

ENHANCING TRUST, EFFICIENCY, AND EMPOWERMENT IN SPORTS: DEVELOPING A BLOCKCHAIN-BASED FAN TOKEN FRAMEWORK

Research Paper

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Abstract

Blockchain-based fan tokens provide token holders with certain rights, incentivizing fan engagement and decision-making within sports organizations. Despite the recent surge in interest, acceptance and technical advancement, a profound understanding of the technical, functional, and conceptual foundations of fan tokens is still lacking, necessitating further research and practical insights. Drawing on customer and fan engagement theory and utilizing a single case study approach, we analyzed the market-leading platform Socios for the issuance and operation of fan tokens. Our analysis yields a generic blockchain-based fan token framework that includes the constructs: 1) Trust and efficiency layer, 2) utility and 3) financialization features. The latter two constructs promote fan token holder empowerment. In addition, we extend the current definition of fan tokens to the context of blockchain. Our findings indicate that fan tokens are still in a nascent stage, requiring continued research and development.

Keywords: Digitalization, distributed ledger, football, smart contract, sports management

1 Introduction

Since the emergence of the COVID-19 pandemic in 2019, the sports industry has witnessed two interconnected but distinct events. Firstly, major sports teams and leagues, primarily in Europe and the United States, have suffered significant losses of billions of dollars over the past few years. This can be attributed to a sharp decline in their three main sources of revenue streams, including commercial, match, and media income (Quansah et al. 2021; Wiltshire et al. 2022). Secondly, a new type of crypto asset called fan tokens has emerged. These tokens can be defined as digital assets that enable fans to obtain sports team memberships and voting privileges via a distributed ledger (Demir et al. 2022). Fan tokens were primarily issued by top international football clubs and reached a market capitalization of approximately \$600 million in October 2021 (Chiliz 2018d; Ott 2022c; Socios 2022c). The rise of fan tokens can be attributed to the financial losses experienced by major sports clubs during the COVID-19 pandemic, leading prominent teams such as the FC Barcelona, Atlético Madrid, Paris Saint-Germain or Juventus F.C. to seek new revenue sources (Byers 2021; Jaiswal 2022), while enhancing fan engagement off-field (Jaiswal 2022; Sun 2021).

From a sports management perspective, fan tokens are being viewed as an attractive solution for to generate new revenue streams and to enhance the relationship between sports clubs and fans (Kharif

2020; Killingstad 2021). A multitude of sports organizations, particularly football clubs, have partnered with specialized crypto companies and exchanges such as Socios, Binance, or Paribu to launch fan tokens. Socios, in particular, has focused on issuing fan tokens across various sports, including football, tennis, basketball, motorsports, gaming, and martial arts, making it the largest provider of fan tokens. The Socios platform, which accounts for approximately 75% of the total fan token market capitalization and reached over 1.5 million app downloads (Ott 2022c; Socios 2022f), aims to address current challenges faced by sports clubs (Kharif 2020; Killingstad 2021; Socios 2022h), and offers fan tokens that provide access to exclusive membership benefits, such as voting rights for club-specific voting polls, on-platform games, or multinational leaderboard competitions (Chiliz 2022b; Socios 2022g). Moreover, Socios provides a marketplace for exchanging fan tokens and different platform-based reward systems, e.g., for receiving VIP tickets, merchandise, or special experiences (Socios 2022e, 2022g, 2022j). Compared to other fan token providers, Socios offers an all-inclusive platform that handles the complete lifecycle of fan tokens.

From a practical and theoretical standpoint, it is crucial to comprehend the significance and functionality of blockchain-based fan tokens, and their influence on fan engagement in the sports domain. A precise, objective and unambiguous delineation and analysis of the attributes, potentials, and challenges of fan tokens provide decision-makers with a foundation for determining the use or implementation of fan tokens. Moreover, a meticulous understanding of fan tokens as a phenomenon is essential to integrate the subject matter into academic disciplines and theories.

Since the usage of fan tokens may necessitate certain transactional and non-transactional consumer and fan behaviors, respectively, transdisciplinary and behavior-based customer and fan engagement theory provides a suitable premise for addressing the research question. Fans acquire tokens that empower them to undertake new activities, such as participating in club-specific decision-making or trading tokens on secondary markets. From a customer and fan engagement theory perspective, prior research has explored fan engagement in the context of social media (Anagnostopoulos et al. 2018; Annamalai et al. 2021; Santos et al. 2019; Vale and Fernandes 2018), narrow applications (Bernthal et al. 2015), or as part of a larger model (Yim and Byon 2020). There exist very few comprehensive frameworks for fan engagement that contribute to a theoretical understanding of fan engagement (Huettermann et al. 2019; Yoshida et al. 2014).

Research in the area of fan tokens is in its infancy, mainly examining their financial characteristics and market performance (Demir et al. 2022; Ersan et al. 2022; Mazur and Vega 2022; Scharnowski et al. 2021; Vidal-Tomás 2022). However, this phenomenon requires an understanding from a theoretical perspective. In addition, research is ought to focus on fan token utility and usage. Although there has been a significant increase in the use of fan token platforms and the rapid advancement of technology, fan tokens and fan engagement remain an area of limited research in both the Information System (IS) and sports management literature. Therefore, to fill this gap, we propose the following research question:

RQ: How can blockchain-based fan tokens be conceptualized?

To comprehensively address our research question, we firstly build on fan engagement literature to generate an in-depth understanding of fan-specific engagement theory. Secondly, we examine the blockchain architecture of the prominent Socios platform to not only broaden our knowledge of blockchain-based fan token platforms, but also to lay a foundation for the next steps. In this context, we, thirdly, consolidate and categorize the Socios platform and football-related tokens, representing the most significant use case of fan tokens. Building on the second and third objectives, our fourth objective is to present the Socios system. We then aim to derive a blockchain-based fan token framework based on the prior presented Socios system. Finally, we extend the definition of fan tokens.

The article is structured as follows: Section 2 explains the foundations of fan engagement theory and blockchain technology. Section 3 describes the case study research methodology. In Section 4, we present the Socios platform, while, in Section 5, we propose our blockchain-based fan token framework. In Section 6, we discuss our results and highlight future research avenues. Section 7 concludes.

2 Theoretical Background

2.1 Fan Engagement Theory

The concept of "fan engagement," and the broader category of "customer engagement," has garnered attention in the fields of marketing, management, and sports, with scholars exploring the significance of these concepts (Behnam et al. 2021b; Huettermann et al. 2019; Santos et al. 2019; Yoshida et al. 2014). Customer engagement is a bi-directional construct that encompasses interactive engagement between a customer and an entity such as a company, organization or brand. The level and intensity of engagement can vary depending on the customer's resource input, such as time, energy, or money (Behnam et al. 2021a; Harrigan et al. 2018; Kumar and Pansari 2016; Yasin and Pandir 2017). Customer engagement is considered a multidisciplinary and multifaceted concept that incorporates cognitive, emotional, social, and behavioral components (Busalim et al. 2019).

Within the theoretical framework of fan engagement, a fan can be defined as an enthusiastic adherent of a sports-related object, whether it be a league, club, coach, team, athlete, or other related entity (Hunt et al. 1999). This attachment leads to a range of actions and behaviors that are unique to the sports context, setting fans apart as a distinctive type of highly attached customers. Research has emphasized the distinctiveness of fan attachment and its impact on behavior, underscoring the significance of a behavioral perspective when analyzing fan engagement. (Guttmann 1986; Hunt et al. 1999; Stevens and Rosenberger 2012; Yoshida et al. 2014).

The existing scientific literature has extensively explored the concept of fan engagement in sports, with Yoshida et al. (2014) and Huettermann et al. (2019) providing a holistic perspective and a comprehensive framework for fan engagement. However, while several publications relate to fan engagement, they do not provide a comprehensive engagement. For instance, Bernthal et al. (2015) identify key factors that lead to increased fan engagement, such as the amount of time a fan devotes to the sports, organizational membership, and participation. In the context of social networks, fan engagement is perceived as a construct comprised of fan co-creation, team-to-fan interactions, and fan-to-fan relationships, with involvement in social media promoting fan engagement and co-creative behavior (Santos et al. 2019).

Yim and Byon (2020) recognize that greater fan engagement has a favorable effect on participation in both online and offline environments, with, e.g., increased stadium visits and increased social media involvement. Fan engagement is a behavioral concept that concentrates on non-transactional exchanges and customer extra-role behaviors, with engaged consumers and fans having higher repurchase rates. Collaborative product development or customer-to-customer interaction may lead to increased purchase rates (Yoshida et al. 2014). Huettermann et al. (2019) propose a more comprehensive approach to conceptualizing fan engagement, which includes both non-transactional and transactional behaviors. The engagement framework consists of three favorable components, namely "fan resource integration," "fan knowledge sharing," and "fan learning," as well as adverse components, namely "fan norm violation" and "fan resistance". Hence, fan engagement should be considered comprehensively from a management standpoint, including both transactional and non-transactional elements, to increase the value creation of each individual fan in relation to the sports reference object. Fans should be incorporated through a variety of practices, including participation in decision-making or open innovation processes, such as the co-creation of team products, fan merchandising, or stadium atmosphere (Huettermann et al. 2019).

2.2 Blockchain, Sports, and Fan Tokens

Blockchain technology enables the secure representation and transfer of value on the internet without the need for trusted intermediaries (Nakamoto 2008). By utilizing cryptographic techniques, peer-to-peer networks, and economic incentives, a decentralized and trustless system is established (Beck et al. 2016). Transactions are anchored in a chain of blocks known as the blockchain, empowering network participants to store and exchange value peer-to-peer (Beck et al. 2016; Schlatt et al. 2016; Steinmetz et

al. 2020). Public blockchains, such as Bitcoin or Ethereum, grant all participants equal rights and permissions, enabling them to write, read, and validate data, and to propose updates on the protocol level (Wüst and Gervais 2018). Conversely, permissioned or private blockchains restrict access, initiation, and transaction processing to a selected group of users chosen by a particular authority such as a corporation or consortium (Zavolokina et al. 2020). These blockchains offer benefits in terms of scaling, transaction rates, data security, transaction costs, and operational costs (Dinh et al. 2017; Helliard et al. 2020). To enhance scalability and efficiency while preserving system authentication and security, sidechains or layer-2 solutions can be implemented and linked to a main blockchain (Back et al. 2014; Unnikrishnan and Victor Paul 2022). Furthermore, blockchains can allow for the implementation of business logic using smart contracts that execute decentrally anchored programming code upon receiving a predefined triggering event (Ante 2021; Buterin 2014). For example, the Ethereum blockchain enables the development of decentralized applications (dApps) and digital tokens (Buterin 2014).

Research has already started to explore the opportunities and application areas of blockchain in the sports sector (Schellinger et al. 2022a). The technology can facilitate innovation and new business opportunities in sports, including the use of smart contracts for managing player contracts or sponsorship (Bernstein 2018), secure data storage and processing (Cao et al. 2021), funding of sport clubs (Naraine 2019) or ensuring player health and safety (Carlsson-Wall and Newland 2020). Moreover, blockchain can enhance cross-organizational data exchange and automate processes (Mika and Goudz 2019; Schellinger et al. 2022a). The potential impact of blockchain in the sports industry extends beyond live sports matches and can promote fan and stakeholder engagement (Khaund 2020; Schmidt 2020). Blockchain-based collectibles, such as non-fungible tokens (NFTs), and fan tokens, represent new tools for fan engagement, athlete and club empowerment, but also novel investment opportunities. Fan tokens, in particular, allow fans to participate in minor decision-making processes of sports organizations, such as choosing a player entrance song (Solntsev et al. 2022). Although blockchain-based fan tokens are increasingly gaining attention, acceptance, and technical maturity in the sports industry (Schmidt 2020), the academic literature has primarily focused on financial analyses of fan tokens. For example, Demir et al. (2022) and Scharnowski et al. (2021) showed that football game results affect fan token returns, Mazur and Vega (2022) analyzed risk and return measures, Vidal-Tomás (2022) examined diversification benefits of fan tokens. In this context, Ersan et al. (2022) assessed the connectedness of fan tokens to stocks. Therefore, this study aims to contribute to the academic discourse on fan tokens from an IS and sports management perspective.

3 Methodology

In order to gain a comprehensive understanding of fan tokens in the context of fan engagement we have adopted Yin's (2018) comprehensive and qualitative approach to single case studies. Given the relatively recent emergence of blockchain-based fan token platforms and ecosystems, we employ a single case study for this research endeavor. The choice stems from the paucity of comparable or contrasting fan token platforms and ecosystems, making a multi-case study either inconceivable or only partially valuable. Moreover, a single case study allows for the research of real-world phenomena, specifically fan engagement in relation to blockchain-based tokens (Treiblmaier 2019). This approach also permits exploratory research, thereby laying the foundation for the development of new concepts and frameworks (Ridder 2017). Employing a qualitative case study technique affords researchers substantial latitude in designing the case within the research framework and interpreting the results (Yin 2018). This interpretive flexibility is essential in the single case study design, as it aims to generalize the outcomes and phenomena of the case study (Ridder 2017; Yin 2018).

In this context, we have followed the content and structural criteria for blockchain-based case studies proposed by Treiblmaier (2019) to provide a theoretical foundation and structure for our study. The focus of our research is on the Socios platform, which is a suitable case for addressing the research question because it a) has the largest share of the global fan token market, b) has issued the most fan tokens, and c) boasts arguably the largest user base (Ott 2022c; Socios 2022f).

This study presents a comprehensive analysis of the Socios case study by utilizing a multi-sourced approach in line with Yin’s (2018) recommendations. The compiled results are integrated with a distinct Socios engagement framework, which incorporates suggestions of Ridder (2017) and Eisenhardt and Graebner (2007). The developed Socios-specific framework serves as the foundation of our blockchain-based fan token framework, which aims to enhance the theoretical understanding of fan tokens.

Following Yin's (2018) recommendations, this study uses multiple data sources that are integrated to strengthen the validity of the research design. The initial step involved scientific databases, including ScienceDirect, EBSCO, Social Science Research Network, Web of Science, and Google Scholar, to search for relevant literature on the Socios architecture and fan tokens to establish a theoretical framework for the case study. Various keywords and search queries such as "socios.com", "fan token*", "socios.com AND fan engagement", and "fan token* AND engagement" were used during the database research. However, due to the immaturity of the topic, there was limited scholarly literature on fan tokens and the Socios platform. Therefore, in the second step of a multivocal literature search (Garousi et al. 2019), this study also evaluates grey literature, white papers, and the websites of Chiliz and Socios to obtain additional insights for the case study. These sources are considered valuable in providing supplementary information, especially in the absence of significant academic literature on the subject matter (Buck et al. 2021; Gramlich et al. 2023).

To gather relevant information about the Socios platform's functionality and design, a comprehensive review was conducted of corporate websites, company terms, and publicly accessible whitepapers. Valuable data was also obtained through the examination of the Socios App and Web App, as well as the Chiliz partner projects, such as rocket.fan, fanmarketcap.com, and coingecko.com. The investigation of these sources yielded information such as voting results between December 19, 2019, and May 15, 2022, user counts, and fan token prices, with a focus on football-related fan tokens on the socios.com platform. Other sports, such as gaming, martial arts, and racing, and tokens from other fan token platforms were disregarded due to their limited market relevance at present. Figure 1 illustrates the data selection process of our case study research approach.

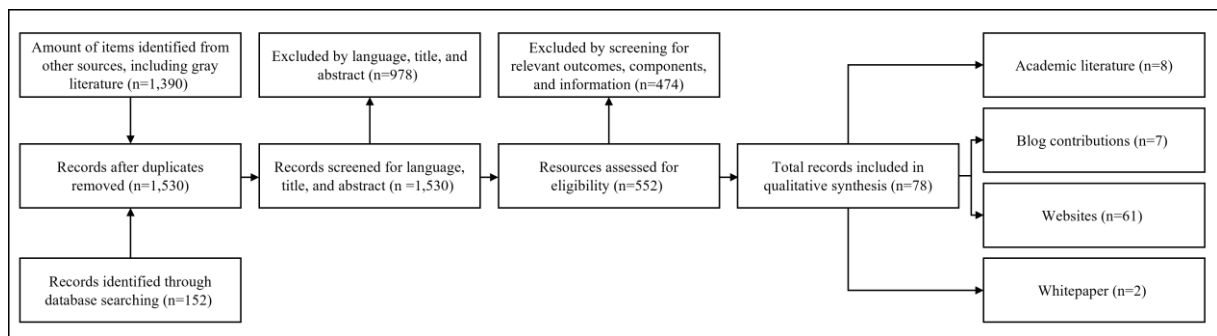


Figure 1: Data selection process of our case study research approach

The acquired data underwent a methodical analysis process. Oliveira et al. (2018) suggested certain features as content guidelines for categorizing the different fan tokens accessible, including their purpose, governance, functional, and technical traits. Ott’s (2022d) classifications were utilized to group, categorize, and analyze the collected voting polls. The data collected has been utilized as the cornerstone for constructing a universal framework for fan tokens based on blockchain technology.

4 The Socios Fan Token Platform

In this section, we present an in-depth analysis of the Socios platform, encompassing its technical architecture and blockchain layers, as well as its utility and tokenomics. Furthermore, we explore the financial aspects related to platform-specific tokens. To provide a comprehensive understanding of the platform, we present the Socios system, as demonstrated in Figure 2.

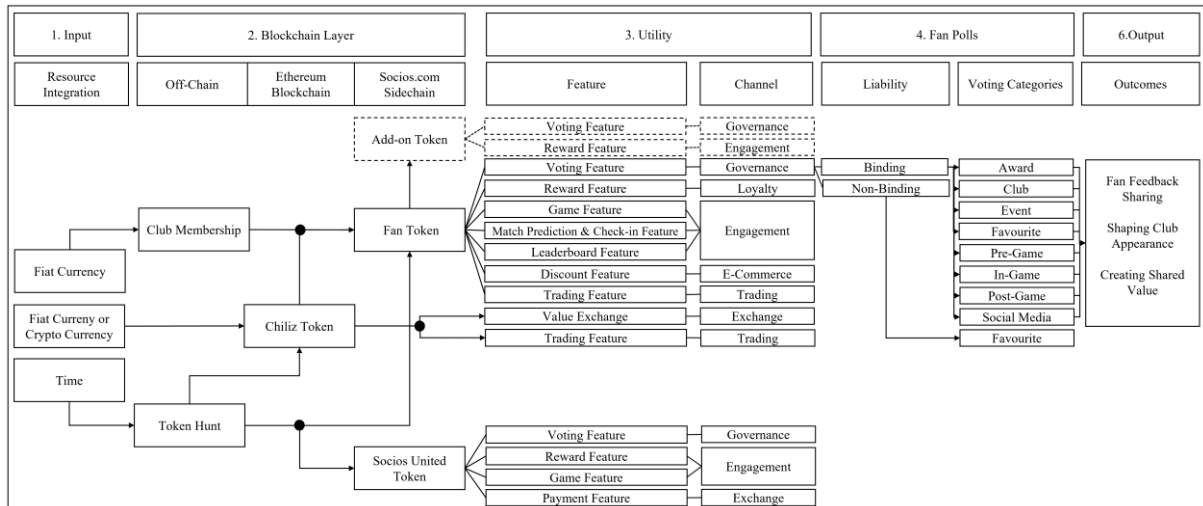


Figure 2: The Socios system

4.1 Architecture and Blockchain Layer(s)

The blockchain layer underpins the operation of the Socios platform, thus ensuring trust resulting from the decentralized infrastructure and public data records. The Socios architecture consists of two layers (Chiliz 2018c), including the public Ethereum blockchain and a permissioned sidechain (see also Chiliz (2018b)). Ethereum serves as the foundation for issuing the Chiliz (CHZ) cryptocurrency, which is a utility token used for payment to acquire platform-specific fan tokens. The Chiliz sidechain, a specific type of permissioned blockchain, is used for the lifecycle management of fan tokens, including issuance, voting, and transfers (Academy 2021; Chiliz 2018a; Socios 2022i). This permissioned sidechain of the Ethereum blockchain restricts transaction processing and validation to specific entities, such as the company Rakuten (Rakuten 2021), while allowing public tracking of all network activities through a block explorer, such as explorer.chiliz.com.

Chiliz (2022d) asserts that the public Ethereum blockchain serves various essential functions. Firstly, it enables Socios and its partners to process exchange and platform service fees with automation, transparency, and trustworthiness. Secondly, the Ethereum blockchain serves as a public ledger for all CHZ transactions. Lastly, Ethereum facilitates the transfer of CHZ tokens, including user deposits and withdrawals (Academy 2021; Chiliz 2022d).

Socios employs a sidechain to mint all fan tokens and distribute them through Fan Token Offerings (FTOs), which resembles initial coin offerings (ICOs) (Ante et al. 2018; Catalini and Gans 2018; Chiliz 2022d; Howell et al. 2020). Moreover, the sidechain stores and distributes non-tradable Socios United community tokens as well as non-tradable add-on tokens (Socios 2022d). The sidechain can be considered a consortium blockchain that is available to all Socios partners, including teams, clubs, brands, and influencers (Chiliz 2018b, 2018c). This permissioned sidechain serves as a foundation for sports organizations to utilize one of the platform's core functions: the voting mechanism (Chiliz 2018c). The automated voting engine can conduct partner-specific voting polls (Chiliz 2018b; Gemini 2021), which are publicly accessible data blocks on the sidechain that are validated using a proof of authority (PoA) consensus mechanisms, thus ensuring efficiency and low transaction costs (Chiliz 2018c, 2022a).

The Socios platform incorporates a peer-to-peer marketplace as a key feature in its design. This marketplace serves as a bidirectional gateway connecting Ethereum and the permissioned sidechain. Users have the ability to exchange their CHZ for fan tokens, and vice versa, through this marketplace (Chiliz 2018c). The Socios system, portrayed in Figure 2, depicts the platform as a two-way pegged oracle, bridging the two distinct blockchains to enable the individual components to function together as a comprehensive system (Chiliz 2018c; Gemini 2021). From a technological perspective, the system design provides several benefits: Firstly, the use of a sidechain with PoA consensus mechanism helps

to reduce transaction costs while enhancing network latency and scalability. Secondly, leveraging blockchain technology affords greater transparency, particularly with respect to the execution and visibility of club voting polls (Chiliz 2018c).

4.2 Utility Layer

Drawing upon the framework proposed by Oliveira et al. (2018), the CHZ token can be categorized as a utility token based on various criteria, including, its intended purpose, functionality, and the information provided by its issuer (Chiliz 2018c). Furthermore, the CHZ token can be classified as a usage token that is built on the Ethereum protocol and is also interoperable with the Binance Smart Chain. The technical design of the CHZ token reflects its intended use as a fungible platform currency for the entire Socios ecosystem (Chiliz 2018c; EXMO Hub 2021).

The fundamental purpose of the Socios platform is centered on the utilization of branded and digital fan tokens, commonly referred to as fan tokens. “Branded” fan tokens are specifically aligned with individual clubs, resulting in unique rights, characteristics, and pricing for each corresponding club-specific fan token. In accordance with the token design specifications of Socios (2022i) and the underlying purpose parameters of Oliveira et al. (2018) and Euler (2018), fan tokens issued by Socios can be conceptually classified as utility tokens. These fan tokens serve as a kind of membership within the Socios ecosystem (Binance Research 2020), granting access to platform features and exclusive fan token-specific features. To obtain an overview of the functionality of club-specific tokens, we conducted a comprehensive examination of all fan tokens within professional football leagues and nations available of Socios, which includes 44 of the 52 fan tokens. By utilizing data from various sources, we were able to extract between four (4.5% of the sample size), five (6.8%), six (68.2%) and seven (20.5%) token features that were extracted for the fan tokens under consideration. Sorted by their frequency of occurrence, the token features include 1) voting rights, 2) trading, 3) match prediction and game check-in, 4) rewards, 5) gaming, 6) leaderboards, and 7) discounts.

Drawing upon an analysis of 44 fan tokens and the Socios platform in general, it is evident that voting constitutes a key feature of fan tokens. The present study encompasses data from December 19, 2019, to May 15, 2022, and compiles, clusters, and scrutinizes all voting polls conducted by the 44 football teams. Based on Ott (2022d), the results of the voting poll clustering are further subdivided into 37 categories, which are presented in Figure 3. Notably, the voting polls specific to each club differ markedly in terms of their legal obligations (Socios Web App 2022). Specifically, 69% of votes were binding, while 31% were non-binding. A binding vote necessitates the corresponding club to assess and execute the results unless “external circumstances” hinder such action. In contrast, non-binding votes do not mandate any further actions (Socios 2022i). Typically, a club-determined minimum number of votes is required for these polls (Socios 2022i). The polls primarily involve the selection of messaging and club design, co-design of items and fan gifts, as well as various forms of fan feedback. Our analysis reveals three significant outcomes for fan engagement: 1) sharing fan feedback, 2) shaping club appearance, and 3) creating shared value. Based on data obtained from rocketfan.com, it is estimated that, on average, 3,234 individuals participated in football-specific and contractually enforceable fan token votes throughout the specified time period. Furthermore, the overall participation percentage for all 458 votes stands as 30.6% (binding surveys: 29.5%; non-binding surveys: 33.28%). It is pertinent to note that 55 of the 458 voting polls (12%) employed incentive schemes to encourage voter participation, such as prices, meet-and-greets, invitations to the training facility, or tickets.

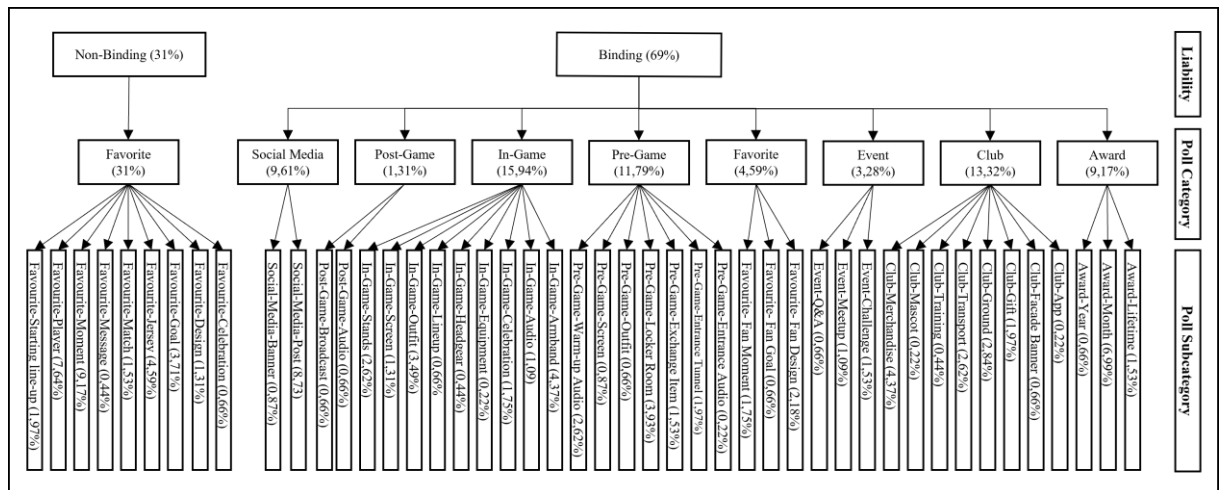


Figure 3: Categories and subcategories of Socio-specific polls and their usage in percentages

The Socios platform has recently introduced add-on tokens, also known as competition or support tokens (Socios 2022i). These tokens offer a range of benefits to their holders, including access to prizes, participation in token-specific games, and voting rights in contest-specific voting polls (Socios 2022b; Socios Mobile App 2022). The key features of these tokens are their reward and voting properties (Socios Mobile App 2022).

Finally, the Socios United (SSU) tokens possess a similar level of utility as branded fan tokens, with a functional scope that includes voting, gaming, and fan reward function (Socios 2020, 2022i). Although the voting function is a significant feature of the SSU token, an analysis of available voting polls in the Socios web application revealed an average voting rate of less than 1% (Socios Web App 2022). These tokens do not have any physical or legal applicability and are digital platform loyalty tokens (Socios 2022i). Users can obtain them through user engagement in activities such as playing the augmented reality game “Token Hunt” or holding and using branded fan tokens. The tokens are redeemable for special items, club tickets, and VIP passes and are not tradeable on any marketplaces (Socios 2020, 2022i, 2022j).

4.3 Financialization

The CHZ token and a range of fan tokens can be traded on several cryptocurrency exchanges, including Binance, Crypto.com, or UPBIT. In addition, they can be traded on Chiliz’ exchange platform (i.e., Chiliz.net) and the Socios mobile application (Chiliz 2022c; CoinMarketCap 2022). Depending on the platform, conventional fiat currencies (e.g., Euro or U.S. Dollars) or cryptocurrencies (e.g., Bitcoin or Ether) can be used to buy, sell, and trade CHZ or the fan tokens (Binance 2022a; Socios 2022a).

Similar to financial markets, the pricing of CHZ and fan tokens is influenced by the principles of supply and demand, which can result in price volatility (Socios 2022n). Fan tokens are distributed to fans based on a predetermined schedule through FTOs, with a set number of tokens being offered to fans at a predetermined price on a first-come-first-serve basis (Socios 2022i). These tokens are immediately tradable on the Socios marketplace and affiliated cryptocurrency exchanges upon issuance (Binance 2022b; Socios 2022i). In addition to purchasing tokens in club-specific FTOs or on the secondary market, fan tokens can also be acquired through the Token Hunt feature on the Socios platform by investing one’s personal time, much like the Pokémon Go game (Socios 2022m). Furthermore, some professional football clubs, such as Arsenal FC and Young Boys Bern, have given away fan tokens to their members free of charge (Arsenal Media 2021; Berner Sport Club Young Boys 2022). While the ownership of a tradable asset may confer a sense of financial involvement or empowerment within an organization, it should be noted that owning fan tokens does not equate actual ownership or control in the organization. As such, fan token owners possess a liquid asset whose value they can personally

assign and trade accordingly, depending on their perception of the asset’s utility relative to market prices.

While the maximal supply of fan tokens is usually capped, so-called token burns provide an opportunity to decrease the existing supply, resulting in a deflationary asset. To illustrate, during the Coppa Italia final between Juventus F.C. and Inter Milan on May 11, 2022, each team burned 2,000 for each goal, and the victorious team burned an additional 4,000 tokens. Thus, a total of 12,000 Inter Milan fan tokens and 8,000 Juventus F.C. fan tokens were burned on that day (Ott 2022a, 2022b).

5 A Blockchain-based Fan Token Framework

The following section presents a compilation of the research findings on the Socios platform and derives a conceptual framework for fan tokens. The derivation of the main constructs was done by synthesizing the main findings from the data analysis and relating them to existing theories and literature on blockchain, fan engagement, and sports management. This framework provides a theoretical understanding of the underlying constructs of blockchain-based fan tokens and serves as tool for researchers in the field of IS and sports management. In addition, our framework can be used, for example, by organizations, federations, and platforms to create a blockchain-based fan token system that empowers all stakeholders (see Schellinger et al. 2022a). The framework consists of three constructs: 1) the *Trust and Efficiency Layer*, 2) *Utility* and 3) *Financialization* features, bundled under the *Empowerment Dimension* illustrated in Figure 4.

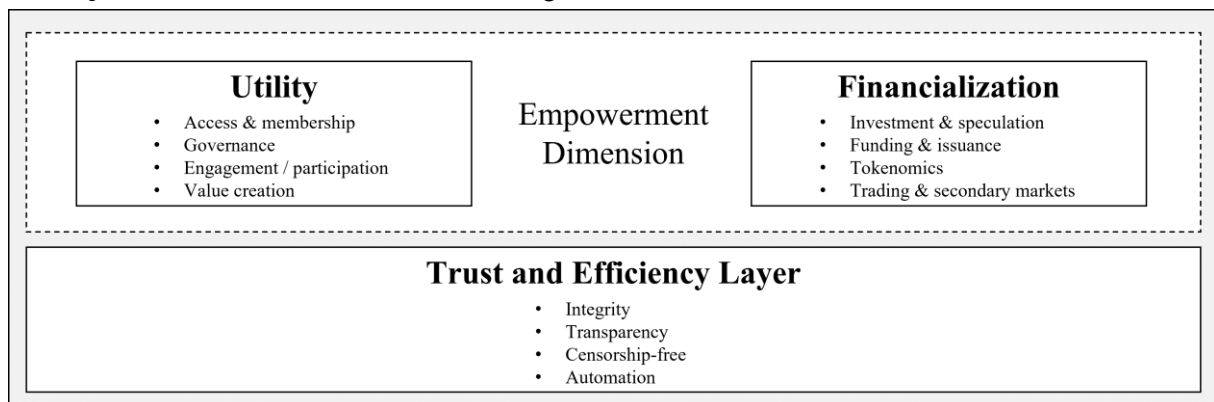


Figure 4: Blockchain-based Fan Token Framework

With regard to the *Trust and Efficiency Layer*, the inherent features of blockchains ensure the integrity of transaction records (e.g., outcomes of votes) using cryptographic primitives such as cryptographic hash algorithms and asymmetric key encryption (Beck et al. 2016). These systems make it impossible to tamper with data, as any attempt at modification would immediately be detected. The transparency of public blockchains allows network participants to verify data and transactions on-chain, providing a trustless infrastructure for fan tokens and related transactions (Beck et al. 2016). Moreover, the use of public blockchains ensures that no one can censor users’ transactions (Wüst and Gervais 2018). By employing smart contracts specifically designed to handle fan tokens, previously manual processes can be automated and made more efficient. The blended use of blockchain and smart contracts reduces transaction costs in fan token systems (Ante 2021; Cong et al. 2021).

The *Empowerment Dimension* of fan tokens encompasses both *Utility* and *Financialization* features. These tokens offer increased access to decision-making processes, previously unavailable to fans, through participation in sports organization polls or surveys. This increased engagement and participation between fans and sports organizations is achieved with minimal input resources, such as time and money (Schellinger et al. 2022a; Behnam et al. 2021a; Harrigan et al. 2018; Kumar and Pansari 2016; Yasin and Pandir 2017). Fan tokens have the potential to allow fans to partake in the strategic decision-making process and the governance of sports organizations, although this depends on the token’s design, organizational management’s willingness to relinquish power, and compliance

requirements (Beck et al. 2018). The ability to participate in decision-making through the voting feature, such as club design decisions or merchandise, creates a form of closed value co-creation and feedback sharing (Huettermann et al. 2019), thereby empowering fans and other stakeholders.

In addition to the utility function, fan tokens provide access to economic value for their holders and issuers. The tokens enable fans to coincide with their preferred sports organizations, affiliations, or other issuing stakeholders. Fans engage financially since tokens enable them to align with a sports organization of their choice. The ability to trade tokens on secondary markets allows for speculation by fans or tokens owners (Demir et al. 2022; Ersan et al. 2022). From an organizational perspective, FTOs provide issuing parties with a novel funding alternative and revenue source (Chiliz 2022d; Howell et al. 2020). The design of fan tokens can include customized economic principles, such as defining the (maximal) token supply, issuance scheme, and options for market intervention, including the burning of tokens or redemption options (Oliveira et al. 2018).

In summary, the *Trust and Efficiency Layer* serves as the infrastructural foundation for empowering stakeholders, particularly fans, from a *Utility* and *Financialization* perspective. Blockchain-based fan tokens can thus obviate the need for centralized entities and provide exclusive access, thereby democratizing and enhancing fan engagement in sports. The proposed blockchain-based fan token framework depicts the fundamental constructs of fan token systems.

6 Discussion and Future Research Opportunities

Blockchain-based fan tokens grant their holders pre-defined rights to participate in the governance of sports organizations and provide utility features (Carlsson-Wall and Newland 2020). Our analysis focused on the largest fan token platform in the market, Socios, to examine its technical infrastructure and the effects on the empowerment and engagement of fans. Based on this analysis, we derived a blockchain-based fan token framework that considers the diverse range of stakeholders in the sports domain, including fans, organizations, affiliations, platforms, or agents (Schellinger et al. 2022a). This framework is intended for use by researchers and practitioners from a range of disciplines, such as IS, sports management, and customer and fan engagement, to gain a deeper understanding of this topic and to engage in fan token projects.

The implementation of a fan token system involves human computer interaction (Foth 2017; Schneider et al. 2020) and has commonalities with research on socio-technical systems. The human component plays a crucial role in blockchain-based ecosystems (Brennecke et al. 2022), particularly in fan token systems, where fans can obtain, purchase, hold, or trade fan tokens motivated by emotional attachment to their teams or by financial incentives. The fan engagement model by Yoshida et al. (2014) constitutes a component that is compatible with persistent and consistent fan behavior. However, the trading opportunities of fan tokens indicate that certain users may have no performance tolerance, and tokens may be sold due to poor team performance or general discontent with the club. While management collaboration and performance tolerance are positively linked to higher purchase intention of fans (Yoshida et al. 2014), fan engagement is not merely reliant on transactional conduct but also incorporates non-transactional behaviors as well as psychological components.

Providing fan token governance may increase in purchase intent in this context. The use of loyalty, engagement, and e-commerce features of non-decentralized fan token platforms, such as Socios, potentially results in different fan engagement scenarios such as increased club identification or purchase behavior. Fan engagement within the context of fan tokens is a multidimensional approach that includes behavioral, psychological, and emotional components (Huettermann et al. 2019; Huettermann 2021). In addition, the resource integration required to collect fan tokens represents transactional customer behavior (Huettermann et al. 2019). Holding fan tokens for a long time period, regardless of the team's success or the tokens' price development, may be defined as a type of loyalty, consistent with Busalim et al. (2019). Thus, our blockchain-based fan token framework represents a multidimensional model that incorporates both transactional and non-transactional behavior.

The design of fan tokens does not need to include an additional incentive system if, for example, they are minted directly on public blockchains, such as Ethereum. In the Socios ecosystem, the SSU tokens and Token Hunt features keep users engaged on the platform (Socios 2020, 2022i). However, this incentive mechanism is specific to the Socios platform, and might not be representative for other blockchain-based fan tokens. Gamification and incentive mechanisms are effective ways to enhancing fan engagement through social interaction, goal setting, process tracking, or rewards (Eisingerich et al. 2019). Nonetheless, this approach can also be problematic, as it may lead to addiction among users (Srivastava et al. 2022), particularly because fan tokens incorporate financial components and options to speculate. This problem emphasizes the need for caution in designing fan token incentive systems.

A significant portion of the binding votes cast through blockchain-based fan tokens are focused on decisions in practice, but the financial or sports-related implications of the outcomes are very limited. This concern raises questions about the true value of fan tokens and its actual *raison d'être*. While current votes could be conducted in a centralized manner, fan token votes are a new and untested concept that may become more significant as they mature. Although transactions are publicly viewable and can be verified by any user, Socios as a centralized platform and its node operators, in theory, still have the power to prioritize, censor, or even delete transactions, undermining the principles of blockchain-based systems and democratic participation (Beck et al. 2016; Buterin 2014). To achieve true decentralization and democratization of fan-related decisions, fan token systems should be developed and operated on public blockchains, without an intermediary entity and opaque infrastructures.

A governance problem arises when sport organizations are not obligated to implement associated decisions, raising questions of accountability and legality of fan token votes. The use of a fan token as a governance tool represents a type of decision-making that can be votes (Busalim et al. 2019). The form of governance depends not only on the design, but also on the rights and role structures of fan tokens determined by the issuer, such as a sports organization. In this regard, fan token distribution, fan engagement, and alignment of financial incentives for token holders become vital (Jensen et al. 2021). The distribution of ownership on- and off-chain as well as permissioned fan token systems, are vital considerations (Wüst and Gervais 2018; Zavolokina et al. 2020). Current token designs grant various rights, such as voting, access, or economic rights, which should potentially be decoupled to decrease inherent risks and conflicting interests of stakeholders (Buterin 2021). Sports organization members may be given preference and different fan token rights compared to regular users, fans or investors, if appropriately designed and desired by the issuing party. Fan token holders could also have rights in a potentially decentralized platform or organization to further develop the protocol, network or organization. (Semi-)decentralized governance structures could be a potential option for fan token systems to develop more democratic, censorship-free, and trustless fan token applications and platforms, which would optimize the balance of power between platform owners and participants, enabling effective value generation and fair redistribution (Chen et al. 2021).

Our proposed framework includes a financial empowerment dimension consistent with the findings of Huettermann et al. (2019). However, as highlighted by Scharnowski et al. (2021), fan tokens carry significant downside risk and are riskier than popular cryptocurrencies like as Bitcoin or Ether. Furthermore, Mazur and Vega (2022) indicated that while fan token returns may surge after the FTO, they tend to underperform cryptocurrency benchmarks in the long run and exhibit significant volatility. These findings highlight the need for increased education and stricter regulatory measures to safeguard the interests of investors, especially fans. The issue of data protection is also of critical importance in the context of blockchain-based fan tokens, such as those issued on the Socios platform. Unlike traditional financial instruments, blockchain-based applications do not provide anonymity to users, but rather pseudonymity. Therefore, fan tokens, require measures and design options to comply with prevailing data protection regulations, such as the EU's GDPR (Schellinger et al. 2022b). Based on our synthesis, we extend the definition of fan tokens proposed by Demir et al. (2022) to the context of blockchain. Accordingly, we define blockchain-based fan tokens as *digital assets that provide versatile utility and financialization features, and an added dimension of trust and efficiency*. Providing a novel definition of this nascent phenomenon helps to improve the understanding of digital technologies, such as blockchain, in the sports domain (Gruettner 2019; Xiao et al. 2018).

In this article, only football-related fan tokens and those issued on the Socios platform are included in the analysis. The rationale for this approach is to concentrate on the most substantial use case on the largest platform in the market, thereby disregarding a fraction of fan tokens issued by other providers and for different sports. Future research efforts across various disciplines, such as finance and economics, customer and fan engagement, law and policy, sports management, and human computer interaction. In addition, the IS research domain should incorporate additional platforms and use cases to enhance the scope and depth of knowledge concerning fan tokens.

This study adopts a case study approach that solely utilizes pre-existing data. Future research should extend our findings through expert interviews with fan token owners or a survey of fan token holders to validate the results. Such an approach would enable the identification of further antecedents and components within the fan token framework.

Considering that the existing sources on fan tokens consists primarily of non-scientific sources such as, white papers, blog articles, or information from fan token providers, the applied method is subject to external limits due to the lack of scientific literature. Both the literature and the fan token ecosystem are still at a nascent stage. Consequently, the technical infrastructure and the empowerment potential of fan tokens can quickly become outdated in a rapidly growing market. We see it as the task of future studies to analyze the added value, utility, and acceptance of fan tokens from various perspectives, including the ones of fans, sports organizations, society, and other relevant stakeholders (Schellinger et al. 2022a). This could be achieved by employing appropriate methodologies, such as technology acceptance studies, which examines the relationships between blockchain-based fan tokens and its users. These models could, e.g., assess fan engagement, purchase intentions, and identification with sports clubs.

7 Conclusion

Drawing on customer and fan engagement theory, this study presents a theoretical understanding of blockchain-based fan tokens, based on a single case study of the Socios platform. Our framework identified three key constructs, including trust and efficiency, utility, and financialization, with the latter two bundled under the dimension of empowerment. In this context, we enrich the literature on customer and fan engagement theory by developing a fan token framework that can represent a foundation for future conceptualizations of fan token systems and fan token-specific phenomena. Our results add to the fan engagement components of Huettermann et al. (2019), with an emphasis on fan tokens, hence bolstering current fan engagement theories. Based on the findings, we additionally redefine the notion of fan tokens. Thus, we position our study as a key contribution to the literature on this emerging phenomenon, providing a theoretical understanding of the fundamental components of blockchain-based fan tokens. Finally, our analysis contributes to the growing body of blockchain research on tokens and tokenomics, offering insights into the functional scopes of usage-based fan tokens in the sports environment.

Our study provides implications for practice that pertain to the understanding of blockchain-based fan tokens, their attributes, and involvement in the sports context. Through a detailed case study of the market leader, Socios, this article furnishes sports management and other stakeholders with comprehensive insights into a current market standard. Additionally, the study provides a profound underlying of the design, encompassing public and permissioned blockchains, which may be not be essential for the operation of fan tokens generally, but do offer specific advantages to Socios. Thus, the study elucidates the role blockchains plays in fan token systems. The detailed account of fan token features and the voting poll categories employed in practice provides an overview of the utility, functionality, and economics of fan tokens, as well as the degree to which clubs commit are committed implementing fan token votes and the level of voter turnout. This information can be instrumental in developing fan token projects, enhancing the efficiency of existing projects, and assessing potential implications for stakeholders, such as fans, clubs, platforms, and regulators. By utilizing a comprehensive and innovation-promoting regulatory guidance and bolstered by a comprehensive understanding of the phenomenon, the sustainable development of fan tokens can progress, thereby combining fan and investor protection and empowerment.

8 References

- Academy. 2021. "Chiliz Explained: Leveraging Fan Tokens to Convert Passive Spectators Into Sports Influencers," available at <https://academy.aax.com/en/chiliz-explained-leveraging-fan-tokens-to-convert-passive-spectators-into-sports-influencers/>, accessed on Nov 16 2022.
- Anagnostopoulos, C., Parganas, P., Chadwick, S., and Fenton, A. 2018. "Branding in pictures: using Instagram as a brand management tool in professional team sport organisations," *European Sport Management Quarterly* (18:4), pp. 413-438 (doi: 10.1080/16184742.2017.1410202).
- Annamalai, B., Yoshida, M., Varshney, S., Pathak, A. A., and Venugopal, P. 2021. "Social media content strategy for sport clubs to drive fan engagement," *Journal of Retailing and Consumer Services* (62), p. 102648 (doi: 10.1016/j.jretconser.2021.102648).
- Ante, L. 2021. "Smart contracts on the blockchain – A bibliometric analysis and review," *Telematics and Informatics* (57), p. 101519 (doi: 10.1016/j.tele.2020.101519).
- Ante, L., Sandner, P., and Fiedler, I. 2018. "Blockchain-Based ICOs: Pure Hype or the Dawn of a New Era of Startup Financing?" *Journal of Risk and Financial Management* (11:4), p. 80 (doi: 10.3390/jrfm11040080).
- Arsenal Media. 2021. "\$AFC Fan Token: Everything you need to know | News," available at <https://www.arsenal.com/news/afc-fan-token-everything-you-need-know>, accessed on Nov 16 2022.
- Back, A., Corallo, M., Dashjr, L., Friedenbach, M., Maxwell, G., Miller, A., Poelstra, A., Timón, J., and Wuille, P. 2014. "Enabling blockchain innovations with pegged sidechains," (72), pp. 201-224.
- Beck, R., Czepluch, J. S., Lollike, N., and Malone, S. 2016. "Blockchain – the gateway to trust-free cryptographic transactions," (6), pp. 4013-4027.
- Beck, R., Müller-Bloch, C., and King, J. 2018. "Governance in the Blockchain Economy: A Framework and Research Agenda," *Journal of the Association for Information Systems* (19:10).
- Behnam, M., Hollebeek, L. D., Clark, M. K., and Farabi, R. 2021a. "Exploring customer engagement in the product vs. service context," *Journal of Retailing and Consumer Services* (60), p. 102456 (doi: 10.1016/j.jretconser.2021.102456).
- Behnam, M., Sato, M., and Baker, B. J. 2021b. "The Role of Consumer Engagement in Behavioral Loyalty through Value Co-Creation in Fitness Clubs," *Sport Management Review* (24:4), pp. 567-593 (doi: 10.1080/14413523.2021.1880772).
- Berner Sport Club Young Boys. 2022. "YB-Fan-Token| BSC Young Boys," available at <https://www.bscyb.ch/ybfantoken>, accessed on Nov 16 2022.
- Bernstein, J. 2018. "Smart Contract Integration in Professional Sports Management: The Imminence of Athlete Representation," *DePaul Journal of Sports Law* (14:88).
- Bernthal, M., Koesters, T., Khalid Ballouli, K., and Brown, M. 2015. "Motivations and fan engagement related to professional bass fishing spectatorship," *Sport Marketing Quarterly* (24).
- Binance. 2022a. "How to buy Chiliz (CHZ) Guide – Binance," available at <https://www.binance.com/en/how-to-buy/chiliz>, accessed on Nov 16 2022.
- Binance. 2022b. "Paris Saint-Germain Fan Token Price | PSG Price Index, Live Chart and USD Converter - Binance," available at <https://www.binance.com/en/price/paris-saint-germain-fan-token>, accessed on Nov 16 2022.
- Binance Research. 2020. "Paris Saint-Germain Fan Token (PSG)," available at <https://research.binance.com/en/projects/paris-saint-germain-fan-token>, accessed on Nov 16 2022.

- Brennecke, M., Guggenberger, T., Sachs, A., and Schellinger, B. 2022. "The Human Factor in Blockchain Ecosystems: A Sociotechnical Framework," *Wirtschaftsinformatik 2022 Proceedings*.
- Buck, C., Olenberger, C., Schweizer, A., Völter, F., and Eymann, T. 2021. "Never trust, always verify: A multivocal literature review on current knowledge and research gaps of zero-trust," *Computers & Security* (110), p. 102436 (doi: 10.1016/j.cose.2021.102436).
- Busalim, A. H., Che Hussin, A. R., and Iahad, N. A. 2019. "Factors Influencing Customer Engagement in Social Commerce Websites: A Systematic Literature Review," *Journal of Theoretical and Applied Electronic Commerce Research* (14:2) (doi: 10.4067/S0718-18762019000200102).
- Buterin, V. 2014. *Ethereum White Paper - A Next Generation Smart Contract & Decentralized Application Platform*.
- Buterin, V. 2021. "Moving beyond coin voting governance," available at <https://vitalik.ca/general/2021/08/16/voting3.html>, accessed on Nov 17 2022.
- Byers, J. 2021. "European Soccer Clubs Pocket \$200M from Fan Tokens," *Front Office Sports - Sports Business News*.
- Cao, P., Zhu, G., Zhang, Q., Wang, F., Liu, Y., and Mo, R. 2021. "Blockchain-Enabled HMM Model for Sports Performance Prediction," *IEEE Access* (9), pp. 40255-40262 (doi: 10.1109/ACCESS.2021.3064261).
- Carlsson-Wall, M., and Newland, B. L. 2020. "Blockchain, Sport, and Navigating the Sportstech Dilemma,"
- Catalini, C., and Gans, J. S. 2018. "Initial Coin Offerings and the Value of Crypto Tokens," *MIT Sloan Research Paper* (5347-18) (doi: 10.2139/ssrn.3137213).
- Chen, Y., Richter, J. I., and Patel, P. C. 2021. "Decentralized Governance of Digital Platforms," *Journal of Management* (47:5), pp. 1305-1337 (doi: 10.1177/0149206320916755).
- Chiliz. 2018a. "Chiliz FAQs - Chiliz - Medium," available at <https://medium.com/chiliz/chiliz-faq-376aafa0e18e>, accessed on Nov 16 2022.
- Chiliz. 2018b. "Chiliz-Corporate Product: Whitepaper V1.09,"
- Chiliz. 2018c. "Chiliz-Corporate Product: Whitepaper V2,3," Whitepaper.io (ed.).
- Chiliz. 2018d. "Whats is a Fan Token and how do they work?" available at <https://www.chiliz.com/en/what-is-a-fan-token-and-how-do-they-work/>, accessed on Nov 14 2022.
- Chiliz. 2022a. "chiliZ FAQ," available at <https://www.chiliz.com/en/chiliz-faq/>, accessed on Nov 16 2022.
- Chiliz. 2022b. "Our Story - Chiliz \$CHZ -," available at <https://www.chiliz.com/en/our-story/>, accessed on Nov 16 2022.
- Chiliz. 2022c. "Partner Wallet - Chiliz \$CHZ -," available at <https://www.chiliz.com/en/buying-holding-chz/>, accessed on Nov 16 2022.
- Chiliz. 2022d. "Terms & Conditions - Chiliz \$CHZ -," available at <https://www.chiliz.com/en/terms-conditions/>, accessed on Nov 16 2022.
- CoinMarketCap. 2022. "Chiliz price today, CHZ to USD live, marketcap and chart | CoinMarketCap," available at <https://coinmarketcap.com/currencies/chiliz/>, accessed on Nov 16 2022.
- Cong, L. W., Li, Y., and Wang, N. 2021. "Tokenomics: Dynamic Adoption and Valuation," *The Review of Financial Studies* (34:3), pp. 1105-1155 (doi: 10.1093/rfs/hhaa089).

- Demir, E., Ersan, O., and Popesko, B. 2022. "Are Fan Tokens Fan Tokens?" *Finance Research Letters* (47), p. 102736 (doi: 10.1016/j.frl.2022.102736).
- Dinh, T. T. A., Wang, J., Chen, G., Liu, R., Ooi, B. C., and Tan, K.-L. 2017. "Blockbench: A Framework for Analyzing Private Blockchains," in *Proceedings of the 2017 ACM International Conference on Management of Data*, R. Chirkova (ed.), Chicago Illinois USA. 14 05 2017 19 05 2017, New York, NY: ACM, pp. 1085-1100 (doi: 10.1145/3035918.3064033).
- Eisenhardt, K. M., and Graebner, M. E. 2007. "Theory Building From Cases: Opportunities And Challenges," *AMJ (Academy of Management Journal)* (50:1), pp. 25-32 (doi: 10.5465/amj.2007.24160888).
- Eisingerich, A. B., Marchand, A., Fritze, M. P., and Dong, L. 2019. "Hook vs. hope: How to enhance customer engagement through gamification," *International Journal of Research in Marketing* (36:2), pp. 200-215.
- Ersan, O., Demir, E., and Assaf, A. 2022. "Connectedness among fan tokens and stocks of football clubs," *Research in International Business and Finance* (63), p. 101780 (doi: 10.1016/j.ribaf.2022.101780).
- Euler, T. 2018. "The Token Classification Framework - Untitled INC - Medium," *Untitled INC*.
- EXMO Hub. 2021. "Chiliz (CHZ) review: where and why to buy the coin," available at <https://info.exmo.com/en/cryptocurrency/chiliz-chz-review/>, accessed on Nov 16 2022.
- Foth, M. 2017. "The promise of blockchain technology for interaction design," in *Proceedings of the 29th Australian Conference on Computer-Human Interaction*, M. Brereton (ed.), Brisbane Queensland Australia. 28 11 2017 01 12 2017, New York, NY: ACM, pp. 513-517 (doi: 10.1145/3152771.3156168).
- Garousi, V., Felderer, M., and Mäntylä, M. V. uuuu-uuuu. "The need for multivocal literature reviews in software engineering," in *Proceedings of the 20th International Conference on Evaluation and Assessment in Software Engineering*, S. Beecham (ed.), Limerick Ireland. 01 06 2016 03 06 2016, New York, NY, USA: ACM, pp. 1-6 (doi: 10.1145/2915970.2916008).
- Garousi, V., Felderer, M., and Mäntylä, M. V. 2019. "Guidelines for including grey literature and conducting multivocal literature reviews in software engineering," *Information and Software Technology* (106), pp. 101-121 (doi: 10.1016/j.infsof.2018.09.006).
- Gemini. 2021. "Chiliz: Sport Fan Voting with Fan Token & CHZ Token," available at <https://www.gemini.com/cryptopedia/chiliz-chz-coin-blockchain-esports-gaming-nft#section-how-does-chiliz-work>, accessed on Nov 16 2022.
- Gramlich, V., Guggenberger, T., Principato, M., Schellinger, B., and Urbach, N. 2023. "A Multivocal Literature Review of Decentralized Finance: Current Knowledge and Future Research Avenues," *Electronic Markets*.
- Gruettnner, A. 2019. "What We Know and What We Do Not Know About Digital Technologies in the Sports Industry Completed Research,"
- Guttmann, A. 1986. *Sports Spectators*, Columbia University Press.
- Harrigan, P., Evers, U., Miles, M. P., and Daly, T. 2018. "Customer engagement and the relationship between involvement, engagement, self-brand connection and brand usage intent," *Journal of Business Research* (88), pp. 388-396 (doi: 10.1016/j.jbusres.2017.11.046).
- Helliar, C. V., Crawford, L., Rocca, L., Teodori, C., and Veneziani, M. 2020. "Permissionless and permissioned blockchain diffusion," *International Journal of Information Management* (54), p. 102136 (doi: 10.1016/j.ijinfomgt.2020.102136).

- Howell, S. T., Niessner, M., and Yermack, D. 2020. "Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales," *The Review of Financial Studies* (33:9), pp. 3925-3974 (doi: 10.1093/rfs/hhz131).
- Huettermann, M. 2021. *Fan engagement in professional team sports*.
- Huettermann, M., Uhrich, S., and Koenigstorfer, J. 2019. "Components and Outcomes of Fan Engagement in Team Sports: The Perspective of Managers and Fans," *Journal of Global Sport Management*, pp. 1-32 (doi: 10.1080/24704067.2019.1576143).
- Hunt, K. A., Bristol, T., and Bashaw, R. E. 1999. "A conceptual approach to classifying sports fans," *Journal of Services Marketing* (13:6), pp. 439-452 (doi: 10.1108/08876049910298720).
- Jaiswal, S. 2022. "The future of sports currency: What are fan tokens and how do they work?" *Economic Times*.
- Jensen, J., Wachter, V. von, and Ross, O. 2021. "How Decentralized is the Governance of Blockchain-based Finance: Empirical Evidence from four Governance Token Distributions,"
- Kharif, O. 2020. "FC Barcelona to Issue Tokens for Blockchain-Based Fan Platform - BNN Bloomberg," available at <https://www.bnnbloomberg.ca/fc-barcelona-to-issue-tokens-for-blockchain-based-fan-platform-1.1389602>, accessed on Nov 14 2022.
- Khaund, S. 2020. "Blockchain: From Fintech to the Future of Sport," pp. 191-203 (doi: 10.1007/978-3-030-50801-2_11).
- Killingstad, L. 2021. "Socios.com: A Case Study in Blockchain Applications for Sports - Front Office Sports," available at <https://frontofficesports.com/pro-archive/socios-a-case-study-in-blockchain-applications-for-sports/>, accessed on Nov 14 2022.
- Kumar, V., and Pansari, A. 2016. "Competitive Advantage through Engagement," *Journal of Marketing Research* (53:4), pp. 497-514 (doi: 10.1509/jmr.15.0044).
- Mazur, M., and Vega, M. 2022. *Football and Cryptocurrencies*.
- Mika, B., and Goudz, A. 2019. "Grundlagen der Blockchain-Technologie," in *Blockchain-Technologie in der Energiewirtschaft: Blockchain als Treiber der Energiewende*, B. Mika and A. Goudz (eds.), Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 37-59 (doi: 10.1007/978-3-662-60568-4_5).
- Nakamoto, S. 2008. "Bitcoin: A Peer-to-Peer Electronic Cash System,"
- Naraine, M. L. 2019. "The Blockchain Phenomenon: Conceptualizing Decentralized Networks and the Value Proposition to the Sport Industry," *International Journal of Sport Communication* (12:3), pp. 313-335 (doi: 10.1123/ijsc.2019-0051).
- Oliveira, L., Zavolokina, L., Bauer, I., and Schwabe, G. 2018. "To Token or not to Token: Tools for Understanding Blockchain Tokens," *International Conference of Information Systems* (doi: 10.5167/UZH-157908).
- Ott, C. 2022a. "Inter Milan | Rocketfan," available at <https://rocketfan.com/brand/INT>, accessed on Jun 10 2022.
- Ott, C. 2022b. "Juventus | Rocketfan," available at <https://rocketfan.com/brand/JUV>, accessed on Jun 10 2022.
- Ott, C. 2022c. "Sports Crypto Assets | Rocketfan," available at <https://rocketfan.com/market>, accessed on Nov 14 2022.
- Ott, C. 2022d. "Polls | Rocketfan," available at <https://rocketfan.com/polls>, accessed on Nov 16 2022.
- Quansah, T., Frick, B., Lang, M., and Maguire, K. 2021. "The Importance of Club Revenues for Player Salaries and Transfer Expenses—How Does the Coronavirus Outbreak (COVID-19) Impact the English Premier League?" *Sustainability* (13:9), p. 5154 (doi: 10.3390/su13095154).

- Rakuten. 2021. "Rakuten Europe and Fintech Blockchain Company Chiliz launch Fan Token Partnership - Rakuten Newsroom EU," available at <https://corp.rakuten.eu/pressrelease/rakuten-europe-and-fintech-blockchain-company-chiliz-launch-fan-token-partnership/>, accessed on Nov 16 2022.
- Ridder, H.-G. 2017. "The theory contribution of case study research designs," *Business Research* (10:2), pp. 281-305 (doi: 10.1007/s40685-017-0045-z).
- Santos, T. O., Correia, A., Biscaia, R., and Pegoraro, A. 2019. "Examining fan engagement through social networking sites," *International Journal of Sports Marketing and Sponsorship* (20:1), pp. 163-183 (doi: 10.1108/IJSMS-05-2016-0020).
- Scharnowski, M., Scharnowski, S., and Zimmermann, L. 2021. *Fan Tokens: Sports and Speculation on the Blockchain*.
- Schellinger, B., Ante, L., and Bauers, S. 2022a. "Blockchain Use Cases and Concepts in Sports: A Systematic Review," *ECIS 2022 Research Papers* (49).
- Schellinger, B., Völter, F., Urbach, N., and Sedlmeir, J. 2022b. "Yes, I Do: Marrying Blockchain Applications with GDPR," in *Proceedings of the 55th Hawaii International Conference on System Sciences*, T. Bui (ed.), Hawaii International Conference on System Sciences (doi: 10.24251/HICSS.2022.563).
- Schlatt, V., Schweizer, A., Urbach, N., and Fridgen, G. 2016. "Blockchain: Grundlagen, Anwendungen und Potenziale,"
- Schmidt, S. L. 2020. *21st century sports: How technologies will change sports in the digital age*, Cham, Switzerland: Springer.
- Schneider, S., Leyer, M., and Tate, M. 2020. "The Transformational Impact of Blockchain Technology on Business Models and Ecosystems: A Symbiosis of Human and Technology Agents," *IEEE Transactions on Engineering Management* (67:4), pp. 1184-1195 (doi: 10.1109/TEM.2020.2972037).
- Socios. 2020. "Socios United Fan Token Launches on Socios.com," *Socios.com*.
- Socios. 2022a. "Adding \$CHZ to your wallet," available at <https://socios.zendesk.com/hc/en-us/articles/4403721183121-Adding-CHZ-to-your-wallet->, accessed on Nov 16 2022.
- Socios. 2022b. "Add-On Tokens –," available at <https://socios.zendesk.com/hc/en-us/sections/5315914782737-Add-On-Tokens>, accessed on Nov 16 2022.
- Socios. 2022c. "Fan Tokens - Socios," available at <https://www.socios.com/fan-tokens/>, accessed on Nov 14 2022.
- Socios. 2022d. *Mobile App*.
- Socios. 2022e. "Socios United - Socios," available at <https://www.socios.com/socios-united/>, accessed on Nov 16 2022.
- Socios. 2022f. "Socios.com - Corporate - Socios," available at <https://www.socios.com/corporate/>, accessed on Nov 16 2022.
- Socios. 2022g. "Socios.com | Be more than a fan," available at <https://www.socios.com/>, accessed on Nov 16 2022.
- Socios. 2022h. "Socios.com to launch mobile games for token holders thanks to wave partnership," available at <https://www.socios.com/socios-com-to-launch-mobile-games-for-fan-token-holders-thanks-to-wave-partnership/>, accessed on Nov 16 2022.
- Socios. 2022i. "Terms and Conditions," available at https://mobile-app-content.socios.com/en_gb/terms-and-conditions-2022-04-05/, accessed on Nov 16 2022.

- Socios. 2022j. "Token Hunt - Socios," available at <https://www.socios.com/token-hunt/>, accessed on Nov 16 2022.
- Socios. 2022k. "UEFA Club Competitions 'Add on' Fan Tokens Launch on Socios.com," *Socios.com*.
- Socios. 2022l. "What can I redeem with the SSU Fan Tokens I earn?" available at <https://socios.zendesk.com/hc/en-us/articles/360019551978-What-can-I-redeem-with-the-SSU-Fan-Tokens-I-earn->, accessed on Nov 16 2022.
- Socios. 2022m. "What is Token Hunt?" available at <https://socios.zendesk.com/hc/en-us/articles/360019100858-What-is-Token-Hunt->, accessed on Nov 16 2022.
- Socios. 2022n. "Why does the price of \$CHZ fluctuate?" available at <https://socios.zendesk.com/hc/en-us/articles/4403734160529-Why-does-the-price-of-CHZ-fluctuate->, accessed on Nov 16 2022.
- Socios Mobile App. 2022. "Mobile App," App Store & Web App.
- Socios Web App. 2022. "Polls | Socios.com,"
- Solntsev, I., Alekseeva, A., and Susov, Y. 2022. "New Financial Tools in Sport: NFTs and Fan Tokens," *Journal of Corporate Finance Research / Корпоративные Финансы* | ISSN: 2073-0438 (16:2), pp. 107-119 (doi: 10.17323/j.jcfr.2073-0438.16.2.2022.107-119).
- Srivastava, G., Bag, S., Rahman, M. S., Pretorius, J. H. C., and Gani, M. O. 2022. "Examining the dark side of using gamification elements in online community engagement: an application of PLS-SEM and ANN modeling," *Benchmarking: An International Journal* (doi: 10.1108/BIJ-03-2022-0160).
- Steinmetz, F., Ante, L., and Fiedler, I. 2020. *Blockchain and the digital economy: The socio-economic impact of blockchain technology*, Newcastle upon Tyne: Agenda Publishing.
- Stevens, S., and Rosenberger, P. J. 2012. "The influence of involvement, following sport and fan identification on fan loyalty: an Australian perspective," *International Journal of Sports Marketing and Sponsorship* (13:3), pp. 57-71 (doi: 10.1108/IJMS-13-03-2012-B006).
- Sun, L. 2021. "The Emergence of Fan Tokens - Mogul Productions - Medium," *Mogul Productions*.
- Treiblmaier, H. 2019. "Toward More Rigorous Blockchain Research: Recommendations for Writing Blockchain Case Studies," *Frontiers in Blockchain* (2) (doi: 10.3389/fbloc.2019.00003).
- Vannikrishnan, K. N., and Victor Paul, P. 2022. "A Survey on Layer 2 Solutions to Achieve Scalability in Blockchain," in *Advances in Distributed Computing and Machine Learning: Proceedings of ICADCML 2022*, R. R. Rout, S. K. Ghosh, P. K. Jana, A. K. Tripathy, J. P. Sahoo and K.-C. Li (eds.), Singapore: Springer Nature Singapore; Imprint Springer, pp. 205-216 (doi: 10.1007/978-981-19-1018-0_18).
- Vale, L., and Fernandes, T. 2018. "Social media and sports: driving fan engagement with football clubs on Facebook," *Journal of Strategic Marketing* (26:1), pp. 37-55 (doi: 10.1080/0965254X.2017.1359655).
- Vidal-Tomás, D. 2022. *Blockchain, sport and fan tokens*.
- Wiltshire, H. D., Supriya, R., and Baker, J. S. 2022. "COVID-19 Impact on the Sport Sector Economy and Athletic Performance," *Journal of Risk and Financial Management* (15:4), p. 173 (doi: 10.3390/jrfm15040173).
- Wüst, K., and Gervais, A. 2018. "Do you Need a Blockchain?" in *2018 Crypto Valley Conference on Blockchain Technology (CVCBT)*, pp. 45-54 (doi: 10.1109/CVCBT.2018.00011).

- Xiao, X., Tan, F. T. C., Lim, E. T., Henningsson, S., Vatrapu, R., Hedman, J., Tan, C. W., Clemenson, T., Mukkamala, R. R., and van Hillegersberg, J. 2018. "Sports Digitalization: An Overview and A Research Agenda," *38th International Conference on Information Systems, ICIS 2017*.
- Yasin, B., and Pandir, B. 2017. "Brand Love and Customer Engagements Role Over Brand Loyalty," *Pressacademia* (4:4), pp. 359-365 (doi: 10.17261/Pressacademia.2017.725).
- Yim, B. H., and Byon, K. K. 2020. "Critical factors in the sport consumption decision making process of millennial fans: a revised model of goal-directed behavior," *International Journal of Sports Marketing and Sponsorship* (21:3), pp. 427-447 (doi: 10.1108/IJSMS-03-2019-0031).
- Yin, R. K. 2018. *Case study research and applications: Design and methods*, Los Angeles: SAGE.
- Yoshida, M., Gordon, B., Nakazawa, M., and Biscaia, R. 2014. "Conceptualization and Measurement of Fan Engagement: Empirical Evidence From a Professional Sport Context," *Journal of Sport Management* (28:4), pp. 399-417 (doi: 10.1123/jsm.2013-0199).
- Zavolokina, L., Ziolkowski, R., and Bauer, I. 2020. "Management, Governance, and Value Creation in a Blockchain Consortium," *MIS Quarterly Executive* (19:1), pp. 1-17 (doi: 10.17705/2msqe.00022).