

# The Role of Digital Artifacts in Fostering Ecosystem Creation

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**Abstract:** Since 2008, blockchain has slowly entered our lives in different ways: from Bitcoins and crypto currencies to platforms like Ethereum, to NFTs and Fan Tokens. There is often still speculation about these issues, but there are successful use cases that have revitalized traditional industries: this is the case in the sports industry. Many sports teams, particularly football teams, have always tried to monetize their fans in various ways to create new sources of revenue; and thanks to Fan Tokens this has been possible. Consequently, an exploratory multiple case studies was conducted in order to analyze how a digital artifact (Fan Token) can create an ecosystem that helps sports companies to innovate and monetize through increased fan engagement. As a final result, this research has led to the definition of an empirical model that demonstrates how the intrinsic characteristics of a digital artifact can be harnessed to create an ecosystem to create and capture value from fan-customers.

## 1 INTRODUCTION

In the increasingly dynamic and interconnected context of contemporary digital society, technological evolution has generated new forms of digital tools that not only reflect technological progress, but also actively influence the way people interact with the world around them. In the field of sport, in fact, we are faced with a reality characterized by universal appeal and emotional involvement. Sport represents a common language that overcomes cultural and language barriers. The passion surrounding sporting events provides fertile ground for experimenting and implementing technologies that amplify this emotional connection between fans and teams (Fonti et al., 2023). Sports teams also enjoy a large supporter base that, thanks to globalization and digital connectivity, can be reached and engaged with globally offering a unique opportunity to implement technology solutions that amplify fan engagement.

One of the most important examples of the latter is the introduction of Fan Tokens, which have opened a new frontier in fan engagement, transforming the traditional passive relationship into an active and personalized involvement. These tokens, usually based on blockchain technologies, allow fans to directly participate in the dynamics of the team and

access exclusive benefits. Thanks to this opportunity, to exploit the affordances generated by these Fan Tokens, which were identified in digital artifacts objects (Kallinikos et al., 2013), entrepreneurs and established firms can create new way to monetize from their customers and new services and value propositions to offer to them (Autio et al., 2018).

However, despite the recent start of explorations in the literature on the potential of digital artifacts (Kallinikos et al., 2013, Ojala et al., 2023) and the analysis of ecosystems and their internal dynamics (Adner, 2017; Felch & Sucky, 2022), the assessment of the impact of a digital artifact on the creation of an ecosystem is still an unexplored area of research. Therefore, this research aims at providing its contribution to the connection between digital artifacts and ecosystems with the research question: “How do digital artifacts enable the creation of ecosystems?”. In particular, through an exploratory multiple case study, this research evaluates how the implementation of Fan Tokens has enabled the creation of ecosystems that cross the traditional boundaries between sport and technology, combining technology providers, sports clubs, and fans in a fruitful synergy.

This study contributes to prior literature in three ways. Firstly, the study explores, how the inherent characteristics of the digital artifact (e.g. Fan Token)

have created new business opportunities and opened up new avenues of interaction for technology providers. Secondly, it provides an understanding of how traditionally game-oriented sports clubs have approached the world of technology through the adoption of these innovations and what activities and resources come into play. Thirdly, how the digital artifact has a positive impact on fan engagement and consequently what sources of value are created and captured, within and outside the ecosystem, as a result of the development and use of the digital artifact.

## 2 LITERATURE REVIEW

*Ecosystems.* Due to the multiplicity of concepts related to the ecosystem theory, there is redundancy and overlapping of theoretic fields that raised confusion about what an ecosystem is and where an ecosystem perspective, of a specific environment, can or cannot add value (Adner, 2017). Adner (2017, p. 4) defined an ecosystem as “the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize”. Adner (2017) added another important contribution to the ecosystem theory, distinguishing between ecosystem-as-affiliation, which sees the ecosystem as a community of associated actors, and ecosystem-as-structure, which views ecosystem as a configuration of activities defined by a focal value proposition. From the definition provided by Adner, four elements characterize ecosystems: activities, actors, positions, and links.

In the ecosystem theory the locus of value creation lies in the presence of interdependencies and complementarities among actors, whose contribute to the creation of a focal value proposition for customers (Kapoor, 2018). While complementarities represent an economic relationship between offers in terms of value creation potential (Felch and Sucky, 2022), interdependencies constitute a structural relationship between offers in terms of how they are interconnected for value creation and how a change in one offer can affect the contribution of other offers to value creation (Kapoor, 2018). Another important contribution of Kapoor (2018) is the identification of three objects that are fundamental for an ecosystem, which are: bottlenecks, complementors, and platforms. All these aspects, technology architecture, interdependencies, and integration systems, have a fundamental impact on how value is created in an ecosystem (Kapoor, 2018).

Value creation mechanisms received attention by a different perspectives (e.g., Amit and Zott, 2001),

Zott and Amit (2010) and Amit and Zott (2001) defined the 4 sources of value creation: novelty, lock-in, complementarities, and efficiency. Later, Amit and Han (2017) discussed the new sources of value creation in a digitally enabled world in which digital platforms and ecosystems play a significant role. Another important study on the different types of value was conducted by Lepak et al. (2007), in which there is a distinction between the use and exchange value. Respectively, the former is the quality perceived by the customers in relation to their needs (Bowman and Ambrosini, 2000), whereas the latter is the monetary amount realized at a certain point in time (Bowman and Ambrosini, 2000).

*Digital Artifacts.* Several authors tried to give a clear definition of what is a digital artifact (Ekbia, 2009; Zittrain 2008), but only Kallinikos et al. (2013) explicitly pointed out the characteristics of digital artifacts. Following other authors (e.g., Ekbia, 2009; Zittrain, 2008), Kallinikos and colleagues (2013) highlight how digital artifacts differ from physical entities of non-digital constitution along a number of dimensions/characteristics, namely: editability, openness, distributedness, and interactivity. Moreover, digital artifacts are often embedded in mutable interdependencies with other entities in broader digital ecosystems, and digital artifacts can generate other digital objects often distributed in the same or other ecosystems, therefore making the connection with ecosystem theory (Kallinikos et al., 2013). These findings suggest that digital ecosystems will never settle due to the incomplete and mutant nature of these digital artifacts (Kallinikos et al., 2013). Based on these characteristics, Ojala et al. (2023) created a framework on which exploiting the digital artifacts characteristics to internationalize new ventures (Ojala et al., 2023).

Therefore, we can notice how clear the concept of "ecosystem" has become an important topic among scholars and practitioners particularly in the past two decades (Adner, 2017, Jacobides et al., 2018). Furthermore, several authors agree on the crucial role that digital artifacts (Kallinikos et al., 2013, Ojala et al., 2023) play in the development of ecosystems. However, although the literature has clearly defined what an ecosystem is, how it is structured and what the internal dynamics are, the question of how actors within an ecosystem (Adner, 2017) interact and align to create value in the presence of a digital artifact (Kallinikos et al., 2013) is missing. Therefore, this research will focus on how the digital artifact, through its characteristics, is the enabler of an ecosystem. All this is encompassed in the research question: *How do digital artifacts enable the creation of ecosystems?*

### 3 METHODOLOGY

This research employs a qualitative (Gartner and Birley, 2002) and exploratory study based on a multiple case study (Yin, 1984; Eisenhardt, 1989; Eisenhardt & Graebner, 2007) to investigate the creation of ecosystems by digital artifacts. This method suits research questions responding to a “why” or “how” when the investigator does not have control over events and when the focus is on contemporary events. In particular, a multiple case study approach has been chosen because the literature has recognized that it is more robust compared to a single one (Yin, 1984), and it allows to obtain generalized results, enabling comparisons among different manifestations of the phenomenon (Eisenhardt & Graebner, 2007).

The digital artifact (Kallinikos et al., 2013) acts as a unit of analysis (Yin, 1984), central to the creation of an ecosystem in which actors collaborate around a shared value proposition (Adner, 2017). In this research, the Fan Token, which is a utility token (Glossario blockchain, 2022) created through blockchain technology (Glaser, 2017; Nakamoto, 2008), is seen as digital artifact. The Fan Token is composed of two basic components: on the one hand, immutable pure computing elements related to the blockchain structure, and on the other hand, modifiable computing components, which are linked to related services, such as redeemable experiences in terms of “rewards” and the possibility of voting, both of which can be modified over time. This second component emphasizes the connection and similarity between the Fan Token and digital artifact characteristics (Kallinikos et al., 2013).

#### 3.1 Case Sampling

In the approach chosen for case selection in this study, a heterogeneous approach was taken. This means that the goal is to include cases representing different patterns of behaviour, outcomes, decisions, and evolutionary stages of the analyzed process. Heterogeneity aims to identify and compare different types related to the same phenomenon, providing a comprehensive view of the dynamics involved (Yin, 1984). To implement this approach, it was essential to establish in advance the number and type of cases to examine (Yin, 1984). After defining the research question that our research focuses on, it was identified the key players involved in this ecosystem, such as technology providers, responsible for the creation and sale of Fan Tokens, sports teams that collaborate with technology providers to increase the engagement of

their fans, and finally, the sports team supporters themselves who constitute the end users of digital artifacts. Among all the types of sports teams that participate to the Fan Tokens initiatives, it was decided to select only the football firms. This choice is due to the fact that football is the most popular and followed sport in the world in fact has about 3.5 billion sports team supporters and about 250 million players in more than 200 countries. Moreover, football is responsible for 40% of the overall market value of sports business, which was more than \$500 billion in 2022.

During the initial phase of the case study selection process, a geographical criterion was adopted. The selection was deliberately limited to European football clubs. This geography-based approach was deemed to be of significant importance as the dynamics and opportunities in the Fan Token industry can vary considerably between different regions. To ensure that the selection of cases was accurate and reliable, the official FIGC database was used, which contains detailed information on a wide range of European football clubs. The research led to 70 football teams operating with Fan Token platforms. In order to refine the selection process, the selection focus shifted to the technological providers to first understand which one is considered to be the most important and most established, so as to also narrow the selection field to football teams. In this case, the criteria chosen was to select the technology providers with the highest Fan Token market cap (sum of market value of all the Fan Tokens traded in the platform) in the Europe landscape. Following this selection criteria, Bitci was excluded due to the too low market cap. The selection of Socios and Binance will allow a focus on companies with greater relevance and impact in the industry, making the analysis more meaningful and representative of the dynamics at play, particularly in the European context. Moreover, for the heterogeneity of the sample, Socios and Binance have been selected due to the different case studies, respectively a more diversified player, and a more focused player. From the numerous teams associated with Socios, Juventus FC, AC Milan and Lega Serie A were selected as objects of study for this research. This selection was based on a targeted strategy to examine very heterogeneous cases in order to obtain a diverse representation of the context of Fan Tokens in football. Among the two European teams partnered with Binance, FC Porto was selected over S.S. Lazio, in order to introduce a foreign team into the set of cases studied for research. This strategic decision aimed to provide a comprehensive and diversified

overview of interactions between the platform and football teams, both domestically and internationally. In addition, for AC Milan, Juventus FC, and FC Porto, supporters were selected in order to understand better the overall environment built around the Fan Token. Instead, it did not select any sports team supporters for Lega Serie A since this firm does not own specific passionate sports team supporters due to its nature of league for the highest Italian football championship.

### 3.2 Data Collection

The data collection phase of the research utilized a comprehensive strategy involving primary and secondary sources to ensure data triangulation. Secondary sources such as YouTube videos, podcasts, whitepapers, and press releases provided additional context, while primary sources included in-depth semi-structured interviews with key informants. The 10 interviews, divided into sections based on the topics of the literature review, were recorded, transcribed, and conducted in an interactive competence (Langley et al., 2013; Collins, 2004) involving technology providers, sports teams, and sport team supporters, as shown in Table 1. The data collection phase involves interviews with different actors in the ecosystem, maintaining a neutral stance to ensure objectivity. Informants are considered knowledgeable agents, and the research aims at a generalizing analysis, treating the case studies as multiple experiments (Gioia et al., 2013). Following Yin's approach (Yin, 1984), "analytical generalization" integrates existing theories with empirical evidence, contributing to a comprehensive understanding of the impact and dynamics of the digital artifact on the ecosystem. Such approach allowed some flexibility for spontaneous exploration of emerging themes. The richness of the dataset was further enhanced by the inclusion of secondary data from external documents, ensuring a robust foundation for subsequent analysis.

Table 1: Overview of the case studies.

Sports teams	Technology providers	Sports team supporters
Juventus FC	Socios	Subject A
AC Milan		Subject B
Lega Serie A		//
FC Porto	Binance	Subject C

### 3.3 Data Analysis

After the data collection phase, the research continued with the analysis and interpretation of the collected data, focused on the development of a discussion based on the results. Following the "logic of replication" (Eisenhardt and Graebner, 2007), each case was treated as an independent experiment in both internal and cross-case analyses. The focus was on understanding the ecosystem mechanisms and interactions facilitated by the digital artifact. After the analysis of the individual cases, a cross-case comparison identified similarities and differences, answering the research question. The analysis made use of coding, using an inductive Grounded Theory methodology (Glaser and Strauss, 2017). An inductive coding tree, incorporating constructed and in vivo codes (Glaser and Strauss, 2017; Gioia et al., 2013), reflected the language of the informants. The iterative process consolidated the codes into first-order concepts, followed by a second-order analysis that aggregated the categories into overarching themes. This process culminated in an empirical model (Eisenhardt, 2023) which illustrates how the digital artifact enables the creation of an ecosystem.

## 4 RESULTS

Following a comprehensive analysis of the results derived from interviews conducted with key stakeholders across the ecosystem, a systematic process has been elucidated regarding the development of Fan Tokens and their associated Ecosystem by the firms involved. The process is divided into two macro-phases: Phase 1 – Focal Value Proposition Design, in which the main actors involved in the ecosystem – Technology Provider (e.g., Binance and Socios) and Sports Teams (e.g., FC Porto, AC Milan, Juventus FC) – align with each other, in terms of creation of connection of activities, resources and competences, envisioning, and effort on added value to the focal value proposition; Phase 2 – Ecosystem Alignment, in which there is the introduction and activation of sports team supporters, which from the use of Fan Tokens create value for the technology provider (e.g., Binance and Socios) and for sports teams (e.g., FC Porto, AC Milan, Juventus FC). Moreover, there is the establishing of new relationships with other actors (e.g., NFT Kings and Lega Serie A) for the supply of resources and inputs for the creation of complementary products to deliver to the sports team supporters.

#### 4.1 Focal Value Proposition Design

The trigger point that fosters the creation of this type of ecosystem is the Fan Token. Both the technology providers interviewed (Binance and Socios) have claimed that the Fan Token has been the starting point for the creation of a new business. For example, the Socios' Partnership Manager claimed: *"As far as the token [Fan Token] is concerned, it was the simplest and most easily applicable decision at the time because it did not require a lot of effort"*. Moreover, the Socios' CEO, during a YouTube interview claimed: *"So, we decided to create an ecosystem based on blockchain in order to engage and monetize sports fans all over the world"*. In this phase the technology providers identify the Fan Token as an opportunity to create a new business unit (e.g., Binance) or a new digital startup from scratch (e.g., Socios). Then, they decide which technological infrastructure to use, whether to exploit the existing one (e.g., Binance) or to create a completely new one (e.g., Socios). As explained by the Binance's Head of Marketing and BD: *"There is not separate technical department. The technicians in Binance are general, then they do the tasks. As I said before, it's not that at a technical setting level the fantoken part is different from the Binance core, it's the same thing more vertical on the fantoken..."*.

During this phase, the technology provider starts to establish collaborations with other actors in order to co-create the Fan Token, as explained by Socios' Partnership Manager: *"Together with the collaborative teams we propose a poll and when we decided it and when the team gives me its approval we will upload every time on the platform that poll with all the experiences and rewards connected."*. During the alignment between the technology provider and the actors, there is the establishing of interdependencies and of what a firm will give to the other side and viceversa, as claimed by AC Milan's Associate Strategy Manager: *"...what we give Socios when we enter into a partnership with them is access to a fanbase of hundreds of millions of fans around the world... They have resources dedicated to Milan, we have a resource dedicated to Socios, and then we agree on what activities to do, when to do them..."*

#### 4.2 Ecosystem Alignment

In this phase, the overall ecosystem architecture is almost complete thanks to the activation of sports team supporters and the introduction of other actors (e.g., Lega Serie A) which provide inputs that are still relevant to the ecosystem, as explained by Lega Serie

A's Partnership Manager: *"To conclude, with Socios, which is a very active partner and wants to activate a lot of users to make them interact in their platform, we did the activity related to matchball, so the NFC ball."*. In this phase, there is the constitution of the overall alignment structure on which actors interact with each other to materialise a focal value proposition.

Thanks to the activation of sports team supporters, the sports teams can engage their fans thanks to the interaction that the Fan Token allows, as explained by the Juventus FC's Head of Operations and Strategy: *"Then over time we saw that it works more what it involves. In fact, as we did on 'design your own shirt' which we then made, marketed and so on, you leave the grids much more open, but the ingredients you go for are controlled. So you leave space and you leave freedom..."*. In addition, they can reach fans all over the world, who previously were unable to interact with their favourite football team, as explained by AC Milan's Associate Strategy Manager: *"Now we are able to reach foreign fans such as fan from Turkey, Indonesia, etc., that previously was impossible to reach."*; and FC Porto's Marketing Manager: *"So, for our fans across the world, we do think it will bring us new fans and share our image throughout the world..."*.

Due to the possibility to interact with and to reach more fans, both, sports teams, other actors, technology providers, can capture value through the use of Fan Tokens and other digital objects (e.g., Matchball NFC of Lega Serie A, or NFTs) as claimed by Juventus FC's Head of Operations and Strategy: *"On an economic level there was a huge benefit because we did a very important revenue sharing ...So we benefit economically and in terms of value from what? From the fans! That's something we like anyway, it's a more direct channel..."*. On the other side, also sports team supporters are more engaged due to the interaction possibility created by the Fan Token, as claimed by Subject A: *"I do believe that fan tokens can open an incredible door to the sporting world and not just to fans. As I said before, the ability to access luxury areas ... made me realise the power of constant work and commitment in using tokens"*.

## 5 DISCUSSION

In our rapidly evolving digital age, in which digital artifacts are replacing physical objects (Kallinikos et al., 2013; Ekbria, 2009), and the creation of ecosystems (Adner, 2017; Jacobides et al., 2018) is needed by established and new firms, it is important

to shed light on the connection between these two previously unconnected research streams. Moreover, it is crucial to study this new phenomenon that is revitalising the sports industry with some success cases, which innovate their relationship with customers (sports team supporters) and create new revenue streams beside the typical ones in this “traditional” industry. So, the topic is attractive not only from a theoretical point of view but also from a managerial and practical perspective.

From this study emerges that digital artifacts can foster the creation of an ecosystems. Particularly, the characteristics of digital artifacts (Kallinikos et al., 2013) foster the creation of an ecosystem (Adner, 2017; Jacobides et al., 2018) thanks to their connections with the sources of value creation (Amit and Zott, 2001) and with value capture mechanisms (Lepak et al., 2007). Each of these characteristics, and their connections with the value creation and capture mechanisms, are specific for each of the two phases described in the previous section.

## 5.1 Theoretical Contribution

The empirical model derived sheds light on how the intrinsic characteristics of digital artifacts (Kallinikos et al., 2013) can foster the activation of value creation and capture mechanisms (Amit and Zott, 2001; Lepak et al., 2007) for each of the phases represented. In other words, the characteristics of digital artifacts can foster the creation of an ecosystem thanks to the connection between these characteristics and the value creation and capture mechanisms.

**Proposition 1:** *The editability and openness characteristics of digital artifacts foster the activation of novelty and efficiency sources of value creation during the creation of interdependencies among actors for the design of the focal value proposition.*

The editability and openness characteristics of digital artifacts (Kallinikos et al., 2013) are the possibility to modify and update the elements of a digital artifact and to be accessible and modifiable by a program. Those characteristics can activate the sources of value creation, novelty and efficiency (Amit and Zott, 2001), during the establishment of interdependencies among actors in the first phase “Focal Value Proposition Design”. Thanks to the two characteristics of digital artifacts (editability and openness), the firms, involved in the creation of a focal offer, can create value in a novel and efficient way (digital artifact) through which they will conduct transactions with the customers. Moreover, these characteristics (editability and openness) allow the

design and arrangement of all the elements that constitute the focal value proposition (digital artifact). Editability and openness guarantee the increase of efficiency and novelty in the following ways: Decreasing transaction costs due to the higher speed and facility through which the information will be transmitted and increasing the efficiency of the transactions thanks to the possibility to instantaneously update and modify the focal offer for the customers; Creation of a novel product that enhances new way through which transactions will be conducted and structured with previously unconnected parties, eliminating inefficiencies and creating new markets.

**Proposition 2:** *The interactivity and distributedness characteristics of digital artifacts foster the activation of lock-in and complementarities sources of value creation during the overall ecosystem alignment among all the actors involved.*

The interactivity and distributedness characteristics of digital artifacts (Kallinikos et al., 2013) are the possibility, for the customers, to interact and activate functions embedded in the digital artifact and the nature of being borderless and distributed in a broader digital ecosystem. Those characteristics can activate the sources of value creation, lock-in and complementarities (Amit and Zott, 2001), during the “Ecosystem Alignment” phase (Adner, 2017). Thanks to these two characteristics of digital artifacts (interactivity and distributedness), the firms that operate in the ecosystem can create value for customers through lock-in and complementarity sources (Amit and Zott, 2001). The interactivity characteristic fosters the increase of lock-in source of value creation thanks to the possibility of creating retention and loyalty in repeat transactions with customers. Whereas the distributedness characteristic fosters the increase of complementarity source of value creation due to the opportunity to reach several actors (e.g., customers, partners, etc.), without any boundary obstacles, with whom the firms, already in the ecosystem, can create a new network of partners for the co-creation and supply of relevant inputs for complementary products.

**Proposition 3:** *The interactivity and distributedness characteristics of digital artifacts foster the capture and appropriation of value for the firms involved in the ecosystem.*

Thanks to the interaction of customers and the possibility to access to complementary products worldwide, the firms, in the ecosystem, can capture value (Lepak et al., 2007) from the customers’ usage of digital artifacts. Thanks to the utilisation of the digital artifact by customers, the firms can capture

different types of value to increase their revenues, acquire new customers, and understand better their audiences through data analysis.

To resume all of these propositions into the proposition that answers the question on which this study is grounded:

**Proposition 4:** *The intrinsic characteristics of the digital artifacts allow the creation of an ecosystem thanks to their connections with the mechanisms of value creation and capture for each of the phases needed to create the respective ecosystem.*

The representation of the empirical model obtained is shown in Figure 1. This model represents the connection between the intrinsic characteristics of digital artifacts (Kallinikos et al., 2013), the phases identified for the creation of an ecosystem (Adner, 2017), and the mechanisms of value creation and capture (Amit and Zott, 2001, Lepak et al., 2007). In this representation, it can be observed how the different characteristics of digital artifacts foster different value creation and capture mechanisms in different ways along the two phases needed for the creation of an ecosystem enabled by a digital artifact. Moreover, in the Phase 1 there are just value creation mechanisms, due to the need to design a novel and an efficient way to deliver the digital artifact to the customers; whereas, in the Phase 2 there is the introduction of value capture mechanisms to capture and appropriate value from customers' interactions.

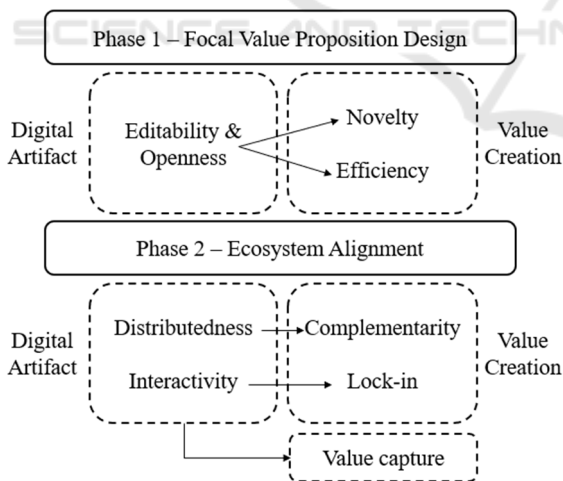


Figure 1: Empirical model representation.

## 6 CONCLUSION

This study investigated how digital artifact can foster the creation of an ecosystem. Particularly, it has been concluded that digital artifacts, thanks to their

intrinsic characteristics, can foster value creation and capture mechanisms within an ecosystem. Moreover, these characteristics are useful for each of the phases needed to create an ecosystem. Besides this discovery, this research enriches the Ecosystem theory. The need to conduct this study stemmed from the gap identified in the literature between previously unconnected streams: ecosystem and digital artifact. Thanks to this research, these two theories are now matched, and can pave the way for future studies. It was conducted an exploratory research using multiple case studies on a sample of four cases identified with six companies and three sports fans interviewed. Sports business was chosen as industry of reference thanks to its specific characteristics (Fonti et al., 2023) and its big market value. In particular, the application of Fan Tokens to the football industry (a segment of sports industry) has been the field on which this study is grounded to answer the research question. The outcome of this work is an empirical model that help to understand how to create an ecosystem exploiting the characteristics of a digital artifact. To conclude, this study led to new original insights, but has some limitations due to the small sample size and the subjectivity that occurs in qualitative research. Indeed, Future research could expand the scope to include other sports and regions. Incorporating quantitative measures could strengthen the validity of the proposed model and offer a more comprehensive understanding of the impact of digital artifacts in ecosystem creation.

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