

The role and function of digital technologies in the sustainability perspective: Evidence from the football organizations in the Italian context

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Abstract. This paper investigates the Italian football clubs adopting a double perspective: the point of view of sustainability and technology innovation. In the last decades, the increasing implementation and spread of digital technologies worldwide in any economic settings, including the sport industry, especially the football business, has been playing a crucial role in supporting managerial, work out and training processes and making them much more competitive and high performing. At the same time, sport organizations, including football clubs, must achieve the UN Agenda 2030 with its 17 SDGs trying to improve their performance in the sustainability perspective. This paper, through a multiple case study of the Italian football clubs in the Serie A for the year 2021/2022, provides a portrait of these sport organizations and their way to be sustainable and much more technologically advanced in one specific county, where football industry has high relevance for volume of affairs and impact on sustainability. Thus, we match the two perspectives especially considering the role and function of digital technologies in making football clubs much more sustainable. After a brief review of the literature on the topic, we investigate the Italian football clubs mapping them considering their degree of sustainability and technology orientation. Our qualitative research provides useful insights about specific technologies able to improve the overall performance of the sport organizations, as well as knowledge about best practices already adopted by organizations for being sustainable, creating a kind of guideline for operators in the football industry.

1 Introduction

Digital technologies are drastically changing our life as well as business models and information structures; thus, due to changes derived from technology, individuals have been significantly changed their way to live and work and firms and any businesses in all economic sectors, such as the sport setting, are going to redesign their way to provide services and

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products. On the other side, in November 2015 the United Nations General Assembly's (UNGA) adoption of Resolution 70/1 'Transforming Our World: the 2030 Agenda for Sustainable Development' introduced relevant changes for sport, representing a significant milestone. The UN Agenda 2030 set out the 17 Sustainable Development Goals (SDGs), and 169 associated Targets, to be addressed through to 2030, replacing the expired Millennium Development Goals (MDGs). Although, sport was not directly mentioned and included in the UN Agenda 2030 and its 17 SDGs, we can observe the recognized role and function of sport for the sustainable development (SD) in the opening declaration which states: "Sport is also an important enabler of sustainable development. We recognize the growing contribution of sport to the realization of development and peace in its promotion of tolerance and respect and the contributions it makes to the empowerment of women and of young people, individuals, and communities as well as to health, education, and social inclusion objectives." (UNGA, 2015: 10).

Starting from these brief considerations, in the sport industry it is possible to observe significant changes because of the increasing adoption of digital technologies in their different forms and the need to achieve the 17 SDGs from the UN Agenda 2030. On one side, sport organizations are increasingly changing and transform their business models and their performance because of the adoption of Information Technology (IT) and all the digital technologies. Recently, sport setting, which traditionally was not recognized as a very relevant industry in terms of economic impact, plays a crucial role as significant business and it is characterized by a deep evolution, also due to digital technologies (ICT, social media, AI, IoT, etc.). Thus, the sport field has been characterized from important changes because of technology arousing the increasing interest by scholars and practitioners, who are searching for more effective and efficient tools to manage this business. Indeed, recently, technology has been changed different areas in the sport sector, with relevant social and economic effects. On the other side, sport organizations must achieve the 17 SDGs and sustainable perform, because sport industry has a significant impact on environmental, social, and economic sustainability [1, 2, 3]. For instance, the football sector is responsible for a significant percentage of all global emissions, in terms of greenhouse gas emissions, mainly carbon dioxide (CO₂) [1]. This negative environmental impact related to the sport mainly concerns the sport events, which can have relevant effects on climate because, for instance, appropriate conditions for setting up the sport events are required, such as temperature, precipitation, snow, humidity [1, 4]. Otherwise, the sport industry, mostly professional football business, has become a major entertainment industry, both economically and socially. For instance, major sport events, such as the FIFA World Cup or the Union of European Football Association (UEFA) Champions League in Europe, imply huge financial interests involving several players, such as TV networks, powerful sponsors, and private investors, with the main goal to maximize revenues from football competitions [3].

Starting from these short considerations, this paper aims to answer the following research questions (RQs): what is the degree of technology orientation and sustainability in the football organizations? Can digital technologies play a key role and function in making football organizations much more sustainable? To answer to these RQs, this paper deals with the concept of designing a sustainable and smart sport organization, that is the investigation of the digital technology to support and make the football sport organizations also sustainable meeting the 17 SDGs. Drawing from previous studies in the literature and from the industry on the topic, this paper investigates the main insights and challenges concerning both perspectives, sustainability, and technology application, within football sport organizations in the Italian context, where the term 'football' is considered as synonymous of the word 'soccer'. We propose to exam if and how the football clubs can be and perform in a sustainable way and in which way digital technologies can affect the sustainable performance of the Italian football clubs. Although some digital technologies have been introduced in

sport, significantly in football sport, in terms of software, technical instruments or digital programs to support the athletes' performance, and the sustainability issue has been receiving an increasing attention in the football industry, this phenomenon, also adopting an integrated reading, is still underrepresented in the literature.

Furthermore, this paper can contribute to the service science research because it is able to provide an integrated reading of service science and technology studies and sport studies, specifically football industry. Indeed, according to previous studies [5, 6, 7, 8], the service science and technology research areas support the sport studies to face the existing challenges that is being and performing in the perspective of high degree of technology innovation and sustainability.

After a short review of the literature on the topic, this qualitative study, conducted through a multiple case study, aims to provide a portrait of the Italian football organizations, specifically football clubs, to identify and investigate the main insights and challenges related to the application of digital technologies, specifically innovative digital programs and technical instruments used to improve their performance in the sustainability perspective. Thus, we aim to provide a clear picture of the role and function of digital technologies also in making the football organizations to sustainable behave according to the UN Agenda 2030.

2 Football organizations in the sustainability and technology innovation perspective: An overview

Most literature on sustainability issue concerns the environmental, social, and financial practices of the organization in any economic settings, including the sport industry. Sustainability reporting represents a significant topic to communicate to stakeholders the results of the Corporate Social Responsibility's (CSR) actions, one of the most investigated issues in the sport industry related to sustainability.

Lis and Tomanek [9], conducting a bibliometric literature review, mapped the thematic landscape of the sport management research field, to identify the leading and more attracting thematic areas, the emerging topics, and the interests of sport managers. The main thematic areas identified by the authors in the research field and in practice are: the use of new information technologies, including social media, and the SD in sport.

The sport industry needs for technology, and it is increasingly being influenced by technology innovation for its global competitiveness. It would be very interesting to understand and to discuss the role of sport technology in both the technology innovation and sport management literature by adopting an organizational learning approach, to hypothesize how to develop a sustainable strategy regarding the management of innovation in the sport industry. This helps to understand how knowledge is managed in a sport context, how it contributes to the development of sport technology, as well as the role of entrepreneurial ecosystems in the sport industry and the way sport technology emerges, taking a sport technology perspective in the global economy [10]. Specifically, Dai and Menhas [11] highlighted that Sport has been recognized as an essential tool for the implementation of the 17 SDGs for SD. For instance, the Chinese government has launched a Healthy China 2030 Plan to achieve health-related SDGs through sport and physical activity: the elderly population in China is participating in sport and physical activity to optimize healthcare public costs and improve the quality of citizens' life. Other countries are making their public health system secure and promoting global health governance through sustainable sport activities. According to global and sustainable perspective, Yang and colleagues [12] stated that the sport industry can promote regional SD. Through the entropy method, coupling coordination model and random effect model, the authors analysed the comprehensive level, combining coordination relationship and driving factors of the sports industry and regional SD in 11 provinces and cities in eastern China, from 2013 to 2017. The results showed that

the relation among the sport industry and regional SD in eastern China is growing, and the sport industry is growing faster than regional SD. Regional innovation, industrial structure upgrade, and human capital can promote the improvement of coupling coordination. It would be useful to strengthen cross-regional cooperation, build a cross-regional “sports+” industry group, with positive spill over effects, creating a coupling platform for the sport industry and regional SD, and facilitating the evolution of coupling coordination to higher levels. Sport organizations, especially football clubs, take care to highlight CSR results to become magnet companies in the local and global community and to attract followers and sponsors. Within the Sustainability Report, a central role is played by value-added, the difference between the revenues and costs of environmental, social, and financial practices [13]. Indeed, in the last 10 years, Borussia Dortmund, Brøndby, Celtic, Futebol Clube do Porto, Juventus FC, Olympique Lyonnais, FC Copenhagen, Sporting Lisboa, Benfica, Aalborg, AIK, Ajax, AGF, Besiktas, Lazio, Roma, and Silkeborg present the most structured reports in terms of financial sustainability, with significant data, conforming to legal requirements, available at official primary sources, reports directly disclosed by the companies [14]. Among the cited clubs, the most part of value-added was absorbed by athlete salaries, the rest by the amortization of fixed assets, the payment of interest charges to creditors, and a minimum part was distributed to the government in the form of income taxes. The shareholders net loss reported by all the cited clubs was necessary to compensate the other stakeholders (such as athletes and debt owners) and was due to pre-existing contractual obligations. Effectively, there was a wealth transfer from investors to other stakeholders, primarily the athletes themselves [14]. According to the financing perspective, sustainability challenges in professional football consist in containing the destructive effects of the society of the spectacle: ticketing, on the one hand, and TV rights and commercial TV revenue, on the other [15]. Specifically, ticketing is referred to the presence of spectators in the stadium for watching the match: some football organizations succeed in stabilizing a large portion of ticketing revenue by year-round subscriptions, selling more than 80% of the seats all year round, so that a variable income is transformed into a fixed revenue, unlinked with the clubs’ performance during the season. TV rights and commercial revenue are linked with broadcasting rights negotiated with TV networks, sponsorship, and merchandising: non-ticketing revenues represent a stable support of cash flow, so that the clubs owners, increasing these revenues, transform themselves in a such a strong brand that it will be able to keep loyal fans regardless of the sporting results [16].

Regarding social sustainability, some football clubs have founded academies integrating sport and school, young people can invest in both: students receive daily specialized football training as part of the school. At the same time, football is used as an educational aid in teaching. The academy has only one goal: all students must pass admission to the national high school’s program. For instance, Malmö FF (MFF), starting from football domain, joining with the City of Malmö, conducts the program to develop good people on and off football field. As all sport organizations, they assume the responsibility to design programs that develop better people rather than simply skilled individuals, assuring the accessibility of sport and organization programs to all, regardless of socio-economic status, race, culture, ethnicity, or gender [16]. MFF promotes inclusion in the Swedish society, participating with the Swedish sports movement which shares the values of a big commitment to society, human rights, and the environment. Using the positive values of sports, MFF works to provide young people with knowledge, integrate them to do community by sharing the respect for everyone of equal value trying to establish itself as a local, national and global international actor against racism and for the inclusion of people with disabilities [16].

From the ecological environmental perspective, football clubs aim to contribute to respond to the challenges of climate change and environmental protection to be a positive force in society that gives people and society the opportunity to grow in a better world. For

instance, in the Chinese football campus the inclusion and ecological development are growing. Nowadays, there are not enough teachers available in China to guide students in the football activities. Most of the football teachers in China are in primary and junior high schools. But at high schools and universities, there are more teachers who focus on other projects other than football: talents who can both play football and learn well need to be supported, bypassing traditional culture which states that if you are a good football player you don't have other skills and desire to learn at the university. While developing campus football, there should be no slack in learning. It is necessary to strengthen the teaching management of cultural courses for football specialty students and encourage students to actively participate in football training for a long time, so that football can be developed in a healthy manner on campus and assure social growth [17]. Many football clubs are involved in environmental sustainability activities and programs, such as clubs in the Primera División (2018/2019 season) (Alavés Atlético de Madrid, Athletic Bilbao, Barcelona, etc.), and in the Premier League (AFC Bournemouth, Leicester City, Liverpool, Manchester City, Manchester United, etc.). The activities carried out by these football clubs for environmental protection can be identified in the following points [18: p. 13-17]:

- "Selecting an area, the construction: The home of the club has been in London's Islington district since 1913. A demand for a newly built stadium emerged in 1999 and with it a new initiative aimed at doing something about the local environment. With the building of the Emirates Stadium, the reconstruction of the whole surrounding area over 25 hectares began. The area reconstruction program, which was the major project of the development, cost 390 million pounds. The restoration project related to the stadium was the largest regeneration project in Europe. As the first step of the project, abandoned industrial and waste management buildings were pulled down, in the place of which a new waste recycling center was established (60 million pounds). Not only did it serve Islington but also the recycling aspirations of the surrounding districts. They were involved in building industrial parks, a road network, bicycle lanes, parks, and green areas and paid special attention to intensified public security. The stadium was handed over with 60,361 seats in July 2006. Through the reconstruction program, over 2600 new jobs were generated with 1800 of them long-term positions. For a nominal amount, 2500 new or restored buildings were sold. It is clearly visible that the land regeneration program touched all the three pillars of sustainability. The projects realized in environmental and social areas brought about significant economic benefits within a few years, which resulted in the appearance of several partner companies in the district.

- *Waste management*: The emergence of sustainability principles can be detected not only in the construction of the stadium but also in its maintenance. The club became aware of the fact that sustainable waste management must be a key factor in its environmental strategy. With this goal, the amount of used materials is reduced, and the club do their best to avoid using materials that are not recyclable and aim to use recycled resources in the first place. They also set out incentives for their suppliers to be conscious about and reduce their impact on the environment. During the matches, they make a special effort to collect plastic cups and bottles in separate containers. On match days, 80% of the waste was recycled and with the help of LED lights, energy consumption was reduced by 31%. Consequently, 7 million kg of carbon emissions were avoided. In October 2007, a cardboard box compressor—a baler—was bought, which helps them to better prepare the waste for transportation. The cardboard boxes and pallets are recycled by the transporting company. Afterwards a large-scale waste container was installed for storing large amounts of waste. An estimated 10 tons of cardboard and plastic bottles are recycled monthly. This machine is used for compressing materials from all the catering units, shops, and broadcasting facilities. During matches, an average of 32,220-litre rubbish bins are filled with glass, which is equivalent to 1.5 tons of glass being recycled. The used oil produced by catering units (snack bars, restaurants) is

transported by a partner for biodiesel production purposes. Food scraps are composted. Food and grass are composted for Islington residents to use. In community projects, food is donated to local food charities. Old furniture is given away to local sports and community clubs. The Emirates Stadium's old floodlights were also released to sports clubs. Pallets are reused by the supplying company as a rule.

- *Renewable resources*: In the Premier League the Emirates Stadium is the first to cover 100% of its energy demands for its operation from renewable resources. In the United Kingdom the club was the first to install a storage cell system at the stadium. The system can generate enough energy to supply the stadium for 90 min, thus the Emirates Stadium is able to run on this storage cell generator alone during matches. This energy equals the 2-h energy demand of 2700 homes. These storage cell accumulators play an important role in the foundation of a cost-efficient, low carbon dioxide emission economy.

- *Operation*: In the whole area of the stadium, no-running-water urinals were placed in the men's washrooms. Running water was limited with timers at the taps, and the thermostat was set to the minimum for producing hot water. Electronic hand dryers are installed in all the washrooms for minimalizing paper waste. With a system filtering chlorine dioxide, clean water is provided in the whole stadium. With a system optimizing electricity consumption, the use of energy has been decreased by an average of 20% in the stadium. Sports lamps and fluorescent lamps were fitted with LED bulbs and unnecessary electricity use was also minimalized with the help of motion sensors. They use biodegradable plastic bags in their shops. The heating is switched off in any currently empty or unused rooms in the building.

- *Office work*: The comprehensive selective waste collection was introduced in 2007. The environmental awareness of the staff is being raised with the help of information leaflets and lectures, and the internal information system and posters also provide information in this field. Employees are encouraged to use minimal electricity (e.g., turn off the monitors, turn off the lights) and use public transport. Moreover, showers are available at the offices, making it possible for the staff to arrive at the workplace running, walking, or by bike. In work areas, the staff can also add their comments, experiences, and suggestions about what provisions could be initiated to make the operation of the club greener. Old printers, printer cartridges, computers, and monitors are always recycled. To avoid using unnecessary paper and plastic cups, employees use their own cups. Envelopes and copy paper are made of recycled material. Timers assure PC-s, lighting, and screens are turned off for the night and the weekend.

- *Transport*: Following the proposal of the Premier League, Arsenal began to promote public transport, and as a result 70% of supporters do not travel to club events by car. Further developments include more than 7.5 million pounds worth of investment and the expansion of the capacity of underground stops. In addition, they can improve bus, bicycle, and walking facilities by providing over 50 million pounds for TFL (Transport for London). With the support of Arsenal, further developments are realized, such as road surface repair, modernization of lighting, and obstacle clearing.

- *Plant based, low-carbon food*: As an SRA approved restaurant, a substantial vegan menu is now available including Dirty Beets burger, three bean Mexican wrap, Sticky Korean glazed vegetable, and Veggie Chili Cheese Fries".

Regarding event management process, sustainable football clubs should achieve fundamental issues in terms of context, event, stadium management, procurement, mobility, and logistics [19].

Governance BPs include all the actions and strategies that must be adopted and developed at the organizational and decisional level, i.e. practices relating the overall organization of the event such as the appointment of an environmental manager, the adoption of an environmental management system, the development of a specific sustainability strategy etc.				
Operational BPs are more directly connected with the event phase and can be divided into 5 categories:				
Context of Event	Event	Stadium management	Procurement	Mobility and logistics
All the aspects related to the location of the event (i.e. presence of green accommodation, water treatment facilities etc.);	All the actions necessary to carry out the event (i.e. waste management, volunteers training, on-site communication means etc.);	All the aspects related to the infrastructure management (e.g. instalment of solar panels, optimized light management, pitch management etc.);	All the green choices that can be made at the procurement level in order to prevent and limit the overall match's environmental impact (e.g. green electricity, green detergents and cleaning products, green procurement guidelines etc.);	All the solutions that can be adopted in order to encourage fans to reach the stadium with more sustainable means of transport and to limit the logistics' impact (e.g. combo tickets, usage of electric or hybrid cars etc.).

Fig. 1. Classification rationale into governance vs operational best practices Source: [19: p. 214]

“During early planning, architects may emphasize the value of green building, but facility designs are ultimately at the mercy of owners and other decision-makers. Even when owners embrace pro-environmental initiatives, the facility designer’s influence is mostly limited to the conception and construction phases of a stadium project. That is, despite a stadium being designed to include cutting-edge technological innovations aimed at maximizing energy efficiency and limiting resource consumption, such advances are mitigated if the facility is improperly managed and maintained once it opens. Instead, facility designers have decidedly greater influence as a collective, as illustrated previously with the number of architecture firms publicizing their support for sustainable facilities (e.g., Populous, AECOM, HKS)” [20: p. 22]. Despite these successful green best practices, an attempt to manifest attention to significant problems, such as climate changes, shortly before the first whistle and during the match with a paraglider which appeared above the stadium, turned out to be not very successful. Moreover, it results weak the strength of the influence of popular footballers on individual social groups in terms of social crucial matters, such as ecological issues: the athlete role model influence is just positively related to teenagers’ favorable word-of-mouth communications, and to teenagers’ brand loyalty. Furthermore, research showed that dependencies apply to women to a slightly greater extent than men when it comes to recommending a given brand or product to others in sport field [21].

In summary, the existing research from the academic and industry context doesn’t give relevant elements about an integrating reading of the two phenomena, sustainability, and technology orientation, in the sport industry. Thus, contributions on the sustainability and technology orientation in the sport industry, especially football clubs, are still scarce and further research is required adopting a double lens for the investigation.

3 Methodology

This study adopts the multiple case study as research method. One of the most representative and major professional Football leagues, that is the Italian Football clubs, has been investigated, analyzing secondary and primary data sources, mainly websites. Indeed, starting from a review of the main contributions of literature and adopting a qualitative methodology, this study provides an in-depth analysis of the technological solutions and initiatives introduced and used by the Italian football clubs. Specifically, the research aim mainly is to investigate the orientation and the degree of technology innovation in terms of

adopting digital technologies by teams playing in the Italian Serie A in the 2021/2022 season. Therefore, this empirical analysis aims to provide a portrait of the Italian football clubs, deepening the behavioural models and initiatives introduced from the perspective of digital technologies and sustainability, thus, outlining the degree of their technology innovation and their sustainability orientation. Specifically, a multiple case study approach [22, 23] allows to achieve descriptive purposes. In our research we describe the current state of the degree of technology innovation and the level of sustainability orientation of the Italian football clubs investigated. According to previous studies in the literature, a qualitative study, is not able to validate theoretical hypotheses or move towards a “grounded theory” because it is easily a case study [24]. The sample is made up of 20 case studies corresponding to the Italian football clubs in Italian Serie A in the 2021/2022 season.

A manual content analysis of all the documentation available was conducted, specifically primary and secondary data were considered. Information and data about the digital technologies as well as the sustainability programs or actions introduced and implemented by the Italian football clubs were collected and processed through reports (FIFA report, Istat, sustainability reporting of clubs, financial statements, etc.), analysis of archival data, football clubs’ documentation, football clubs’ websites, football clubs’ social network sites (SNS), press and magazines, focusing on issues related to digital technologies and sustainable performance. Information and data about the digital technologies introduced and implemented by the football clubs and their sustainability orientation, including the accessibility of their websites, were collected, and processed, focusing on issues related to digital technologies and sustainability. We went through all the mentioned sources of our analysis, carefully reading them using specific key words, separately and combining them, that is “technology”, “sustainability”, “digital technology”, “environmental sustainability”, “economic sustainability”, “social sustainability”, “disability”, “tools”, “inclusion”, “sustainable performance”, “SDGs”, “sustainable development goals”, “Agenda 2030”, “sustainable development”.

All the solutions, programs and actions promoted and introduced by the football clubs analysed were identified and investigated to outline their overall degree of technology innovation and sustainability orientation. To complete the analysis, some of the most significant experiences and solutions carried out by some football clubs were compared to identify the key organizational and managerial implications that characterize the main differences with a specific focus on their approach and orientation to technology innovation and sustainable performance.

4 Results and discussion

The sample investigated consists of 20 teams participating in the Serie A championship in the 2021-2022 season, only three of which are listed in the stock exchange market. The data collected show that all 20 football clubs (100%) have implemented a website and use specific applications for the provision and access to several services and adopt technological solutions related to match analysis; 11 football clubs (50%) use e-learning and e-training solutions.

Speaking about sustainability, it is surprising that only 3 football teams, that is the Juventus FC, the AC Milan and Cagliari club have a Sustainability Report. Juventus FC is the first football club in Italy to present its first Sustainability Report as a formal commitment to establish, maintain and develop a dialogue with its main interlocutors. Aware of the importance of its role as a football company not only in the sporting world, but also in the society, the club has not only maintained its commitment by publishing the annual reporting document, but in 2015 presented "Colour? What Colour? ", the first study entirely funded by a football club on racism and discrimination in the world of international football. The

document consists of 84 pages, highlights the negative impact of social prejudice, discrimination, and racism in football, offering concrete solutions for its eradication.

Among the teams analysed, it is possible to outline that AC Milan is very committed to social responsibility, launching a 'Manifesto RespAct' project to promote social equity, equality, and inclusiveness. The manifest develops the following four main points: The AC Milan club, in addition to guaranteeing accessibility to the stadium by reserving 250 seats for people with a 100% disability and their friends, has implemented cutting-edge technologies. As part of the "San Siro for all" project, the Club has created an exclusive sector at pitch level, dedicated to blind and visually impaired fans, thanks to the collaboration with the Onlus Visual Impaired People Foundation (Fondazione Istituto dei Ciechi di Milano Onlus) and the Italian Union for blind and visually impaired people Onlus (Unione Italiana Ciechi). Furthermore, it was planned a service with the presence of two speakers who, from the stadium's press box, give every detail of what happens at San Siro Stadium during the match to all the fans who ask for information; the story, thanks to the collaboration with Radio Rossonera, is transmitted to supporters via a dedicated radio signal, thanks to an audio device that is distributed to the assigned seats. Thanks to the in-depth and relevant digitalization and modernization process of the Club, the team guarantees the usability of digital contents for deaf fans: in fact, through the agreement with the National Deaf Entity, there are subtitles and translations into the Sign Italian Language (Lingua Italiana dei Segni, LIS) every week for the most relevant videos and interviews and all the pre-race press conferences. The company decided to implement a dedicated channel to help fans with special needs by giving responses to their requests and needs. To promote responsible use of digital communication, the Club adhered to the Manifesto of Non-Hostile Communication For Sport, conceived by one specific association dedicated to manage and face discriminatory behaviours especially for the language. Furthermore, to guarantee a friendly confrontation and prevent the use of incorrect language, the AC Milan underlined the importance of improving the moderation policies of the Club's social networks: moderation of posts and comments published on social networks and connected to profiles, entities or discussions involving the club.

Another football club, Inter, has given a strong signal by showing great attention to the world of sustainability. Several projects dedicated to fans with sensory disabilities were implemented. With the 'Audio Descriptive Commentary' Project in collaboration with the CAFE (Centre for Access to Football in Europe, partner of UEFA CSR) and with the Institute for the Blind in Milan, the Club provides a radio commentary of the football team's home matches dedicated to blind and visually impaired fans at the stadium. In addition, a further relevant project concerns the Sign Italian Language in collaboration with the National Body for the protection and assistance of the deaf (ENS) Lombardy Regional Council, which provides, like the Milan club, that some pre-match conferences are transmitted in sign language. These initiatives are part of the CSR activities that this football club carries out with commitment in the Milan area and beyond, paying special attention to the value of inclusion that has characterized Inter since its foundation.

Four clubs have decided to use cutting-edge technologies to bring their fans closer together. In the digital innovation perspective, it is relevant the agreement for a multi-year partnership worth 85 million euros of Inter Club with the support of the DigitalBits Foundation. The Club also uses the DigitalBits blockchain to integrate and accept the XDB cryptocurrency for payments to be made in the stadium, in physical and online stores. The partners are using this blockchain technology to create digital player cards and digital NFT (non-utility tokens) collectibles for a global audience. The DigitalBits brand appears on the Club's game shirts, having also signed a sleeve partner agreement with Inter. The cryptocurrency logo appears in all the uniforms of Inter, the men's and women's first teams, the Primavera team, and the youth teams, during all official international and national matches.

Another team which uses technological solutions is Lazio Club that has implemented the Fan Token, a utility token (Criptovaulta with different functions) powered by blockchain technology, which intends to revolutionize fan engagement through innovative and exclusive experiences. With this technology, fans can enjoy exclusive voting rights on club decisions, meet their favourite players, get VIP tickets to the Olympic Stadium and so forth. Lazio Fan Token gives all Lazio fans the privilege of being part of an exclusive and growing digital community, which can enjoy special benefits such as exclusive merchandising, digital art, limited edition NFTs, discounts, as well as special access to events world-class, also overcoming social and physical barriers.

The Hella Verona FC team has also entered a new era by choosing AI6 to embark on a Digital Transformation journey, addressing to offer fans a personalized and omnichannel 360° experience. The club, in fact, thanks to FANVIEW, the proprietary platform of AI6 (AI6 is a company based in Bologna composed by a group of international and highly qualified marketing professionals), and SALESmanago, a well-known Marketing Automation tool, integrates all touchpoints in a dynamic and easy-to-read Data Platform. It allows also to visualize data, analyse trends and create relevant Fan Engagement strategies, to establish an ever-deeper relationship with fans.

In the sustainability perspective, some clubs (14) have implemented measures to make their stadiums sustainable according to environmental issues, while others have opted for measures to make their structures accessible and usable for all promoting total social inclusion. The structures of the Cremonese, for example, were built with particular attention to modern energy saving techniques. The lighting system of the U-Power Stadium of Monza football club has a strong green impact as it guarantees significant savings in energy costs thanks to LED technology. The 4 lighting towers are equipped with LED lights with a power of 1200 lux (the old system was 500 lux). The lighting system is controlled by a DMX system which allows spectacular light effects, making the U-Power Stadium the second stage in Italy with this feature. Salernitana football club has already planned renovation intervention at the Arechi Stadium for a green facility, also considering the opening of a museum. The specific reconstruction includes, among other things, the installation of photovoltaic panels, to promote energy saving, and a completely new and much more "modern" lighting system. Even Spezia football club has renovated its stadium according to green regulations. The company "Distretti Ecologici Spa", leader in the field of energy transition and green conversion, will be the main partner and main jersey front sponsor of the eagle club for the next two seasons. Promoted by the Social Sport Foundation, the project was born thinking of a new vision of sport and the environment, with the aim of combining the education and growth of young people with the sporting needs of a football club, respecting the urban context and resources (beware of waste and resources, the concrete from the demolition of the old grandstand-changing room was recovered, ground and recycled to create the foundation for the fields). Udinese football club, on the other hand, has implemented a stadium with all seats covered; a family-friendly stadium, with ad hoc structures and innovative services for expectant mothers, new mothers and fathers, toilets equipped with changing tables, refreshment points with bottle warmers and special menus for the little ones, family parking, babysitting service and play areas, with parking spaces reserved for waiting ladies.

With concern of sustainability, we cannot fail to note how every web page tends to pollute, thanks to the study conducted by AvantGrade, the SEO (Search Engine Optimization) and digital marketing agency which draws up the sustainability ranking of Serie A club websites every year. In 2021, the Veronese club was the "greenest" team in Serie A, followed by Turin, Udinese, and Rome. The last places in the standings are occupied by Juventus and Bologna. Most of the football teams (18) have implemented their own app. Bologna uses a 'BUSINESS APP' application reserved for companies that support the

development, territory and values of the Bologna club every day. A new way to reconcile the passion for the football club with the development of one's own activities and business. For instance, the Cremonese club has created an app, so that all the supporters can stay constantly updated about all the news of the grey-red club, reading the news, following the results and the Serie B championship standings, the statistics of the players in the first team squad and enjoying the highlights of all the official matches in which the team is the protagonist.

Numerous Serie A clubs have implemented the use of digital technologies. For example, the Roma Club is the first football club to join the social publishing platform Medium (Medium is a blogging platform). The Club has entered a strategic partnership with AIM Sport, a leading company in Sport Marketing and Digital Perimeter Advertising, which will allow the introduction of the innovative Digital Overlay® technology at the Olympic Stadium. The Turin Club, on the other hand, has announced its collaboration with RealFevr and, for the first time, will give to its fans the opportunity to own "Historical video collectibles".

The data analysed showed that only 7 teams have their own museum, some inside their stadium, others in external premises, in the social and cultural perspective. The Milan and Inter clubs share it inside the San Siro Stadium. In some cases, technology can support this action, e.g., the Turin team also offers its fans a free virtual tour of the museum, visible every day of the year.

The analysis conducted, which briefly outlined a summary framework of the Italian football clubs in the Serie A for the 2021/2022 season regarding the topic of technology innovation and sustainability, reading the two phenomena also adopting an integrated approach, allows us to make some considerations in order to clarify the degree of innovativeness related to technology of the same football clubs through the use and adoption of digital technologies also for achieving the SDGs and thus to sustainable behave (see Table 1 for a summary):

1. The majority of football clubs has their own website and use its also primarily for providing some basic services, such as ticketing online and connections to social media (official Facebook page or TV channel, tec.) that have policies and measures aimed at promoting inclusion making their environment physically and virtually (website) accessible and usable in practice tend to substantially transpose and apply the current legislation on the protection of weak categories or guarantees for the fragile or in difficulty categories.
2. The football clubs with a greater orientation to the adoption of technologies, such as Juventus FC or AC Milan, are mostly concentrated in Northern and Central Italy, and they used to be part of Serie A for the last five seasons, showing that the constant position in Serie A also helps to be much more innovative in their management and their orientation to develop and adopt technological solutions and, consequently, it is correlated to their high performance, as well as these results are linked also to the tendency that these football clubs are much more responsible in terms of adopting sustainable behaviour. Sustainability is, therefore, about long-term development, evaluation, and innovation. In the last years, clubs have transitioned to business entity models, with modern traditional clubs no longer being just a football club, but instead thriving businesses that have extensive strategies, structures, and goals [25].
3. The football clubs investigated mostly tend to adopt digital solutions for supporting their fans with disability or special needs, specifically people with physical and sensory disability, thus these clubs are much more focused on the social dimension of sustainability; at the same time, many digital solutions adopted by the football clubs concern the environmental sustainability.

4. Most football clubs with a long history stand out more for the promotion and adoption of technological solutions for being much more sustainable. Specifically, regarding sport, Rydin [26] states: “Sport is sustainable when it meets the needs of today’s sporting community while contributing to the improvement of future sport opportunities for all and the improvement of the integrity of the natural and social environment on which it depends.” In addition to sporting results, Deutsche Fußball Liga (DFL) outlines that sustainability concerns several features, such as intelligent marketing of media rights, adopting innovative leadership styles, being technology advanced, promoting digitalization, increasing presence and licensing processes. The aforementioned definitions encompass all major aspects of success in a football club [25].

Table 1: A brief portrait of the Italian Serie A Championship in the 2021/2022 season.

Football Teams A Serie Italy 2021-2022	Website (Yes/No)	E-learning/ training solutions (Yes/No)	Match Analysis (Yes/No)	Applications (Yes/No)	Museum	Technology & Sustainability
AC Milan	Y	Y	Y	Y	Y	Y
Atalanta	Y	Y	Y	Y	Y	N
Bologna	Y	Y	Y	Y	N	Y
Cagliari	Y	N	Y	Y	N	Y
Empoli	Y	Y	Y	Y	N	N
Fiorentina	Y	N	Y	Y	N	N
Genoa	Y	Y	Y	Y	Y	N
Inter	Y	Y	Y	Y	Y	Y
Juventus	Y	Y	Y	Y	Y	Y
Lazio	Y	N	Y	Y	N	Y
Napoli	Y	Y	Y	Y	N	N
Roma	Y	N	Y	Y	N	Y
Salernitana	Y	N	Y	Y	N	Y
Sampdoria	Y	Y	Y	Y	N	N
Sassuolo	Y	N	Y	Y	Y	N
Spezia	Y	N	Y	Y	N	N
Torino	Y	N	Y	Y	N	Y
Udinese	Y	Y	Y	Y	Y	Y
Venezia	Y	N	Y	Y	N	Y
Verona	Y	N	Y	Y	N	Y

5 Concluding remarks

Adopting the perspective of technology innovation and sustainability, this study provides a synthetic analysis of the Italian context by taking a picture of the Italian football clubs. Scholars, over the years, have discussed innovation in the sports field, focusing on various aspects, concerning technology, organizational and management issues [27]. The literature review allows us to outline that innovation is widely considered as an element capable, in many ways, to generate value for sport clubs. With reference to the contributions in the research on football industry, most studies have been concerned with the technological aspects of innovation [28, 29, 30]. Specifically, this study outlines that usually the adoption of digital technologies allows to the sport organizations to sustainably perform, but the solutions proposed and implemented in this direction are still scarce and also most football clubs often do not clearly disclose and create the conditions for sharing and comparing the different experiences and expertise realized using digital technologies for supporting them in being sustainable and supporting the fans and the overall stakeholders. Indeed, we observe that football clubs present still limited orientation to develop and adopt technological solutions and sharing them appropriately, especially in the sustainability perspective, and it

is clear the need to promote internally at football clubs, involving managers and coaches and athletes, a significant process of organizational change, especially reducing the resistance to the technological change in the sustainability direction. Both issues, technology innovation and sustainability, require a deep organizational and cultural changing process. According to Merten and colleagues [31], there is a need for an open organizational culture to innovate and change.

The first relevant point is promoting sustainability and maintaining a competitive advantage, which require long-term plans, implementation of efficient processes and optimal strategies [32].

Football clubs should participate in events and workshops such as, for example, the 'More Than Football' conference organized by the European Football Development Network, to share their sustainable solutions improving their knowledge and expertise about that. The UEFA is studying an action plan that starts from teaching practical skills to coaches, who take UEFA licenses to coach; this action plan includes the promotion and training about recycling, the increase in the use of renewable energy sources in stadiums and also the implementation of public transport to reach the stadiums.

An interesting key in this perspective was the imposition, for all the European football federations, since July 2022, to have a manager for sustainability, who will be able to maintain and promote the strategy in this sense (www.90min.com). In Italy, the AC Milan, the Juventus FC and the Roma club have already nominated this professional figure.

The Roma club, which is very active on sustainability, had a recognition by the UEFA, which choose the Club to pilot the development and implementation of some aspects of the Force through unity. The plan includes actions aimed at creating long-term guidelines and programs in the world of football dedicated to socially responsible and eco-sustainable initiatives (www.ilgiornale.com). Otherwise, the goal of sustainability often collides with the decisive role played in procuring resources for clubs by sponsors, supporters or even owners referring to contexts in which the first form of sustainability, i.e. respect for fundamental rights, is anything but accepted. For example, regarding the Qatar experience, the 2022 Qatar World Cup has been described as “sustainable” due to the desire of the involved actors to build stadiums with low energy impact and “green”, but all the facilities were built in the wake of intensive exploitation of labor and hundreds died in semi-slave conditions.

The exploratory nature of this study makes several limitations that we can consider as starting points for the development of the same research in the future. Indeed, in the future we aim to develop a research design model to test, considering the Stakeholder Theory and the sport-for-development (SFD) approach as theoretical framework, and then conduct in-depth and semi-structured interviews to coaches and managers, including sustainability managers, within the same football clubs of the Serie A to collect specific information and data for identifying exactly the technological tools adopted in the sustainability perspective in all its dimensions, and also we aim to compare the results regarding the Italian professional football clubs with other football series at European level going to investigate the link between digital technologies and sustainability.

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