	6.32%	92.18%
Investment in Green Initiatives (IGI)	5.30%	97.48%
Performance Metrics and Accountability (PMA)	2.52%	100%

The relative and cumulative percentage calculations have clearly indicated that the highest percentage is obtained by Athlete Advocacy and Leadership (AAL) itself which amounts to 36.82%. This indicates the significance of the contribution made by athletes in promoting the culture of sustainability in the sports sector. Moreover, when Athlete Advocacy and Leadership (AAL) and Fan Engagement and Education (FEE) are considered together, they make up to 58%, making it evident that sustainability can be successfully introduced in the culture of sports if efforts are undertaken by athletes in collaboration with educated fans. Other than the leading factors, there are some factors which are termed as mid-range factors and include Sustainable Product Design (SPD), Corporate Social Responsibility (CSR), and Sustainable Infrastructure (SI). These mid-range factors altogether account for around 28%, indicating that these factors have relevance in terms of being supporting measures for sustainability practices. However, institutional measures including Policy and Regulatory Support (PRS), Investment in Green Initiatives (IGI), and more importantly, Performance Metrics and Accountability (PMA) are the least significant in terms of their contribution, which amount to almost 15%. It can be concluded from the findings that institutional measures are not deemed critical cultural factors but rather secondary factors.

Interpretation of Fan Engagement and Education as a Source of Demand for Sustainable Sports Products and Services

FEE (Fan Engagement and Education), on the other hand, was the second highest rated criteria at 20.96% since fans have an important influence on creating demand for sustainable products and services in sports. Fans who are educated are likely to be receptive to green products, eco-sportswear, sustainable event services, recycling programs, and brand communication based on CSR. This means that FEE can help achieve innovation in the sustainable market through active participation of consumers.

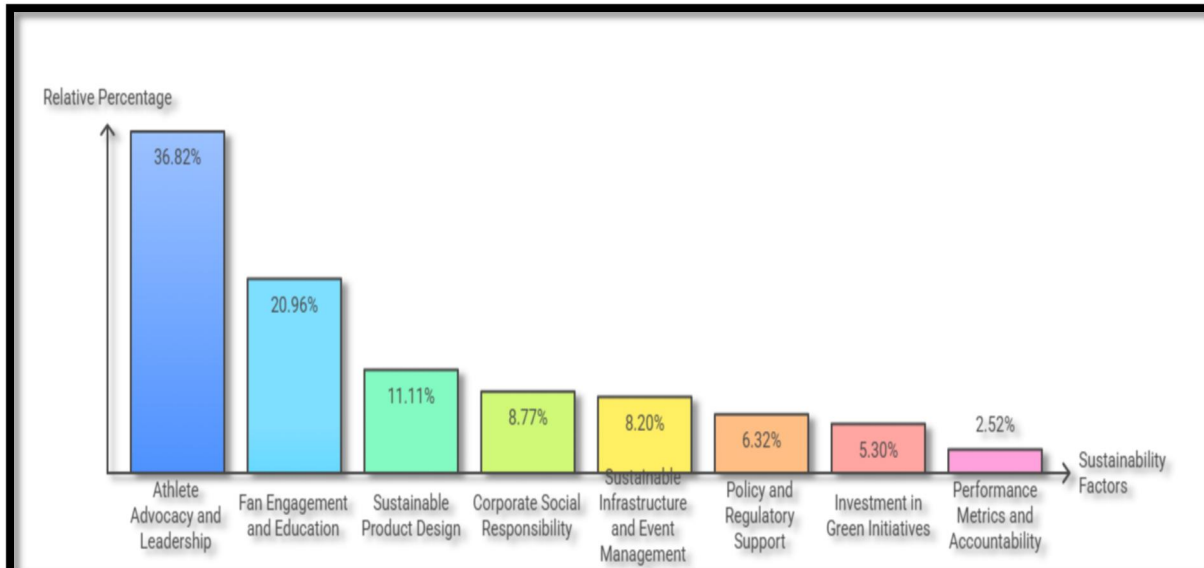
Sustainable Product Design, CSR, and Infrastructure as Mechanisms for Market Innovation

The three other key elements—Sustainable Product Design, Corporate Social Responsibility, and Sustainable Infrastructure and Event Management—have medium-ranking importance in the sustainability hierarchy; nevertheless, the contribution of these factors is substantial for innovations in the marketplace. The factor of Sustainable Product Design allows the development of the product component, as it includes environmentally friendly production techniques and circular product designs for the production of sports products. In turn, Corporate Social Responsibility gives the reputation component, as sports organizations relate themselves to being socially and environmentally responsible organizations. Lastly, the element of Sustainable Infrastructure and Event Management provides the experience component in the sense that greener infrastructure and efficient events management allow developing unique experiences for consumers.

Importance of Sustainability Factors for Sustainable Market Innovation in Sports

The discussion identifies the order in which each sustainability dimension is important in facilitating the market-oriented transformation in the sport sector. The discussion shows that athlete advocacy and leadership and fan engagement help build demand while product design, CSR, and infrastructure turn sustainability concepts into innovations within the sport market. As indicated by Figure No. 1 below, Athlete Advocacy and Leadership and Fan Engagement and Education play more prominent roles in market transformation than Sustainable Product Design, CSR, and Sustainable Infrastructure. However, the three sustainability dimensions mentioned above play crucial supportive roles in promoting sustainability within the sport industry. In terms of sustainable market innovation, the diagram clearly shows that the maximum market transformation can be achieved through the synergy of athletes' and fans' cultures with organizational innovations.

Figure No: 1 Relative Importance of Integrating Sustainability into Sports Culture



Practical Implications

Sports associations need to devise campaigns driven by athletes to raise awareness about sustainable sports goods and services, because athlete advocacy and online mediums may increase environmental consciousness and reliability (Mehra et al., 2025; Glebova & Madsen, 2024). Campaigns for fan education must include initiatives that foster sustainable consumption habits, recycling practices, low-emission transport methods, and sustainable event behavior, because fan-oriented messaging boosts support and environmentally conscious actions (Casper et al., 2014; Casper et al., 2017; Harrison et al., 2022; Opelík et al., 2025). Sports-related brands, sponsors, and event organizers need to integrate corporate social responsibility, green infrastructure, and circular marketing approaches to build a green brand image and long-term market acceptance (Agarwal et al., 2025).

Discussion

The findings of this research show that the best way to embed sustainability in sports culture is through cultural levers, where Fan Engagement and Education (FEE) and Athlete Advocacy and Leadership (AAL) emerge as the most influential components. From the perspective of sustainable market innovation, this result indicates that sports market transformation is mainly influenced by athletes and fans because they directly shape awareness, trust, consumption attitudes, and acceptance of sustainability-oriented sports practices. Advocacy by athletes increases the legitimacy of green branding through increasing the

visibility and reliability of sustainability communications, whereas fan involvement turns sustainability knowledge into actions, favorable intentions, and demand for sustainable sports products and services (Harrison, Vafeiadis, & Bober,

2022; Opelík et al., 2025). The results corroborate those presented by Lenxi et al. (2023), who noted that young people consider sustainability very important, but sports have not been recognized as an essential vehicle to foster such behaviors. Among other suggestions raised by Lenxi et al. (2023), there was the involvement of fans and advocacy by athletes.

In addition, the results support the theory and findings in green marketing and sustainable consumption by highlighting the notion that sustainable communication, brand credibility, and education may affect consumer behavior. From the present study, it is apparent that AAL and FEE are ranked highly because sustainability within sport is more successful if the green message is communicated via credible cultural figures and the fans are educated about the connection between sports participation and environmentally conscious consumption. The current findings resonate with other studies suggesting that communicating the alignment, closeness, and effectiveness of sustainability efforts improve fan attitudes and behaviors in support, whereas sustainability-driven marketing affects consumer behavior in the realm of circular and responsible consumption (Harrison, Vafeiadis, & Bober, 2022; Agarwal et al., 2025).

The findings of González-Serrano et al. (2020), who focus on the building concept while minimizing the role of sustainable innovation within sports, are captured in the moderate performance of SPD, CSR, and SI. The presence of a moderate contribution level for SPD, CSR, and SI is an additional proof that these determinants work as enablers of market practices rather than simply sustainability management processes. The contribution of SPD to green sportswear, eco-innovative sports equipment, recycled merchandising, and sustainable sports products ensures that sustainability is linked to marketable innovations. On the other hand, the role of CSR is related to the enhancement of organizational legitimacy, sponsor loyalty, and green reputation, whereas the contribution of SI and EM facilitates the creation of responsible events and environmentally credible services. These findings are consistent with the existing studies in sports innovation and sustainable markets in which product design, CSR, and responsible operations are recognized as instruments for achieving market value through sustainable innovations (Glebova & Madsen, 2024; Agarwal et al., 2025).

In contrast, the comparatively lesser attention to the PRS and PMA criteria is consistent with the findings of Boros et al. (2024), which observe that external indicators are often favored but fail to integrate within broader cultural contexts. Despite having been ranked relatively low, this does not mean that PRS, IGI, and PMA lack importance. In fact, these less favored criteria are essential for ensuring sustained credibility within sports markets and institutional longevity by ensuring conditions are favorable for the development of a mature market for sports. Policy support may help maintain standards, green investment can fund innovative sustainability efforts, and performance metrics can improve transparency and reporting practices. Thus, these factors can operate as supplementary cultural drivers but remain crucial nonetheless.

On the whole, these results correspond with the work of Houtbois et al. (2024), which states that sport at once represents a factor in the problem of sustainability and an opportunity to become its solution. Thus, it can be concluded that cultural change driven by fans and athletes alike, with institutional support, is the most likely approach for sustainable transformation in sports.

All in all, it becomes clear that sustainable innovation in the market of sports requires the interaction of culture and market approaches. The athletes and fans themselves create the largest impulse for sustainable consumption, whereas other elements such as product development, corporate social responsibility, infrastructure, policy, investments, and accountability create the

structure needed for sustainability in sports markets.

Conclusion

It shows how the cultural effects are influenced by the player and spectator cultures, proving that "Athlete Advocacy and Leadership (AAL)" and "Fan Engagement and Education (FEE)" are undoubtedly the two most important determinants of embedding sustainability into the sporting culture. This paper contributes to sustainable market innovation in sports by showing how sustainability factors can be systematically ranked to support both cultural integration and market-oriented transformation in the sports sector. Although Policy Regulatory Support (PRS), Investment in Green Initiatives (IGI), and Performance Metrics and Accountability (PMA) maintain reinforcing but less critical positions, mid-level variables such as Sustainable Product Design (SPD), CSR and Sustainable Infrastructure (SI) are supportive enablers. The findings emphasize that athlete advocacy and fan engagement can build green demand and consumer acceptance by increasing sustainability awareness, strengthening trust in green sports initiatives, and encouraging fans to support sustainable sports products, services, and event practices. The acceptability of the consistency ratio affirm reliability. Thus, sports managers would be able to prioritize campaigns for athletes and campaigns for spectators, based on CSR, infrastructure development, and accountability structures; policy makers would be able to regulate such activities to empower athletes and organizations towards meeting climate goals; and society would be able to reap the benefits of increased awareness and behavioral changes because of athletes' involvement in the sport. In light of this, the study suggests that sports organizations incorporate cultural leadership along with sustainable products, CSR, and innovative infrastructure development so as to turn sustainability into an economic reality that is associated with their green brand image.

Disclosure

Author Contributions

This research was conducted under the academic supervision of Prof. Dr. Nilesh R Berad. Mr. Amit Gupte led the study and was responsible for the conceptualization, research design, development of the theoretical framework, literature review, data interpretation, and preparation of the complete manuscript. Dr. Nilesh R. Berad contributed to the methodological guidance, critical review of the analytical approach, and comprehensive refinement of the final manuscript. Their combined scholarly engagement has shaped the depth, coherence, and overall quality of this work.

Disclosure of the Delegation to Generative AI

The authors declare that generative AI was used in the research and writing processes. According to the GAIDeT Taxonomy (2025), the following tasks are delegated to GAI tools under full human supervision.

- Proof reading and editing
- Reformatting

The responsibility of the final manuscript lies entirely with the authors. GAI tools are not listed as authors and do not bear responsibility for the final outcomes.

Declaration submitted by : Prof. Dr. Nilesh R Berad
Amit Gupte

Conflict of Interest

The authors declare no conflict of interest related to this research.

Data Access Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data will be shared following institutional guidelines for data sharing and ethical considerations.

Ethics Statement

This research followed ethical standards that ensured that informed consent was obtained where applicable, and all personal data were anonymized. The study adhered to the ethical guidelines set forth by the Institutional Review Board (IRB) of the MET's Institute of Management.

Funding Statement

This study was not funded by any external agency. The authors independently funded this research.

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