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Contents

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I. Executive summary

Cryptoart is a combination of digital art, blockchain, and NFTs. It empowers artists to challenge traditional systems, introducing innovative ways of creation, monetization, and distribution. Cryptoart encompasses a spectrum of subgenres and carries the counterculture identity of past art movements, providing a distinct alternative to centralized systems. NFTs are the base layer of this ecosystem, introducing automatic royalties promising fair artist compensation, but reliance on marketplace terms for royalty payments remains a concern (Gilbert & Hernandez, 2022). NFT ownership grants control over metadata rather than the artwork, challenging traditional ownership concepts. However, the emergence of scams and fraud has questioned the reliability of this technology, emphasizing the need for further development and safeguards (C, 2023). Cryptoart raises questions about rarity and ownership in the digital world, despite its early-stage vulnerabilities. These technologies continue to redefine digital art, driving the art world toward transformation. The future of cryptoart promises to be shaped by maturing markets, a convergence of art and technology, and the integration of VR, AR, and the metaverse.

As we navigate this dynamic landscape, stakeholders must embrace adaptability, innovation, and responsible practices. Continuous experimentation and risk management are essential strategies, especially for artists. Building networks and active self-promotion can enhance visibility and success. Collectors should diversify their portfolios, staying informed about market trends and recognizing the long-term potential of NFTs. Platforms must prioritize compliance, continuous innovation, and user-centric experiences to stand out in a competitive landscape. Curation of artwork can also be a tool for platforms to attract investors. Regulators and policymakers should balance innovation with consumer protection, supporting an environment that encourages technological advancement while ensuring transparency and compliance. Collaboration with industry stakeholders is vital for informed and balanced policymaking.

II. Roadmap for cryptoart

1. Introduction

1.1. Definition and relevance of cryptoart

The roots of cryptoart are in digital art, which serves as the foundational movement encompassing any artwork created entirely or partially through electronic devices and software. Its defining characteristic is its authentication and tokenization through non-fungible tokens (NFTs) on blockchain technology. NFTs offer a unique, verifiable, and immutable proof of ownership. At its core, Cryptoart represents the intersection of technology and creativity. It offers artists innovative ways to create, monetize, and distribute their work. A succinct definition of cryptoart can be formulated as follows: "Cryptoart is art that incorporates blockchain technology in its creation and/or its distribution." The "crypto" aspect of cryptoart is rooted in its connection to cryptographic techniques, based on blockchain technology. These techniques enable the secure storage, transfer, purchase, and sale of artworks. However, this initial characterization, while valid, only provides a preliminary understanding of this art form. Cryptoart is a subset of digital art, a broader movement that encompasses any artwork generated wholly or partially using electronic devices and software. Unlike digital art, which emerged in the 1990s and experienced activity in the 2000s through movements like Pixel Art or Net.Art, cryptoart is distinctly reliant on recent technological innovations, notably the blockchain. In the 2020s, cryptoart further diversified into subgenres like voxel art (architectural and installation art within metaverses) and generative art. Some experts compare cryptoart to pop art and street art, sharing a "counterculture" and "anti-establishment" identity. Art critics and curators make distinctions within cryptoart. They distinguish between blockchain art, which delves deeply into exploring the potential of blockchain technology, cryptoart, which celebrates cryptocurrency culture, and the broader category of digital art or design that has been tokenized for trading. NFTs, integral to cryptoart, lie at the heart of its definition, but it would be inappropriate for artists to refer to their work simply as "NFT art". Cryptoart and NFTs are often heralded as transformative forces, leveraging blockchain and decentralization to shift agency from traditional, hegemonic entities to individuals. It's characterized as having an "anti-system" DNA, aimed at empowering creators and eradicating profit-seeking intermediaries. Nevertheless, the online origins of cryptoart contribute to its persistent lack of recognition. The unmoderated online space, comprising highly educated individuals and less educated ones, fuels a world where opinions often overshadow reason. Detractors have criticized cryptoart as resembling amateur digital sketches created by children or even automated processes, diminishing its ability to compete with traditional art forms. Critically, cryptoart hinges on the principles of decentralization and blockchain technology. These aspects, while promising in terms of reshaping various fundamentals, can be perceived as disruptive forces, posing challenges to established tech companies and centralized economic systems. With NFTs at the forefront, these technologies have redefined ownership, work arrangements, financial transactions, and relationships with central powers. They offer alternative solutions to mitigate contemporary challenges, which might be appealing to individuals facing diminishing social mobility.

In summary, cryptoart represents a convergence of technology and creativity, characterized by its association with blockchain technology and NFTs. It strives to empower creators and challenge traditional art paradigms, though it remains a subject of debate within the art world. Its

decentralized nature has the potential to reshape various aspects of our digital existence, prompting both enthusiasm and skepticism.

1.2. Importance and evolution of the cryptoart market

The cryptoart market has undeniably emerged as a disruptive force, drawing considerable attention from both the general public and the traditional art industry. The significance of the cryptoart market transcends the boundaries of art itself. It extends into the realm of technology, digital ownership, and the future of creative industries, making it a phenomenon that warrants deeper exploration. NFTs as unique digital assets have introduced a transformative element to the art world. One of their key features is the ability to automatically provide artists with royalties for secondary sales. While the Artist's Resale Right law, which exists in the United Kingdom and the European Economic Area, has long stipulated this provision, it has never been adequately enforced. Blockchain technology has the potential to alter the status quo, ensuring that artists receive due compensation for their work. However, the reliability of royalties isn't guaranteed, as it depends on the contractual terms set by each marketplace. Some platforms have even explored models that do not involve royalties, threatening the artists' income. Moreover, ownership in the cryptoart world is not as straightforward as the prevailing claims and hype might suggest. NFTs grant ownership over the metadata associated with an artwork, not the artwork itself. This technicality implies that the actual artistic content can still be subject to theft and reproduction. The prevalence of phishing scams and other fraudulent activities has raised concerns about the reliability of blockchain technology and ultimately eroded trust in the system. In a broader context, it's reasonable to view NFTs as a technological innovation that has endowed digital art with newfound agency, ultimately extending to the cryptoart domain. NFTs and crypto have addressed long-standing needs for digital artists and other industries. They are challenging ownership in virtual spaces by introducing scarcity for digital assets.

It is important to understand that these technologies are still in their early stages and may have certain vulnerabilities. However, it would be premature to rule out their potential. They question our relationship with centralized authorities and tackle complex issues like digital ownership that, until now, seemed unsolvable. The ongoing small-scale revolutions within the cryptoart market serve as reminders of how transformative innovations often begin. The cryptoart market, though currently imperfect, represents a glimpse into a future that could redefine the way we perceive and interact with digital art, ownership, and creative expression.

1.3. Purpose and scope of the report

The purpose of this report is to provide a comprehensive roadmap for understanding and navigating the cryptoart ecosystem. A detailed report reviewing recent developments in the area of cryptoart, current trends, likely outcomes, and recommended courses of action for the various stakeholders of the cryptoart ecosystem. It will analyze recent developments, current trends, and potential future directions in cryptoart and related technologies. The report aims to guide various stakeholders, including artists, collectors, platforms, and policymakers, by offering insights and recommended strategies for their roles in this dynamic landscape. It contains the following sections: the roadmap for cryptoart and a practical guide containing an article with the following title

“NFTs and Blockchain for the creative industry: How to acquire the necessary knowledge within 9 days” and a presentation of the basics of cryptoart and relevant terms.

2. Recent developments in Cryptoart

2.1. Overview of the Cryptoart ecosystem

2.1.1. Market size, growth, and trends

The cryptoart market has indeed experienced substantial growth in recent years. There has been a noticeable move of traditional artists into cryptoart, drawing along established art collectors who are keen to explore this innovative space. NFTs, serving as the technological backbone, have expanded beyond their origins in digital art to encompass physical artworks and collectibles, indicating the market's evolution. While early attention was heavily focused on soaring prices and speculative trading, the discourse has now shifted toward the longer-term implications of blockchain applications within the art market.

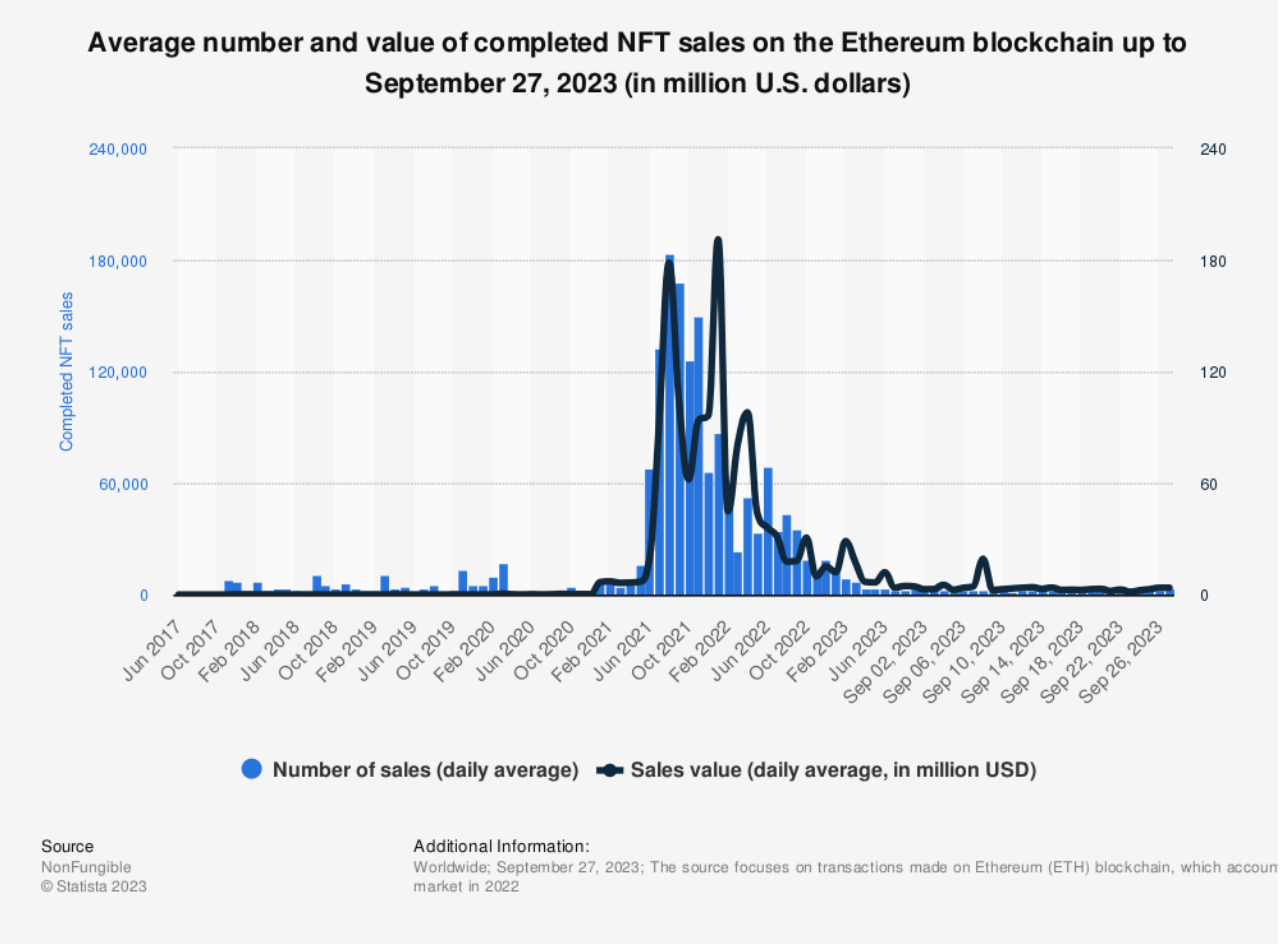

Figure: Average number and value of completed NFT sales on the Ethereum blockchain (Statista, 2023)

Key trends and statistics include:

- Sales of art NFTs surged from $605,000 in 2019 to a remarkable $2.9 billion in 2021. However, the market witnessed a cooling-off period in 2022, with overall art NFT sales still reaching nearly $1.5 billion, reflecting values over 70 times the 2020 market size.
- The average time between purchase and resale of art NFTs in 2021 was a mere 33 days, a stark contrast to the art market's traditional resale period of 25 to 30 years.

- The average price of art NFTs witnessed a substantial increase, growing more than 20-fold in value from the end of 2020 to the peak in August 2021.
- High-net-worth collectors demonstrated considerable interest in art-based NFTs, collectively spending an average of $46,000 during the first half of 2022, surpassing the combined sum of the previous two years.
- Valued utilities in art NFTs include a direct relationship with the artist, membership in exclusive communities, invitations to physical events, access to future art NFTs, bonus rewards, access to premium content, online experiences, and gamified elements.
- Main motivations for collecting digital art include an appreciation for digital art, support for digital artists, and proof of digital ownership.
- Factors motivating collectors to buy more digital art in the near future include more curation and contextualization, an artist's exhibition history, increased adoption by museum collections and a simpler payment process

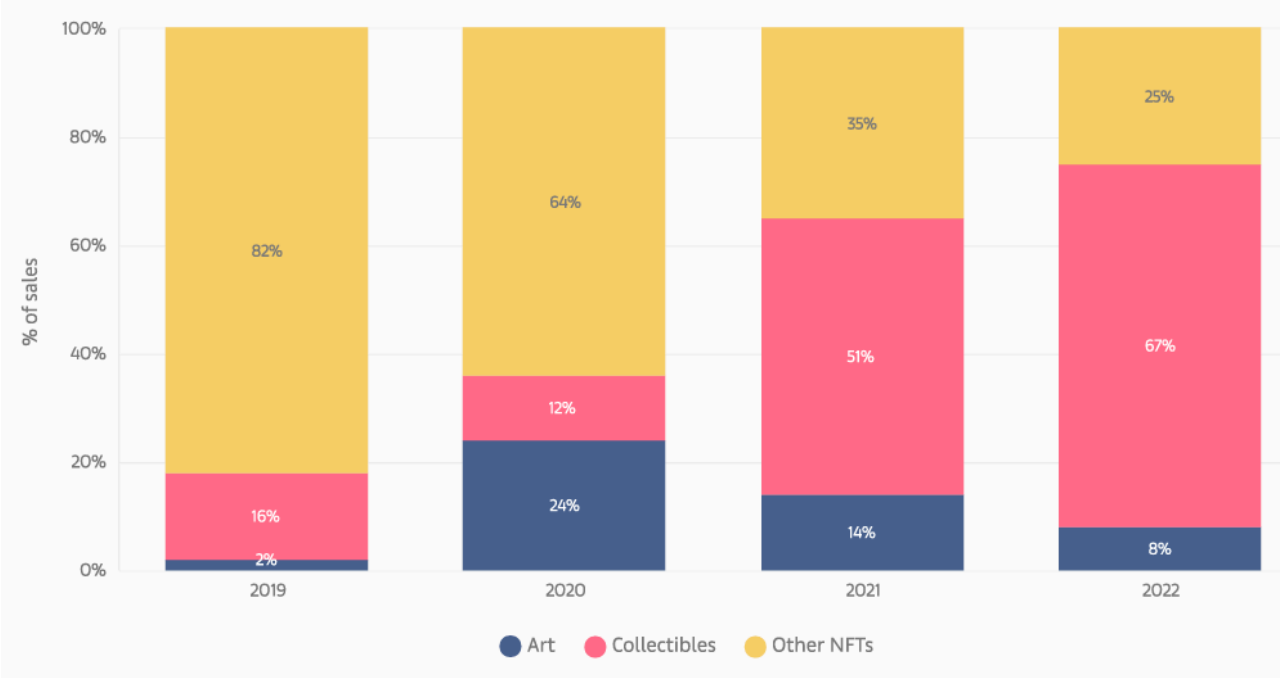

Figure: Share of Value of Art and Collectibles in All NFT Sales 2019–2022 (Art Basel and UBS, 2023)

It's worth noting that the cryptoart market's landscape has expanded to include various collectible categories, and while art's share has grown, it experienced a decline in 2022 due to lower sales values. Additionally, beyond the financial aspects, the art trade is steadily adopting the long-term implications of Web3 and blockchain technologies for their businesses, emphasizing responsible ownership and best practices. As the digital art market continues to grow, encompassing digital, film, and video art, we can expect increased participation from artists, collectors, and investors. This growth promises a more dynamic, diverse, and accessible art market for all stakeholders. In this evolving landscape, factors such as demand, sale velocity, collector interest, and accessibility to quality examples remain crucial in determining art's value. NFTs have the potential to create new

revenue streams for artists and democratize the art world, contributing to a more inclusive and accessible art market.

2.1.2. Major players and platforms

The NFT stack is similar to the Decentralized Finance (DeFi) stack or can even be considered as part of it. DeFi is based on a multi-layered structure with each layer serving a unique purpose. These layers build on each other and are therefore sometimes compared to “Lego bricks” It's important to note that these layers are hierarchical, which means each layer is only as secure as the layers below. The framework distinguishes between five layers: settlement, asset, protocol, application, and aggregation layers, as illustrated in the figure below.

1. Settlement Layer: The foundational layer housing the distributed ledger technology with its native protocol, responsible for secure ownership, settling the transactions and dispute resolution.
2. Asset Layer: Comprises all assets issued on top of the settlement layer, including native protocol assets and additional tokens.Each asset represents an atomic unit of value.
3. Protocol Layer: Provides standards and smart contracts for specific DeFi activities, enhancing interoperability across different applications.
4. Application Layer: Consists of user-oriented applications with web-based interfaces, simplifying interactions with DeFi protocols.This layer usually makes up the front end that users can interact with.
5. Aggregation Layer: Extends the application layer by creating user-centric platforms that combine multiple applications and protocols, offering tools for comparisons, complex tasks, and information presentation.

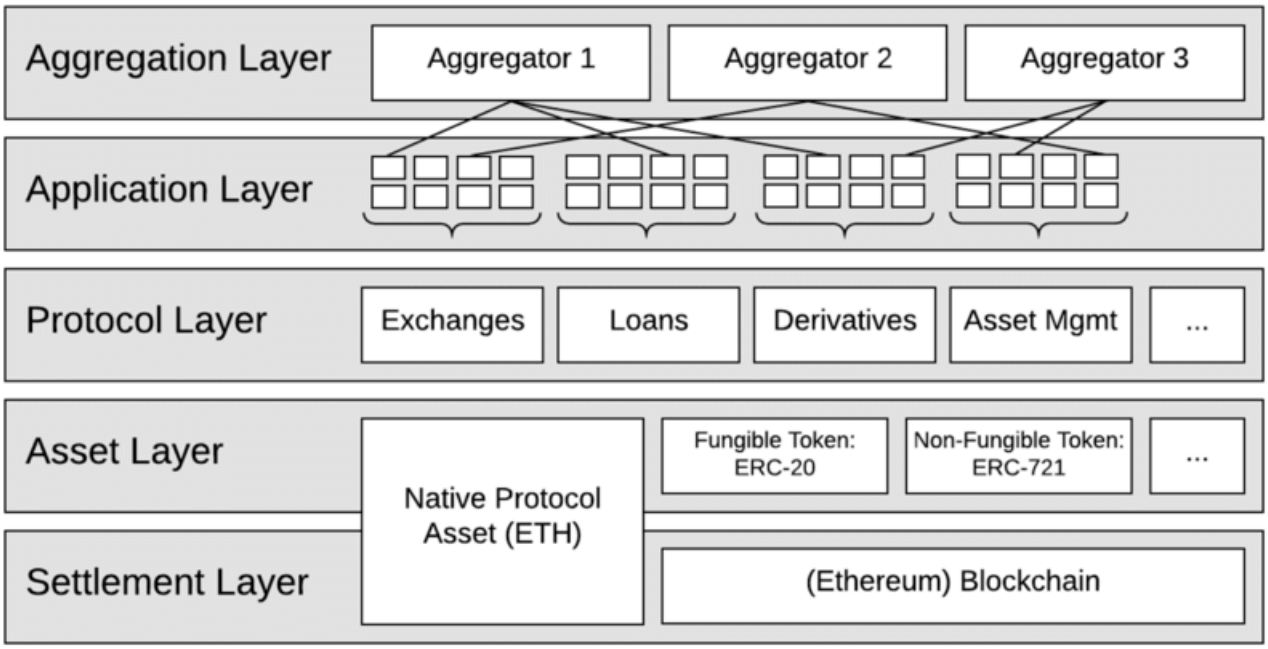

Figure: The Decentralized Finance stack (Schär, 2020)

The NFT landscape has evolved from a small ecosystem of collectors and enthusiasts to an emerging multichain ecosystem positioned at the intersection of culture and technology.

Certain definitions of the NFT layers distinguish between layer 1 blockchains, layer 2 blockchains & sidechains, storage solutions, and different applications built on these layers. As NFTs require storage for their metadata, which is usually limited on layer 1 and 2 blockchains, there are certain storage solutions available. The most common storage solutions are Arweave, IPFS (InterPlanetary File System), Filecoin, or Sia. Services like Filebase and Pinata provide clean interfaces for companies that want to use IPFS or other storage layers but need to fulfill formal and legal requirements. IPFS, or InterPlanetary File System, is a decentralized, peer-to-peer file storage system that allows users to store and share files on a global network. IPFS is designed to be fast, secure, and resilient, with built-in encryption and hash functions that help prevent data loss or corruption. The network itself is maintained by a community of developers and cryptocurrency enthusiasts who are actively working to improve and expand its capabilities. Some of the key features of IPFS include its ability to store large files and its support for file compression and deduplication, which can help reduce the amount of storage space needed on the network.

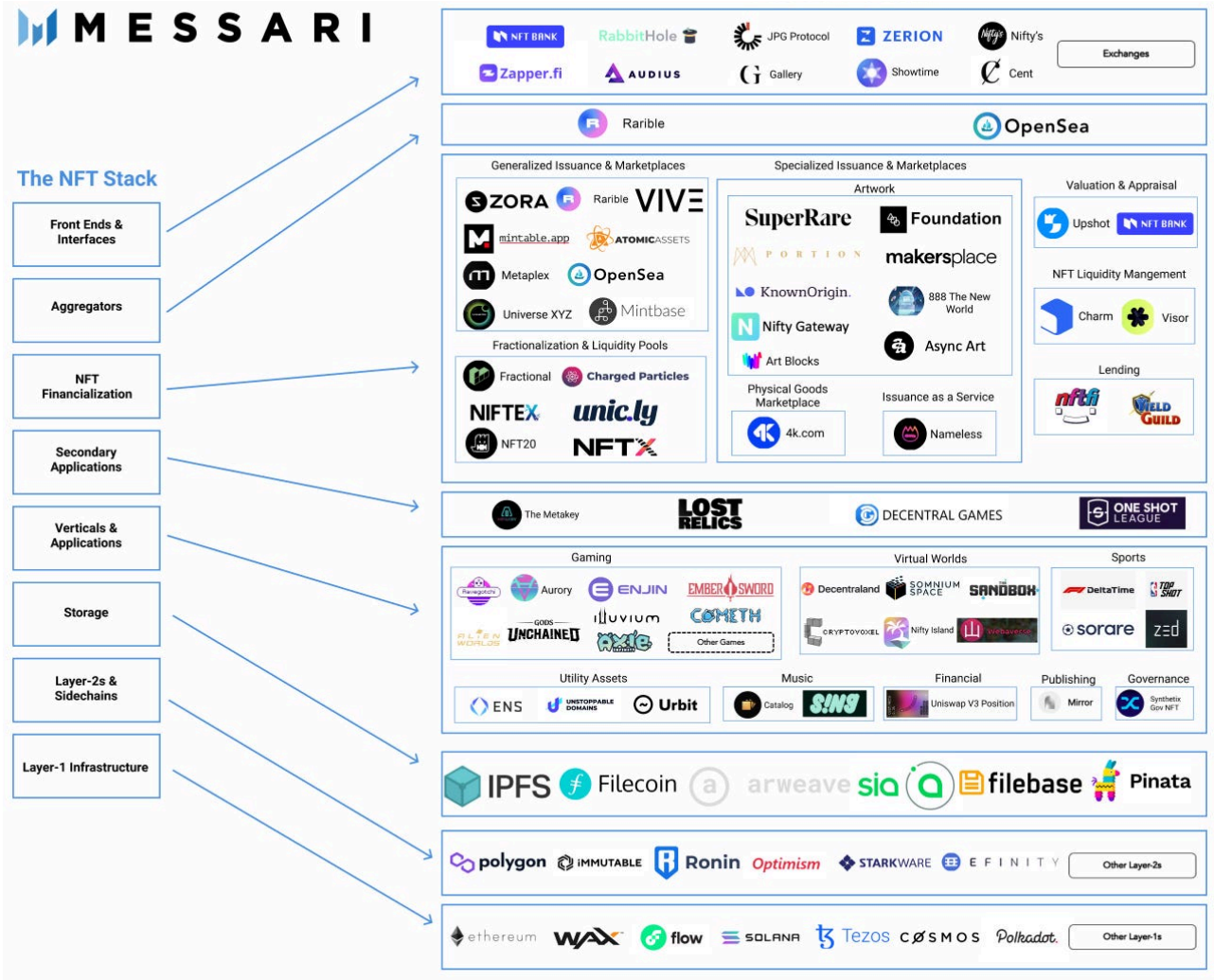

Figure: The NFT stack (Nystrom, 2021)

Leading blockchain platforms, particularly Ethereum, Polygon, Solana, and Tezos, have emerged as central hubs for cryptoart creation and trading. These platforms provide the foundation for the creation and exchange of non-fungible tokens (NFTs), which underpin the cryptoart market.

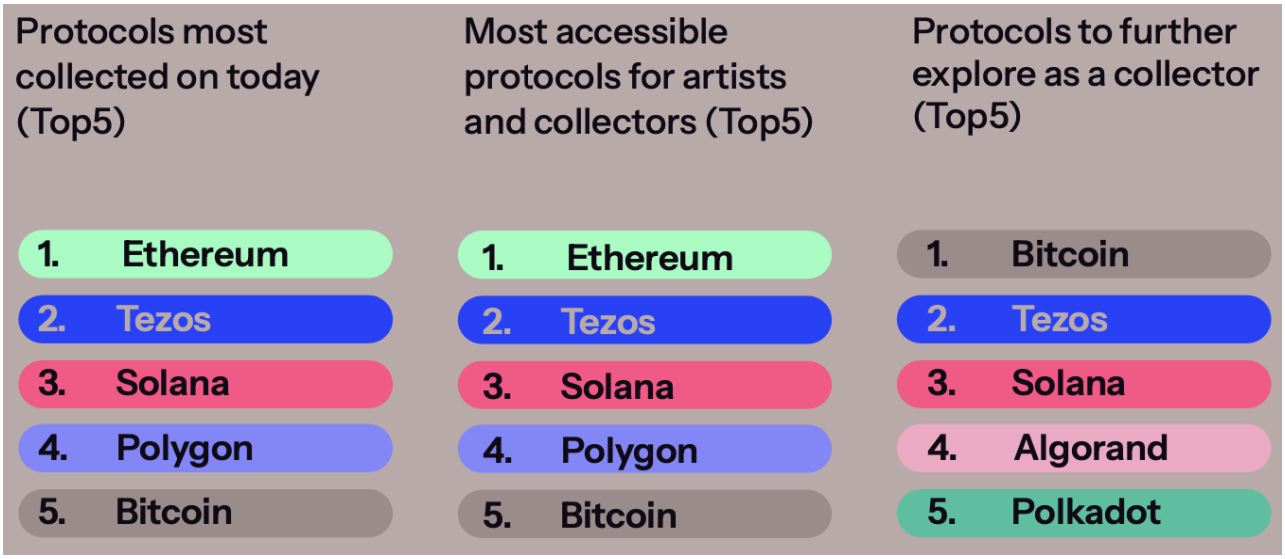

Figure: Leading art NFT protocols (Gold, 2023)

Key players in the cryptoart market include NFT marketplaces that facilitate the buying and selling of NFT art. Surveys show that art collectors primarily obtain art NFTs from NFT marketplaces, artists, and curated NFT platforms. Galleries and auction houses are less favored due to limited art NFT supply. Prominent marketplaces like OpenSea, Rarible, and SuperRare have gained significant attention within the ecosystem. Art NFT collectors selected OpenSea, Objkt, and fxhash as the most preferred platforms. Marketplaces serve as essential platforms for artists, collectors, and enthusiasts to engage in the cryptoart space. Renowned artists, such as Beeple and the creators of several profile picture (PFP) NFTs such as CryptoPunks and Bored Ape Yacht Club, have achieved international recognition due to their high sales values. Their work has not only pushed the boundaries of digital art but also drawn substantial interest and investment. NFT marketplaces offer various features, including mining functions and optional features like (de-)centralization, cross-listing, aggregation from multiple marketplaces, royalty fees, support for single items and collections, access controls (open, invitation, application), and curatorial models (non-curated, curated). Some marketplaces adopt timed release strategies, known as "drops," while others function as virtual galleries. Major NFT marketplaces have contributed to the cryptoart ecosystem. These platforms differ significantly in the assets they support, fee structures, and the market segments they offer, such as general, art, and utility marketplaces.

Collectors mainly use social media, online communities, and dedicated art NFT platforms as information sources. Newsletters and influential collectors also play notable roles, while blogs and online magazines are less influential. Digital art platforms provide immediacy and independence while reducing reliance on intermediaries. Curated art NFT platforms indicate that collectors still value curation and categorization, despite the decentralized nature of web3.

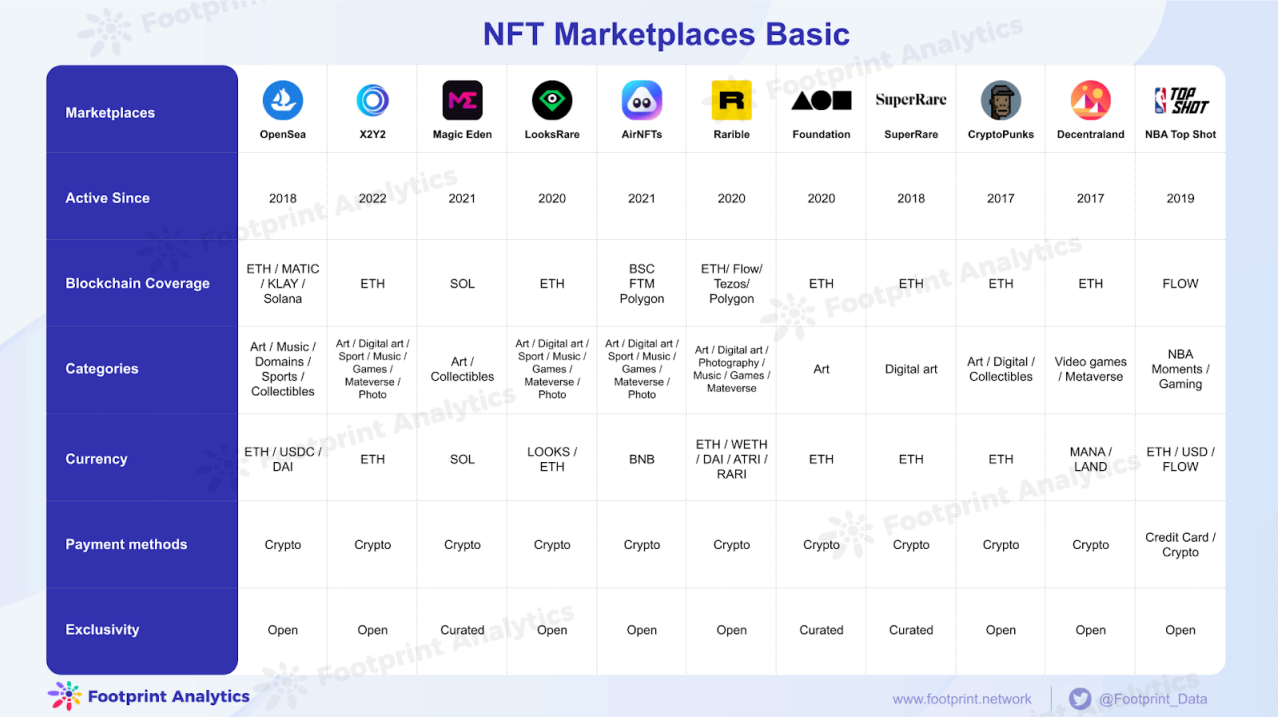

Figure: NFT Marketplace landscape (Footprint Analytics, 2022)

In recent years, many NFT marketplaces have emerged, each targeting specific user segments and offering various features and commission or pricing models. These marketplaces aim to create unique communities around themselves, emphasizing their individual characteristics and value propositions. Consequently, the cryptoart market comprises a diverse array of marketplaces, each trying to serve the evolving needs of artists, collectors, and investors.

2.1.3. Artistic trends: Artists and genres in Cryptoart

Cryptoart encompasses a diverse array of styles and genres, reflecting the broad spectrum of digital artistic expression. These styles include digital paintings, generative art, 3D sculptures, music, and more. Artists are pushing the boundaries of creativity, exploring the limitless possibilities offered by the digital medium. In the context of the metaverse, avatars and virtual identities are emerging as novel forms of artistic expression. These digital characters serve as a canvas for self-expression and creativity, further blurring the lines between the real and virtual worlds. However, not all cryptoart receives equal attention or recognition. Viral NFT collections often feature procedurally generated characters that, while commercially successful, may lack depth or artistic innovation. Many view these collections more as intellectual properties than profound works of art. This trend has sparked frustration within the art world, as substantial investments are made in tokens that sometimes offer more bragging rights than artistic value. Nonetheless, beyond the hype and skepticism, there are hidden champions within the cryptoart space. Some artists are leveraging NFT technology to explore the very limits of blockchain, challenging conventional notions of value, ownership, and authenticity. These blockchain art projects invite viewers to reconsider the fundamental aspects of art and its relationship with technology.

Critics and curators distinguish between blockchain art, which delves deep into blockchain's possibilities, cryptoart which celebrates cryptocurrency culture, and the broader category of digital art or design that has been tokenized for trading. While some art may be associated with collectible Profile Picture Projects (PFPs), others capture the attention of serious curators. For instance, works like Mad Dog Jones' Replicator use NFTs to self-generate unique variations, challenging notions of static art. Pak's The Pixel echoes a tradition in conceptual art by transforming the ordinary into art. Moreover, certain NFTs challenge the very foundations of crypto culture. The act of "hijacking" older tokens, and changing their hosted media, exposes the limits of blockchain's permanence, raising intriguing questions about the nature of digital ownership. In essence, while cryptoart has its share of commercial trends, it remains a space where technology and creativity intersect. As trends evolve and certain collectibles fade, the enduring movement of artists exploring technology's capacity to provoke thought and emotion will continue to shape the cryptoart landscape.

2.2. Technology

2.2.1. Blockchain, NFTs and their impact

Blockchain technology has significantly impacted the cryptoart market, introducing transparency, provenance tracking, and immutability to cryptoart ownership. Smart contracts, a core feature of blockchain platforms, automate royalty payments to artists whenever their work is resold, offering creators a new revenue stream. Decentralization, a fundamental principle of blockchain, eliminates the need for intermediaries in transactions, reducing costs and fostering trust within the ecosystem. Blockchain stores transactions transparently and securely, allowing viewing by anyone while restricting edits under specific conditions.

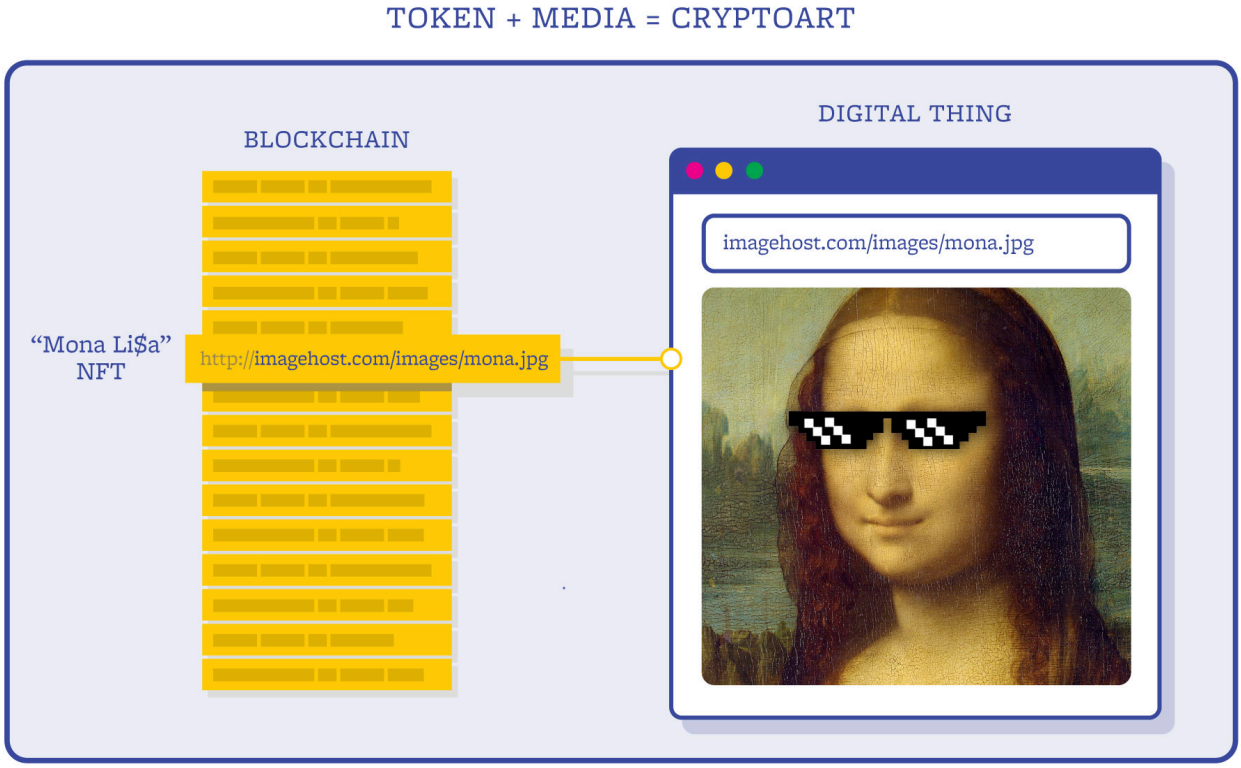

Figure: What is Cryptoart? (Cone, 2021)

NFTs have played a transformative role in the art world by introducing digital scarcity and defining property rights. Initially applied to digital art, NFTs have extended their reach into virtual real estate, virtual goods, and even ownership of tweets and memes. NFTs empower artists to monetize their work directly, revolutionizing the art market. However, there are debates about the "non-fungible" nature of NFTs, as ownership of an NFT does not prevent non-owners from creating digital copies. NFTs are backed by blockchain technology, which may require substantial energy, though most blockchains that are used for issuing NFTs have addressed environmental concerns by transitioning from proof-of-work to proof-of-stake.

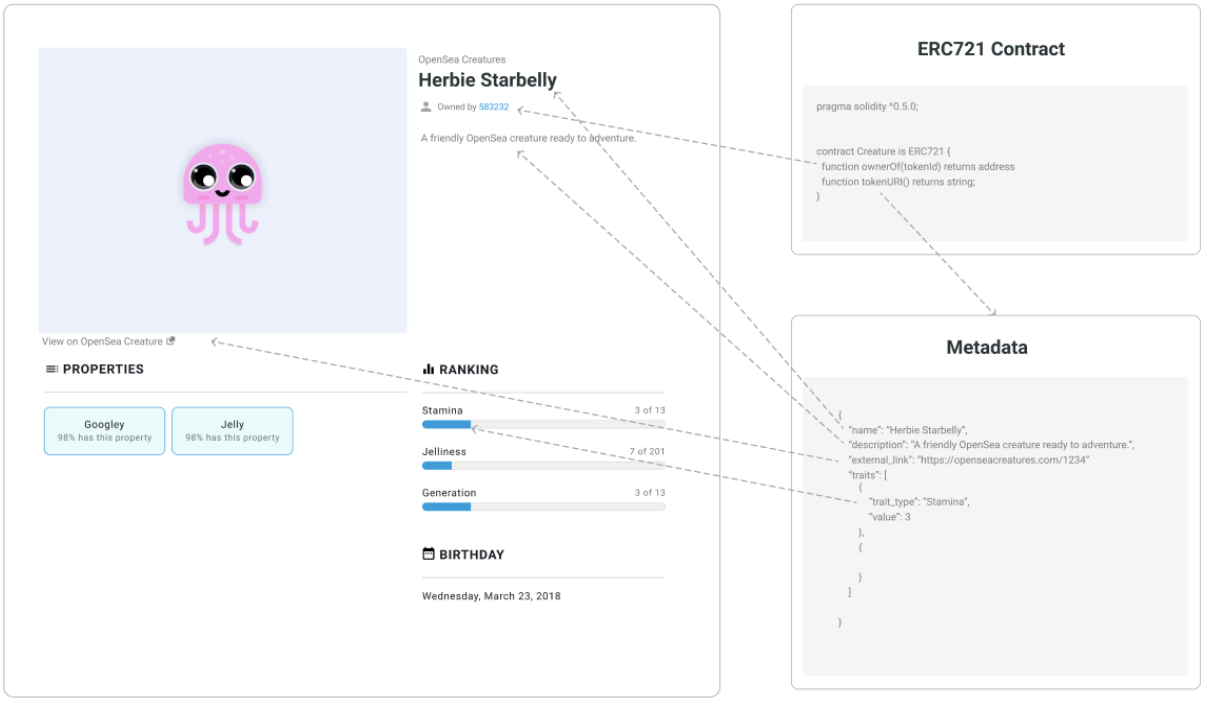

Figure: Setup of NFTs (OpenSea, 2023)

Despite their potential, NFTs have faced skepticism, with concerns ranging from environmental impact to misconceptions about their value. Notably, NFTs were initially designed for the decentralized digital ownership landscape, making their application to physical assets complex. The introduction of royalty fees for NFTs is evolving, with various marketplaces offering unique rules and options for setting and paying royalties. NFTs have diverse use cases, including digital content like digital collectives used in merchandise, gaming items, domain names, identity verification, tokenization of physical assets, collateral in decentralized finance (DeFi), and token-gating for exclusive content or events.

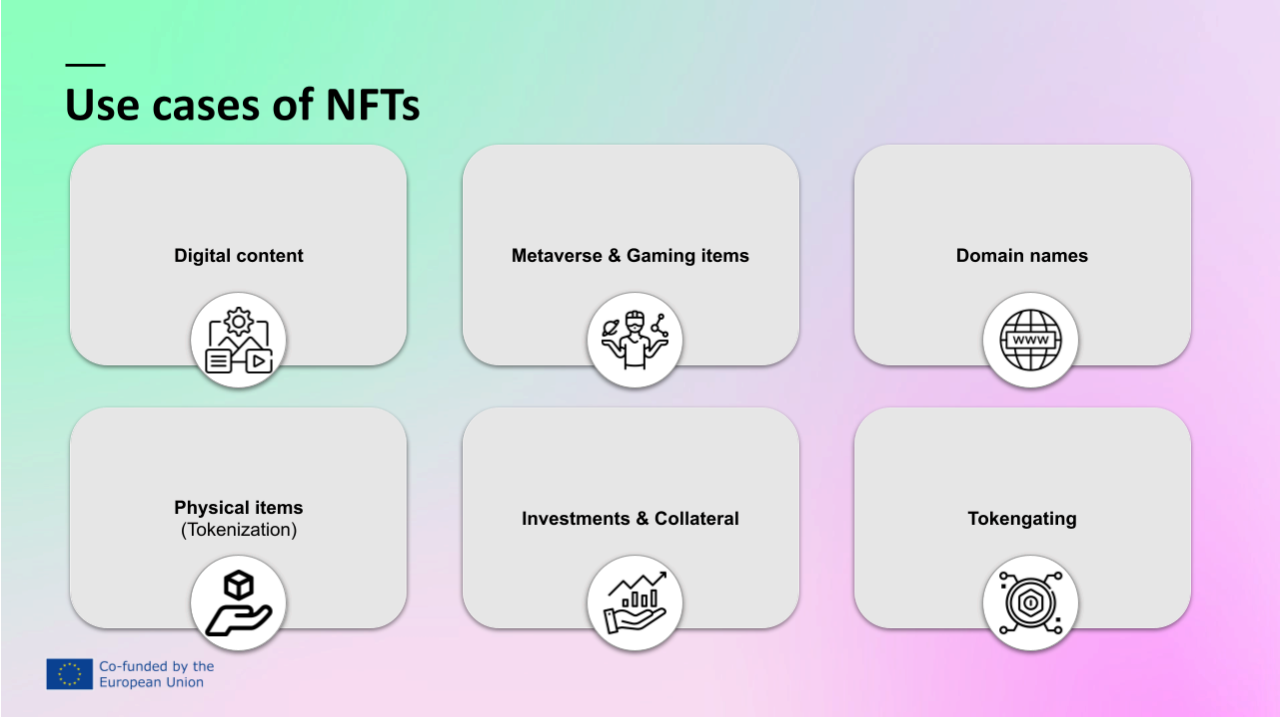

Figure: Use cases of NFTs (own illustration)

While NFTs have generated excitement for their potential to unlock new revenue streams and introduce people to cryptocurrencies, there are challenges, including the need for simplification for broader user adoption.

2.2.2. Other Technologies

Virtual Reality (VR) and Augmented Reality (AR) technologies are increasingly merging with the cryptoart landscape, creating immersive experiences for art collectors. These technologies allow users to interact with digital art in novel ways, blurring the boundaries between the physical and digital worlds. The concept of the metaverse, a virtual shared space, is gaining prominence in discussions surrounding cryptoart. While the idea of the metaverse has existed since the 1992 science-fiction novel "Snow Crash," it recently garnered mainstream attention, notably with Meta's rebranding in October 2021. However, the definition of the metaverse remains ambiguous, with various interpretations ranging from a universe beyond the physical world to a parallel virtual world. This lack of consensus highlights the need for standardization, not only in defining the metaverse but also in shaping its technologies, systems, and governance. The integration of NFTs into this evolving virtual landscape raises important questions. How will NFTs be incorporated, or not, into this new virtual world? This debate mirrors larger cultural clashes within the video game and cultural industries, where established companies are heavily investing in metaverse ventures while others question their value, use cases, and future. Artists and creators are exploring innovative ways to leverage VR, AR, and the metaverse to create unique art experiences.

2.2.3 Technology outlook

NFTs as digital tokens have developed beyond their art origins and are finding applications in a wide range of sectors. Art remains a driving force in NFT innovation, with collectors investing significantly in art-based NFTs. While this expansion is promising, several challenges and limitations must be addressed to fully realize their potential. One of the primary hurdles facing NFTs is scalability. As their popularity grows, the underlying blockchain infrastructure must keep pace to accommodate the increased demand. Moreover, for NFTs to thrive, there is a need for broader cryptocurrency acceptance, as NFTs are often purchased using cryptocurrencies. The integration of virtual reality (VR), augmented reality (AR), and the metaverse into cryptoart is providing users with immersive and interactive experiences. However, not everyone has access to the technology required to fully engage in these experiences, which poses a barrier to widespread adoption. The decentralization of curation in the metaverse has fostered creativity, allowing artists to explore new forms of artistic expression. However, it may also lead to fragmentation, with exclusive art communities forming. Virtual NFT galleries are emerging, offering users the opportunity to interact with 3D digital objects in metaverse spaces. Originally, NFTs were designed to serve a specific purpose – as digital authenticity certificates for virtual goods. They act as a form of copyright, securing the ownership and provenance of digital assets. This immutable and transparent system enables the tracking of owners, prices, and sales. It's essential to keep this original purpose in mind as NFTs continue to expand into various domains.

Outlook on Ethereum and token standards (ERC)

Ethereum founder Vitalik Buterin, recently explained what Ethereum needs on its road toward becoming a 'mature tech stack'. The evolution of Ethereum from an experimental niche technology into a mainstream tech stack includes the following three transitions:

1. The L2 scaling transition: Implementation of layer 2 solutions as transaction costs are too high on layer 1 and products aiming for the mass market will build on centralized services instead.
2. The wallet security transition: Without smart contract wallets users are uncomfortable storing their funds and move to centralized exchanges.
3. The privacy transition: Having all transactions available publicly for everyone compromises the privacy of many users while centralized solutions that at least hide data to a certain extent.

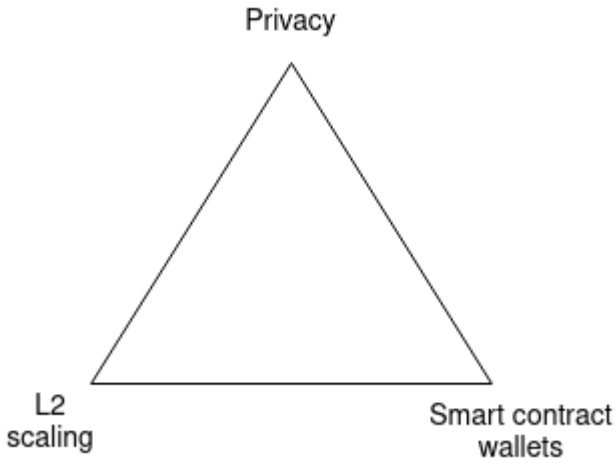

Figure: The Ethereum ecosystem transition triangle (Buterin, 2023)

These three transitions will radically reshape the relationship between Ethereum users and addresses. There are two different types of standards for implementing or proposing changes to the Ethereum protocol. Ethereum Request for Comments (ERCs) are used to standardize new features in Ethereum, while Ethereum Improvement Proposals (EIPs) are used to propose improvements to the Ethereum protocol itself. Regarding NFTs, there are two proposals currently in discussion which are in line with these transitions.

The ERC-6551 standard implements token-bound accounts. It allows NFTs to be equipped with wallet functionality like receiving and sending transactions, storing and swapping tokens, and more. ERC 6551-enabled tokens are called "token-bound accounts".

The ERC-4337 or account abstraction is a technology that allows Ethereum wallets to act like decentralized banks. It blurs the line between wallets and smart contracts. The most promising development based on EIP-4337 could be smart wallets granting new functionality like gasless transactions, batch transactions, and social recovery.

3. Future developments in Cryptoart

3.1. How NFTs are changing the creation of art

For artists NFTs can represent a digital revolution that allows them to reach a global audience without the need for traditional intermediaries like galleries and auction houses. However, this democratization of art also comes with its own set of challenges. As more artists join the NFT space, the market has become increasingly crowded. While reaching a global audience, this means greater exposure for creators, it also raises concerns about market saturation. With thousands of artists minting NFTs, it can be difficult for individual talents to stand out in the crowd. However, compared to the traditional art market, this is not something new. Artists rather have to diversify themselves by creating outstanding artworks and combining multiple technologies. With NFTs dynamic features through smart contracts can be integrated into artworks. These self-executing contracts enable artists to explore new dimensions of creativity. For example, an NFT artwork can change over time or interact with external data sources. This dynamic nature opens up endless possibilities for artists to experiment with their creations. However, developing and implementing smart contracts requires technical expertise, and even a small error can have significant consequences. Additionally, the introduction of complex features can make the artwork less accessible to a broader audience, potentially limiting its appeal.

NFTs have fostered collaboration between artists and developers, leading to innovative and multidisciplinary projects. These partnerships have the potential to push the boundaries of art and technology. Artists can team up with blockchain developers, coders, and even AI to create unique and interactive experiences. Yet, collaboration is not without its challenges. Disputes may arise over intellectual property rights, revenue sharing, and creative direction. Artists must carefully navigate these waters to ensure that collaborative efforts are mutually beneficial.

The emergence of Web3 has undeniably left a significant impact on the evolution of contemporary art and art collecting. Collecting digital art is distinct from traditional art collections or the collecting of NFTs and collectibles. It has carved its unique niche and adds something novel to the art world. The concept of digital ownership has solidified digital art's place within traditional art. The use of blockchain as a creative tool, coupled with the possibilities offered by Web3 technology, has allowed the genre of (Digital) Art to push its artistic boundaries further. Blockchain itself has become the creative medium of our time. Consequently, we can expect art to continue evolving, giving rise to unique and exciting artistic works such as generative art. Dynamic and interactive NFTs are also poised to transform the art landscape as technology progresses.

The Phygital Frontier: Bridging physical and digital art

NFTs are not limited to the digital world. Physical art can be tokenized referring to an NFT. Tokenizing physical artworks can enhance their provenance and make secondary market transactions more transparent. By creating a digital certificate of authenticity linked to the physical piece, NFTs provide buyers with a secure way to verify the artwork's origin and ownership history. This convergence of physical and digital art is often referred to as ‘phygital’. Artists and collectors should be aware of counterfeiting and fraud, as physical art can be replicated and paired with counterfeit NFTs. The fusion of physical and digital art has given rise to hybrid art exhibitions that can reach a global audience. These exhibitions combine the immersive experience of physical art

spaces with the accessibility of the digital world. Collectors from around the world can participate without geographical limitations.

NFTs have undeniably reshaped the way art is created, experienced, and valued. While they offer artists opportunities for self-expression and global exposure, the challenges of market adoption, saturation, technical complexity, challenges of collaboration, and the convergence of physical and digital art must be carefully navigated. The art world is undergoing a digital transformation, and artists and stakeholders must adapt to thrive in this new creative frontier.

Summary of social implications of digital art:

1. Accessibility and inclusivity:

- NFTs and the metaverse make art more accessible to a global audience. Digital art can be easily shared and viewed online, eliminating the need for physical presence or geographical proximity to galleries.
- Artists from diverse backgrounds and locations can gain visibility and recognition, reducing the traditional barriers to entry that may exist in the art world.

2. Empowerment of artists:

- Royalties enable artists to have greater control over their work and its monetization. Smart contracts embedded in NFTs can ensure that artists receive a percentage of resale transactions, providing ongoing revenue streams.
- Direct transactions between artists and collectors reduce the reliance on intermediaries like galleries and auction houses.

3. Transparency and authenticity:

- Blockchain technology ensures transparency in ownership and provenance of digital artworks. This can help combat art forgery and ensure that artists receive appropriate credit for their work.
- The decentralized nature of blockchain also provides a secure and tamper-proof record of transactions, enhancing the authenticity of digital art.

4. New revenue streams:

- NFTs allow artists to explore novel revenue streams beyond traditional sales. This includes royalties on secondary market transactions, collaborations with brands, and even virtual exhibitions within the metaverse.
- The creation of digital assets beyond static images, such as virtual reality (VR) experiences or interactive art, opens up new possibilities for artistic expression and monetization.

5. Community engagement:

- The metaverse is a platform for artists to engage with their audience in unique ways, fostering a sense of community. Virtual exhibitions, live events, and interactive experiences create immersive and participatory spaces for art enthusiasts.
- Social media platforms and online communities dedicated to NFTs enable artists to connect directly with fans, further democratizing the art world.

6. Environmental considerations:

- While there are debates about the environmental impact of blockchain technology, most NFTs are issued on more sustainable options, such as protocols with proof-of-stake consensus mechanisms.

3.2. NFT market outlook

The maturing NFT market may bring stability attractive to long-term investors but might deter speculative traders. Diversification into various sectors creates new investment opportunities but also introduces added risks. Niche markets catering to specialized collectors are emerging, offering tailored experiences but facing challenges in gaining broader recognition and liquidity. Achieving a balance between stability and excitement will be essential in shaping the NFT market's future. NFTs have revolutionized the relationship between artists and art dealers. Digitally native creators can now consign their works directly to auctions without the need for traditional galleries. But auction houses tend to attract the highest-quality works, further blurring the lines between traditional and digital art. The cryptocurrency and NFT market has witnessed substantial growth in recent years. In 2019, the estimated revenue for crypto exchanges, neobrokers, and NFT marketplaces was $3.7 billion worldwide. However, the landscape evolved significantly during the pandemic years, with NFT marketplaces experiencing a strong rise in traffic and user count in 2021. Looking ahead, revenue projections are promising. Statista analysts predict that income for cryptocurrency and NFT platforms, excluding dedicated DeFi, Web3, and B2B platforms, will reach an estimated $71.5 billion by 2025.

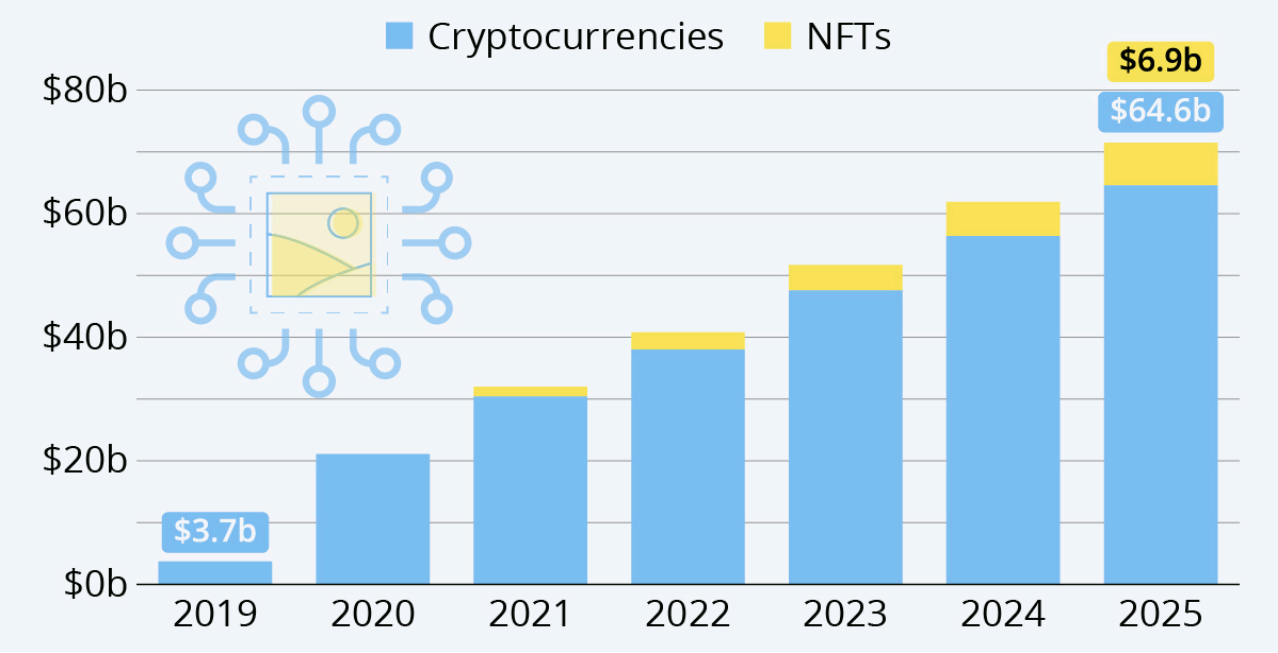

Figure: Prediction of NFT and cryptocurrency sales until 2025 (Statista, 2022)

This translates to a projected compound annual growth rate (CAGR) of 21 percent over the next few years. Despite the impressive growth, NFT trading revenue alone is expected to account for a relatively smaller portion, estimated at $6.9 billion, or around ten percent of all crypto trading platform income by 2025. This divergence in value is also likely to impact global user penetration,

with a projected adoption rate of approximately 4.5 percent for cryptocurrencies and only about one percent for NFTs.

But while the valuation of NFTs broadens a lot of attention, it is not the only metric that should be considered. The development of active users or wallet addresses and active developers is important for the further adoption of this technology. Looking at these numbers gives a relatively promising outlook on future development as the number of unique wallet addresses for the most common blockchains has been continuously rising since the the introduction of this technology.

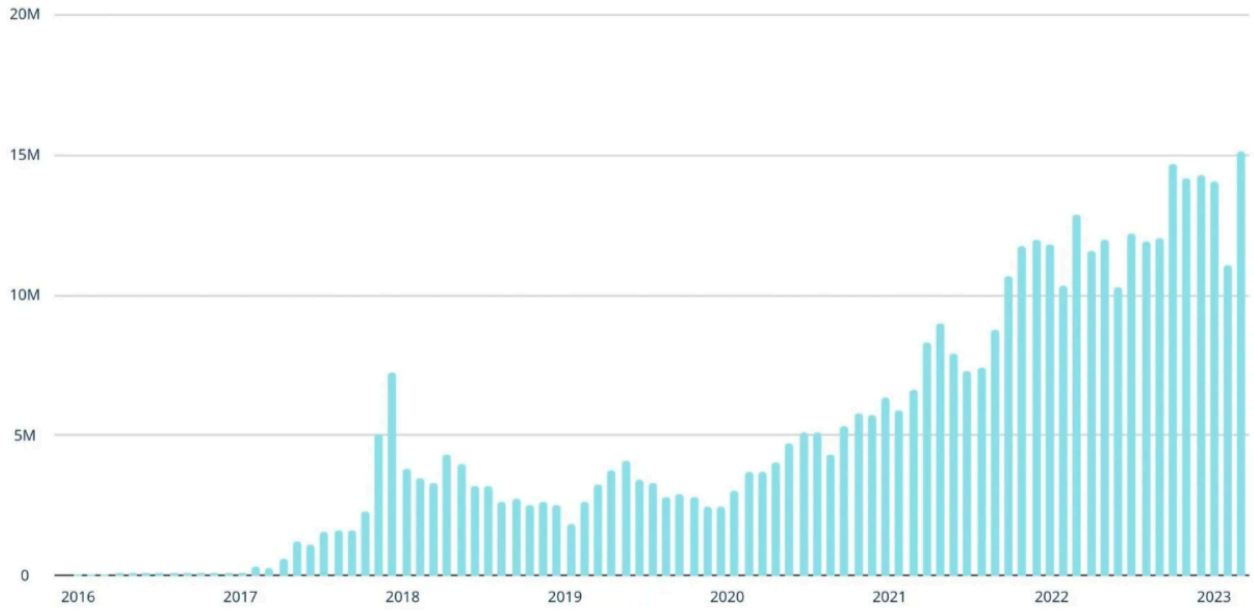

Figure: Number of unique active (sending) addresses per month across Ethereum, Polygon, Solana, Avalanche, Fantom, Celo, Optimism, and Arbitrum (Matsuoka, 2023)

3.3. The future of cryptoart

Cryptoart, a fusion of art and blockchain technology, is in the midst of a profound transformation. This evolution is being led by artists who are pushing the boundaries of creativity by exploring new mediums, styles, and concepts. Blockchain technology, in particular, serves as a powerful tool for these artists, enabling them to create, sell, and authenticate their digital works in ways previously unimaginable. In doing so, it promises a new era of artistic expression, challenging conventional norms and practices in the art world. At the heart of this transformation are Non-Fungible Tokens, which continue to play a central role in the cryptoart ecosystem. Initially gaining prominence in the art world, NFTs have rapidly expanded their utility beyond the confines of art. They now find applications in diverse domains, including gaming, collectibles, music, and more. This diversification not only ensures the relevance and influence of NFTs but also paves the way for a dynamic and multifaceted future, extending the boundaries of how we perceive and interact with digital assets. Market prices and the volatility of the web3 market, including cryptocurrencies, collectibles, and artworks, have been discussed widely. Despite price fluctuations, there is a steady growth in the adoption and engagement metrics in Web3 and NFTs, indicating a growing global interest in this space. NFTs are seen as essential for ensuring the provenance, traceability, and

ownership of digital assets in the evolving internet era. Web3 technology serves as a catalyst for new media art forms, empowering artists and attracting new collector segments, thereby making digital art more inviting and accessible. The evolution of art driven by blockchain and Web3 technology is seen as a complement to traditional art forms, rather than a replacement, pushing the boundaries of artistic creation. There are questions about whether Web3's core principles, like transparency and decentralization, can be fully applied to digital art collecting. Traditional art world players are expected to continue playing a role, albeit in different ways. The convergence of the traditional art world and Web3 may challenge established art market practices. Web3 technology will gradually contribute to a more transparent, accessible, and diverse art ecosystem, offering benefits to all participants in the art world.

Emerging technologies such as virtual reality (VR) and augmented reality (AR) are being seamlessly integrated into the cryptoart experience. These innovations have the potential to transform the way art is both created, displayed and experienced, enhancing the immersive nature of digital art and providing collectors and enthusiasts with interactive and captivating experiences. In this landscape, art and cutting-edge technology converge, promising to redefine the very essence of art itself. Marketplace innovation also plays a pivotal role in shaping the future of cryptoart. White-label NFT marketplaces are gaining prominence, offering artists customizable spaces to showcase and sell their digital art. This innovation democratizes the cryptoart space, making it more accessible and artist-friendly. It empowers artists to take control of their careers and directly engage with collectors and enthusiasts. The traditional gatekeepers are gradually being replaced by a more open and democratic model, fostering a sense of self-determination among artists. Moreover, NFTs are poised to play a pivotal role in establishing digital art as a globally recognized and established branch of contemporary art. With digital-native generations likely to primarily collect digital art, NFTs serve as a means to prove ownership and authenticity. Furthermore, they facilitate royalty payments. This enables artists to receive a direct share of the sales of their art. This allows artists to remain on the market for longer and also reduces their dependence on various stakeholders such as curators. The introduction of royalties has shifted artists' focus from short-term primary sales to long-term earnings from secondary sales. Artists are encouraged to foster a thriving collector community, emphasizing the importance of ongoing interactions and engagement. This evolving relationship contributes to the sustainability of the cryptoart ecosystem. The growth of the cryptoart industry has been significantly enabled by blockchain technology, cryptocurrencies, and smart contracts. These technological foundations have underpinned the creation and expansion of this unique art ecosystem. They not only provide the infrastructure for the cryptoart market but also ensure transparency and security in transactions, thereby building trust within the cryptoart community. The convergence of art and technology is further evident as creating, collecting, and even platform development are considered forms of art within the cryptoart world. This convergence results in a dynamic and diverse landscape where technology itself becomes a means of artistic expression, blurring the lines between traditional and digital art forms. This creates a new artistic challenge to link the digital world with the real world and thus create new and outstanding works of art. This new form of art is in demand because it appeals to both traditional and new enthusiasts. One of the most successful artists using this new form of art to create products that combine the digital world with the real world is Beeple. What is perhaps most noteworthy is the growing recognition of digital art's significance. According to a survey, 83% of collectors now acknowledge digital art as holding the same weight as traditional art forms,

marking a significant milestone in the journey of digital art's recognition and acceptance. Furthermore, generative art has emerged as a leading digital art form, with blockchain-based art and AI art also gaining attention. Artists increasingly view blockchain as a dynamic creative medium, resulting in entirely new and innovative forms of artistic expression. Collectors can now directly engage with artists, bypassing galleries and intermediaries, resulting in a more inclusive and accessible environment for digital art collectors. This shift aligns with the broader philosophy of the creator economy, empowering artists to take control of their careers and interact directly with collectors.

In conclusion, the future of cryptoart is marked by a dynamic evolution driven by new forms of art, technological advancements, diversification of NFTs, marketplace innovation, and changing artist-collector relationships. It represents a significant shift in the art world, one that is here to stay and will continue to evolve as technology advances. This journey promises to redefine art, extending its reach and impact beyond the confines of traditional norms and practices.

3.4. Regulatory and legal developments

The evolving regulatory landscape surrounding NFTs and cryptoart aims to protect consumers and intellectual property. However, it brings challenges such as regulatory ambiguity and compliance costs that could stifle innovation. Self-regulation efforts within the industry aim to foster trust but face challenges in enforcing ethical standards and resolving disputes. Collaboration between regulators and the cryptoart community is crucial to strike a balance between preserving innovation and ensuring long-term industry sustainability.

Key legal issues in the NFT space include the distinction between NFT ownership and intellectual property rights, various types of licenses offered by creators, and disputes related to copyright and trademark infringement. Regulatory roadblocks involve considerations like the Bank Secrecy Act and Anti-Money Laundering (BSA/AML) regulations, securities laws, and fraud issues. The US Treasury Department's stance on NFTs in the context of BSA/AML regulations suggests that NFTs not functioning as interchangeable currency may fall outside the regulatory regime. Securities laws also pose potential challenges, as certain NFTs could be classified as investment contracts, subject to registration requirements.

The EU is actively considering regulations to extend anti-money laundering and terrorist financing rules to the crypto sector, obliging crypto asset service providers to conduct due diligence on customers and apply customer due diligence measures for transactions exceeding €1,000. These regulations aim to address money laundering risks in the crypto space and enhance transparency. On the other hand over-regulation can lead to a decline in innovation and a monopolization of the market. Besides that Chainalyis found that blockchain technology’s inherent transparency and the often public nature of terrorism financing campaigns, cryptocurrency is not an effective solution to finance terrorism at scale (Chainalysis, 2023b).

The legal and regulatory landscape surrounding NFTs and cryptoart seeks to strike a balance between protecting consumers and intellectual property rights while fostering innovation. However, several complex challenges and considerations have emerged:

- Ownership and IP rights: The distinction between NFT ownership and intellectual property (IP) rights is important to understand. When someone purchases an NFT, they gain ownership of the

token but not necessarily the underlying digital artwork's copyright. This distinction has led to various licensing arrangements, ranging from noncommercial rights to full IP transfers.

- Standardized NFT licenses: To address the complexity of NFT licenses, some efforts have been made to create standardized NFT license terms and conditions. These aim to provide clarity to users without a legal background and establish common rights granted to NFT holders.
- Legal principles apply: While the NFT space is relatively new and rapidly evolving, traditional legal and regulatory principles still apply. Some high-profile IP infringement issues related to NFT sales have been brought to court, helping establish legal precedents.
- Regulatory challenges: Regulatory challenges include determining whether NFTs fall under existing financial regulations, particularly concerning the Bank Secrecy Act and Anti-Money Laundering (BSA/AML) regulations and the Markets in Crypto Assets (MiCA) Regulation. The US Treasury Department has noted that certain NFTs that do not act as interchangeable currency may not fit within BSA/AML regulatory requirements. However, NFTs with payment functionality may pose money-laundering risks.
- Securities laws: There is a potential for NFTs to be classified as securities, particularly when they are sold as investment contracts. The "Howey Test" is used to determine if an NFT qualifies as an investment contract and whether it should be registered.
- Fraud prevention: Beyond regulatory concerns, the NFT space also faces challenges related to fraud. Instances of insider trading have been reported, emphasizing the need for ethical practices.
- EU Regulation: The European Union (EU) is actively working on regulations to extend anti-money laundering and terrorist financing rules to the crypto sector. Under the Markets in Crypto Assets (MiCA) regulation, the EU aims to establish a comprehensive framework for the regulation of crypto assets. This regulation is designed to enhance consumer protection, ensure market integrity, and promote legal clarity in the crypto space. It encompasses various aspects of crypto assets, including issuance, trading, and service providers. Under the MiCA regulation in the EU, unique and non-fungible crypto assets, such as digital art and collectibles, are exempted from its scope. These assets are excluded due to their distinct characteristics and lack of interchangeability with other assets. However, it's essential to note that this exemption doesn't affect their potential classification as financial instruments under other EU financial regulations. If NFTs are categorized as financial instruments under MiFID II, they will be subject to MiFID and other relevant EU securities regulations. Similarly, if NFTs qualify as e-money or payment services under the E-Money Directive or Payment Services Directive, they will be subject to regulations specific to those areas. The exemption within MiCA applies to its scope alone and doesn't impact the application of other EU financial regulations to NFTs.

The cryptoart industry must adapt to changing legal and regulatory standards, collaborate with regulators, and ensure that ethical standards are upheld to foster long-term sustainability and responsible ownership within the industry.

4. Stakeholders: Their roles and courses of action

4.1. Artists and Creators: Challenges, opportunities, and strategies for success

The challenges and opportunities of cryptoart might have the biggest impact for artists and creators. While they get the opportunity to innovate the creation, distribution and the perception of digital art.

Opportunities

- Direct Monetization: NFTs offer artists a direct route to monetize their work and engage with a global audience. This opportunity allows them to sell art that might find limited market potential in traditional settings. However, in practice, artists often face the challenge of finding buyers willing to invest in their artworks, mirroring the sales and recognition struggles of the traditional art world.
- Creative Collaboration: Collaborations with blockchain developers and virtual reality artists open up new creative frontiers for artists. These collaborations encourage the exploration of innovative projects that extend beyond traditional artistic mediums. However, identifying the right collaborators and navigating the complexities of technology is not as easy as it sounds.
- Reduction of traditional middlemen in cryptoart: While NFTs theoretically eliminate middlemen, the reality is more nuanced. In the traditional art world, middlemen take the form of galleries, dealers, auction houses, curators, and anyone facilitating transactions between artists and collectors. In the cryptoart space, these middlemen manifest as minting platforms and cryptoart marketplaces. While they are not essential for creating and selling cryptoart, they serve critical functions:
- Reach: Platforms enhance the visibility of artists they support.
- Protection: They provide mechanisms to report fakes and counterfeits, offer customer service, and maintain a reputation to protect.
- Value boost: Platforms can boost the value of artwork through timed auctions, social media hype, and engagement with affluent customers.
- Gatekeepers: Curated platforms are gatekeepers for serious digital art while social media platforms also serve as gatekeepers to the NFT art world, playing a crucial role in an artist's exposure.

Challenges

- Competition: With lower entry barriers and international reach artists often find themselves with lots of competition in the cryptoart space. The sheer number of artists seeking recognition can make it daunting for newcomers to stand out and gain visibility.
- Price volatility and market saturation: The volatility in the cryptoart market can lead to income instability for artists. Furthermore, the market can become saturated with new artworks, which can challenge artists' abilities to command higher prices for their creations.
- Complex intellectual property rights: Artists must deal with the difficulties of intellectual property rights, a complex issue in the cryptoart space. Understanding the implications of selling digital works, including potential copyright disputes, adds another layer of complexity to their journey (Zeilinger, 2016).

Strategies for success

To thrive in the dynamic cryptoart space, artists and creators must embrace several strategies, considering the following ten key aspects:

1. Experimentation: Success in the cryptoart world often stems from a willingness to experiment, irrespective of market conditions. This experimentation should be viewed as a continuous journey, rather than a one-off endeavor. Cryptoart is still young and thus evolving, therefore the ability to adapt is invaluable. The creative challenge lies in combining different technologies to create outstanding experiences for the consumer (MakersPlace, 2022).
2. Network building: Building a strong network within the cryptoart ecosystem is a fundamental step. Meaningful connections with fellow artists, collectors, and collaborators can offer valuable insights, open up opportunities, and provide a support system. Collaboration is often a catalyst for growth in this space. Furthermore, communities provide valuable feedback and inspire artists.
3. Creation and collection: Active involvement in the creation and collection of art pieces is essential. Continual creation and engagement contribute to an artist's visibility and reputation. It's important to note that success in the cryptoart world often comes after multiple attempts, failures, and learning experiences. Persistence is key.
4. Marketing and social media: Strategic use of social media, online communities, and blockchain platforms is crucial for building a personal brand in the cryptoart space. Artists should engage with collectors, tell compelling stories about their artwork, and leverage platforms to enhance visibility. Proactive self-promotion, including participation in (crypto) conferences and charitable events, is also beneficial. The size of an artist's network and their influence within the cryptoart scene significantly impacts success, with some curated marketplaces highly valuing social media followers and activity.
5. Risk management: Artists must be cautious regarding the uniqueness of their creations. Compliance with copyright laws is important for artists and marketplaces. Ownership of the token differs from the artwork, emphasizing the need to track rights and originality. Marketplaces must comply with copyright laws, addressing potential takedown requests.
6. Art market insights: Understanding the dynamics of traditional art markets can offer insights into the cryptoart space. But as times change, new forms of art with the use of new technologies create new structures that should be observed and understood so that you can benefit most from the new advantages Success in both worlds depends on how in-demand your art is, how quickly it sells, famous collectors' interests, media coverage, and the availability of quality pieces for sale.
7. Dispelling NFT myths: Artists should be aware of myths around NFTs. NFT value isn't solely driven by scarcity, factors like utility and provenance play significant roles. Additionally, the notion that smart contracts ensure assets last forever is not entirely accurate. The reliance on other entities, such as websites or mobile apps, can affect an asset's worth if these platforms go down.
8. Choosing the right marketplaces: Selecting the appropriate NFT marketplaces is important for success. Marketplaces like OpenSea, Magic Eden, Blur, Rarible, Nifty Gateway, and SuperRare are popular choices. Artists should consider factors such as marketplace stability, available data,

listing frequency, and payment methods. Understanding the marketplace's fee structures and royalty policies is vital.

Artists from the ARTeCHÓ fellowship desire for the development of cryptoart beyond its current state, focusing on aspects such as storytelling, marketplaces, smart contracts, and addressing the influence of social media and speculators. There's a call for a more discerning appreciation of artistic value within the community, advocating for initiatives like educational efforts, curation standards, and critical discourse to elevate the quality and perception of cryptoart, ensuring its recognition as a legitimate space for contemporary art.

4.2. Collectors and curators: Research and due diligence

Collectors and curators play pivotal roles, contributing to the growth and development of the NFT market. To navigate this space realistically, they should consider several key aspects in their due diligence and investment strategies. Collectors and curators must exercise due diligence to ensure the authenticity and integrity of the NFTs they acquire. Thoroughly researching the authenticity of NFTs is important to understand the value and background of the NFT and their artist. The reputation of artists and platforms should be carefully evaluated to avoid falling victim to scams or counterfeit NFTs. Understanding the rights associated with NFTs is essential. NFT ownership doesn't automatically confer copyright or intellectual property rights. Buyers need to examine the licensing terms provided in the NFT metadata or on the project's website to determine the scope of their rights. Given the volatility of the NFT market, collectors and curators should adopt sound risk management practices to safeguard their collections. Diversifying NFT holdings across different artists, genres, or categories can help spread risk. By not putting all assets into a single NFT, collectors can reduce exposure to market fluctuations. Keeping a close eye on market trends and emerging artists and understanding the long-term potential of NFTs can aid in making informed investment decisions. Also research for this report showed that the cryptoart market follows the rules of traditional art in some aspects such as the serious traditional art NFTs beginning to gain stable traction, highly valued artworks are more stable in terms of value than cheaper artworks, and curation of artworks plays an important role. Collectors play an influential role in determining the value of art in the NFT space. Their buying and selling activities can significantly impact the perceived worth of specific artists or art movements. While digital art may be comparatively less expensive than traditional art, the NFT market shows a higher purchase frequency. This reflects substantial collector interest and potential in the digital art world, underlining its unique market dynamics.

Collectors and curators can contribute to the maturation of the NFT market and secure their positions within this promising digital art landscape, by exercising due diligence and implementing well-informed investment strategies

4.3. Platforms and marketplaces

The transformative impact of NFTs on the art world has significantly reshaped the dynamics of artist-dealer relationships. Digitally native creators are increasingly bypassing traditional intermediaries and directly consigning their works to various platforms and auctions.

NFTs have given rise to a new era in art auctions. Buyers, though possibly incurring higher fees, are drawn to the prestige and assurance of authenticity that brick-and-mortar auction houses offer.

These esteemed establishments primarily handle high-quality NFT works, becoming hubs for connoisseurs. Although sales volumes have exhibited fluctuations compared to previous peaks, the sustained interest in cryptoart has attracted a fresh wave of collectors. For marketplaces planning to distinguish themselves from standard NFT platforms with minimal filtration, curation becomes an important component within the ecosystem. Implementing this component provides both newcomers and established collectors with a pre-filter, safeguarding the integrity of the marketplace. Achieving effective curation is and will always be a challenging task. It necessitates significant time and effort to scout and review artist applications. Engaging in one-on-one sessions with each artist joining the platform is time-consuming but valuable. To encourage individual self-expression and creativity, platforms may offer pre-curated sets of items. This strategy, however, raises questions regarding the fairness of curation. Curation, when not executed thoughtfully, may exclude talented artists. A potential solution to this challenge is the inclusion of co-curators, such as galleries, curators, and brands. Co-curators could invite artists they appreciate, leading to a more diverse and inclusive curation approach. This approach has demonstrated success globally and fostered different curatorial perspectives. Moreover, platforms can deliver mutual benefits to artists, whether they are emerging or established. They can provide additional visibility to creators and offer collectors and newcomers a unique learning experience through exhibitions. In the fast-evolving world of cryptoart, platforms must continuously innovate to engage artists and collectors. The competitive landscape is dynamic, with new entrants and innovative features. Therefore, differentiation is a key strategy for success. Platforms should carefully consider their target audience and tailor their value proposition accordingly. The user experience is crucial. Platforms should prioritize providing a seamless, secure, and user-friendly experience to retain customers and build trust. Navigating the complex regulatory landscape is a fundamental challenge for cryptoart platforms. Regulatory changes have the potential to significantly impact platform operations, making legal compliance a top priority. Platforms should proactively engage with regulators to contribute to the formation of an ethical and transparent regulatory framework. Collaboration with artists and collectors can lead to practices that benefit all stakeholders while ensuring compliance with regulations. Balancing innovation with legal compliance will be a continuous challenge, but one that is central to the long-term success of cryptoart platforms.

Platforms and marketplaces stand as the gatekeepers of the cryptoart sector. Their actions and decisions shape the landscape for artists, collectors, and the entire ecosystem, emphasizing the need for thoughtful curation, compliance, innovation, and user-centric experiences.

4.4. Regulators and policymakers: Balancing innovation and protection

Regulators and policymakers play a critical role in shaping the cryptoart landscape while balancing innovation and protection. The Web3 and cryptoart sectors emerged quickly during the past years. While hardliners might not see the need for regulation in this digital and decentralized space, regulators and policymakers are responsible for protecting both consumers and artists. While blockchain technology traditionally stands for decentralization and autonomy, the regulation of digital assets to a certain extent is necessary to address the risks for everyone involved. These risks include:

- Financial risk: NFT prices exhibit high volatility, and investors are exposed to significant losses. The value of an NFT can decrease if the market demand disappears.

- Regulatory risk: NFT regulations are still evolving, potentially introducing new requirements or restrictions on marketplaces and participants.
- Money laundering: The decentralized and unregulated nature of crypto assets makes them an option for money laundering. On the other hand the transparent nature of blockchains makes money laundering very difficult. Money laundering in cryptocurrency aims to hide the illegal source of funds and convert them into untraceable cash through exchanges. According to Chainalysis this is highly concentrated in a few services and even more so in specific deposit addresses within those services (Chainalysis, 2023).
- Liquidity risk: NFTs are unique, and lack an established market. Sellers may have to accept substantial losses if they need to sell quickly.
- Custody risk: NFTs are typically stored in digital wallets, subject to the risk of loss or theft if a wallet is compromised.
- Smart contract risk: NFTs and marketplaces rely on smart contracts. Any flaws in these contracts can result in losses.
- Wash trading: This deceptive practice artificially inflates an asset's value through simultaneous buying and selling. It's a manipulative tactic that can mislead other investors. Legally, wash trading is prohibited in many jurisdictions. While blockchain's decentralized nature makes it challenging to prevent such activities, it's a risk for both NFT marketplaces and participants, artificially inflating prices and potentially causing financial losses.

Policymakers should collaborate with industry stakeholders and develop mechanisms to detect and prevent such practices, similar to traditional financial markets. Policymakers are actively addressing the challenges associated with NFTs, striving to define their legal status, tax implications, and consumer protection measures. However, ambiguities in regulations can lead to uncertainty within the industry. New regulations may focus on enhancing investor protection and preventing money laundering. Policymakers must balance between promoting innovation and safeguarding consumer interests. Policymakers should nurture an environment that encourages innovation and technological advancement. Research and development in blockchain technology should receive support and investment. The protection of consumers and investors should be prioritized in regulations. This includes ensuring transparency, enforcing copyright laws, and preventing fraud. Collaboration with industry stakeholders and continuous dialogue are crucial for informed and balanced policymaking.

In the landscape of cryptoart, regulators and policymakers act as stewards, working to facilitate growth and innovation while safeguarding the interests of artists, collectors, and investors. Balancing these dual roles in the digital art ecosystem is a responsible task, requiring careful consideration and adaptability.

5. Conclusion

5.1. Recap of key findings and insights

This report has explored the recent development and future trends of cryptoart, characterized by the fusion of digital art, blockchain technology, and NFTs. Cryptoart emerged as a promising combination of digital art with NFTs using a blockchain for ownership and authentication of the digital asset. This empowers artists to monetize their creations in innovative ways, challenging established art paradigms. Although it shares a counterculture identity with art movements, it's not without its critics. Cryptoart presents an alternative to traditional art and centralized systems, with the potential to reshape the art landscape. Cryptoart disrupts various industries, including art, technology, digital ownership, and creative sectors. NFTs, with features like automatic royalties, address long-standing art world issues, yet their reliability depends on marketplace terms. Ownership of NFTs is nuanced, granting rights over metadata rather than the artwork itself. Concerns regarding scams and fraud have led to doubts about blockchain technology's reliability, even as it introduces scarcity and challenges traditional notions of ownership in virtual spaces. Despite early-stage vulnerabilities, these technologies have the potential to redefine digital art and ownership.

The cryptoart market has experienced substantial expansion, with NFTs extending into physical artworks and collectibles. In 2021, art NFT sales reached a staggering $2.9 billion, attracting the interest of high-net-worth collectors. The motivation of collectors includes appreciation for digital art, support for artists, and various utilities they can access with NFTs, such as interactions with artists and exclusive communities. The cryptoart market is diverse, encompassing various collectible categories and emphasizing responsible ownership and best practices.

The layers of NFTs are similar to the DeFi stack with multiple layers which build on each other, allowing services to aggregate different layers in one platform. Major blockchain platforms like Ethereum and Solana play central roles. The landscape features significant players like NFT marketplaces, artists, and curated platforms. NFT marketplaces offer diverse features such as mining functions and royalties. Collectors source information from social media, online communities, and art NFT platforms. Many marketplaces target specific user segments and emphasize unique characteristics.

NFTs are changing the way art is created and distributed. NFTs empower artists to reach a global audience directly, but this journey is not without challenges. Market saturation and smart contract complexities pose hurdles. The impact of Web3 and "phygital" art cannot be ignored. The transformative power of artist-developer collaborations is revealed, offering innovative possibilities for artistic creation.

Looking at the outlook for the NFT market outlook, a maturing market is expected focusing on relevant use cases such as providing a utility and/or a stable value that's attracting long-term investors rather than speculative traders. Serious cryptoart has the potential to offer both. The transformation of cryptoart is led by artists and blockchain technology. NFTs are expanding into various sectors looking for further adoption. The convergence of art and technology is inevitable, with VR, AR, and the metaverse playing supporting roles.

In summary, cryptoart has a disruptive potential and plays a transformative role in the world of art. The future of cryptoart is promising, with technology and creativity converging to reshape the art landscape in innovative and exciting ways.

5.2. Final thoughts and recommendations for stakeholders

In this dynamic and disruptive space, the following insights can guide artists, collectors, platforms, regulators, and policymakers towards a positive development of the cryptoart landscape.

- Embrace Adaptation and innovation: Regardless of their role, stakeholders in the cryptoart space must be prepared to adapt continuously. The cryptoart landscape is ever-evolving, and innovation is the currency for survival. From artists experimenting with new techniques to platforms offering cutting-edge features, adaptation, and innovation are essential to keep pace with the shifting trends.
- Prioritize risk management: Risk management is a common theme that resonates with all stakeholders. Artists, collectors, platforms, and even regulators should take a cautious approach. Diversification of investments, whether in artworks, platforms, or regulations, can be a safeguard against volatile markets and unexpected disruptions. Wise risk management strategies can prevent unwarranted losses and promote the long-term sustainability of the cryptoart ecosystem.
- Collaboration and education: Collaboration and dialogue are the keys to informed decision-making. Artists, collectors, platforms, and regulators should engage in open discussions to better understand each other's needs and perspectives. Additionally, educational initiatives are essential. Artists and collectors should stay informed about market trends, platforms, and regulatory changes, while platforms must educate users about the digital art world.
- Navigate the regulatory landscape: The regulatory framework in the cryptoart space is a work in progress. All stakeholders need to navigate this landscape carefully. Artists must be mindful of copyright and trademark issues, collectors must ensure tax regulations, platforms must proactively engage with regulators, and policymakers must strike a balance between innovation and consumer protection. The ultimate aim is to foster a transparent and legally compliant environment.
- Balancing innovation and protection: Innovation drives the cryptoart landscape, but consumer protection and the safeguarding of creators' rights must also be considered. Policymakers should be careful not to decrease creativity with overbearing regulations, while platforms and artists should equally avoid behavior that may harm consumers.
- Understand the market and evolving trends: Both collectors and artists can benefit from understanding the market and staying informed about emerging trends. For collectors, recognizing the long-term potential of NFTs and discerning quality from novelty is important. Artists can gain traction by exploring various styles, pushing creative boundaries, and creating art that goes beyond viral trends, addressing deeper thematic or conceptual concerns.
- User experience and valuable art: For platforms, continuous innovation, compliance, and a user-centric experience should have priority. The competitive nature of the cryptoart space calls for platforms to differentiate themselves by understanding their target audience and providing a seamless, secure, user-friendly experience and especially valuable artwork.

- Foster ethical practices: Artists and platforms can contribute to the ethical framework by promoting diverse curation, engaging in collaboration, and ensuring artists' visibility while upholding marketplace integrity.
- Promote responsible ownership: Collectors and platforms should promote the idea of responsible ownership. By recognizing the value of digital art and the importance of supporting artists, collectors can contribute to a thriving cryptoart environment.

These recommendations aim to guide all stakeholders toward a brighter, more robust cryptoart ecosystem while acknowledging the challenges that lie ahead. While the future remains uncertain, the insights gained from this report can guide stakeholders toward more informed decision-making and responsible engagement within the innovative cryptoart space.

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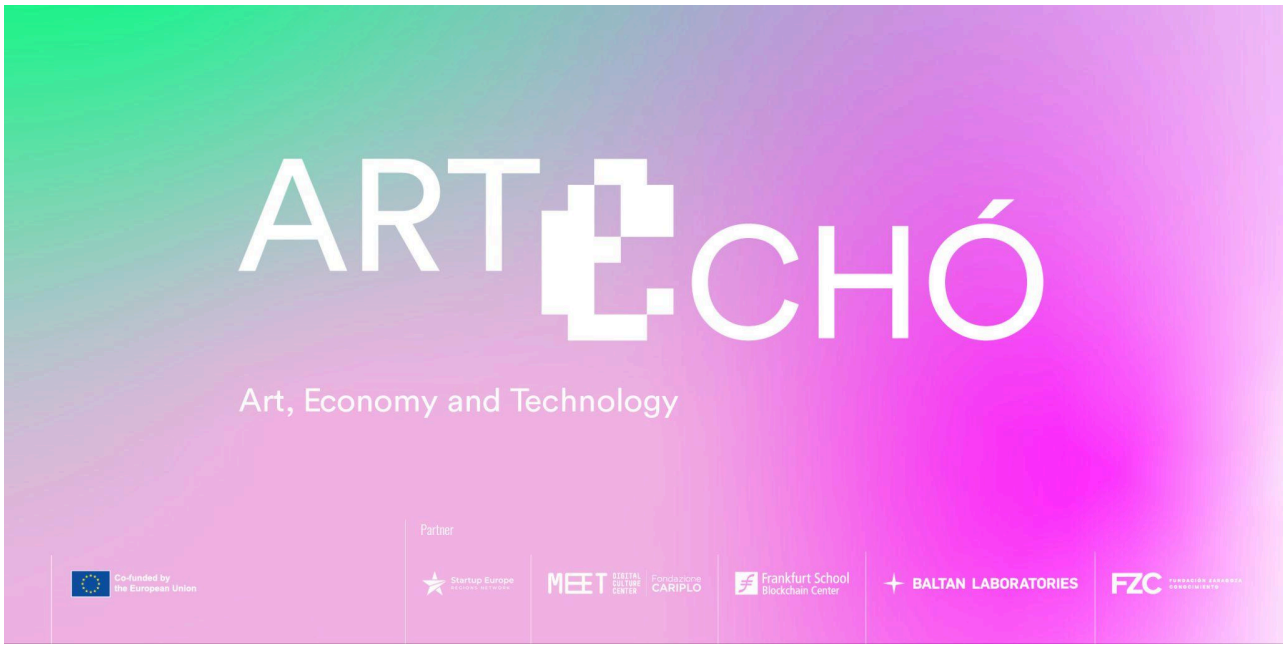
III. Practical Guide

A. NFTs and Blockchain for the creative industry: How to acquire the necessary knowledge within 9 days

Blockchain and NFTs for the creative industry: How to acquire the necessary knowledge within 9 days (Published here)

In the intersection of creativity and technology, Non-Fungible Tokens (NFTs) and blockchain have emerged as transformative forces. This article addresses the urgency of acquiring knowledge about these concepts within a limited timeframe of 9 working days. Our agenda encompasses practical steps, including crypto token basics, engaging with podcasts, studying whitepapers, watching videos, networking, and exploring online courses, articles, and books. By following this agenda, you will be able to understand the basic concepts of public blockchains, NFTs, and their relevance in the creative industry, staying ahead in this dynamic landscape.



Introduction

From the initial cryptocurrency and decentralized finance hype to the more recent rise of Non-Fungible Tokens (NFTs), the digital landscape has undergone remarkable shifts and will most likely do so in the future. While speculative interests often marked the initial hype, the underlying technology and its possibilities stay.

As blockchain technology and NFTs continue to gain traction, understanding their fundamental principles is becoming increasingly important. Beyond the potential of quick gains, comprehending the mechanics behind these innovations allows individuals to understand the mechanics of secure transactions, decentralized networks, and the potential to reshape various industries.

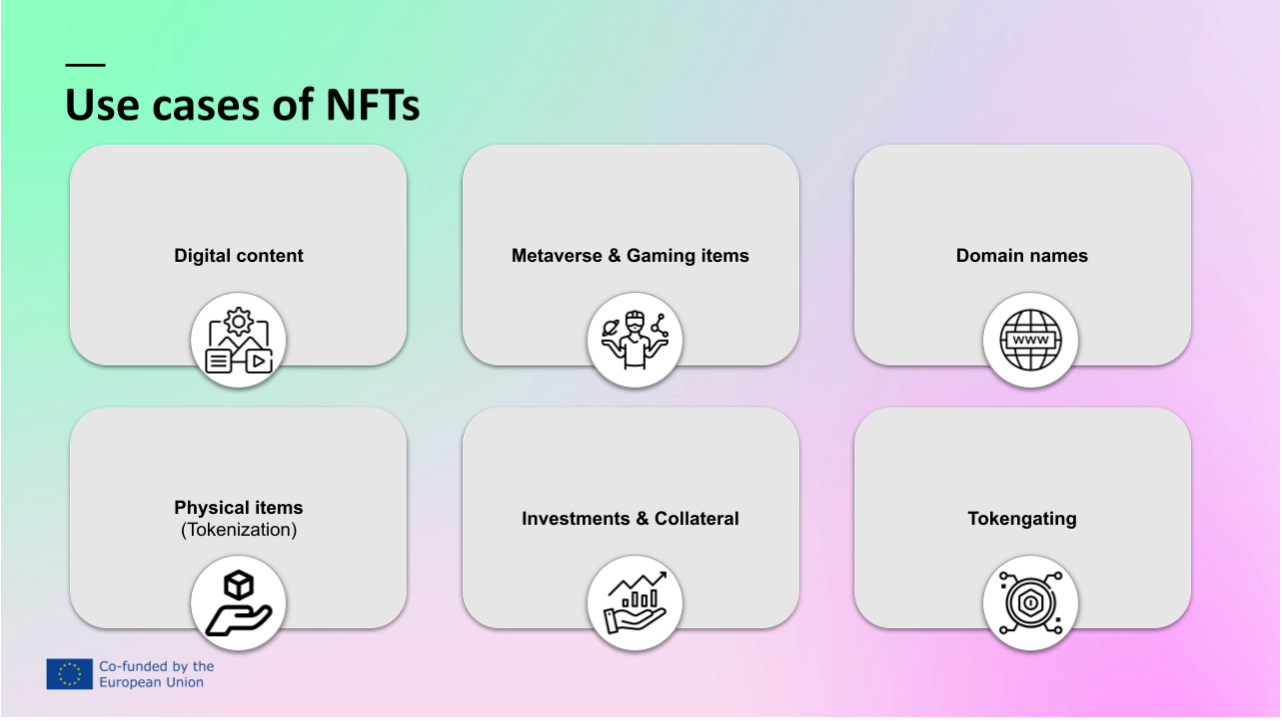


Figure 1: Summary of relevant use cases of NFTs

NFTs, once predominantly associated with art, have transcended those boundaries as they offer potential for various industries such as:

Digital content: NFTs empower content creators to own and monetize digital content while earning royalties from resales.

Metaverse & Gaming items: NFTs establish ownership for in-game & metaverse items, creating economies and enabling trading. Developers earn royalties on secondary sales.

Domain names: NFTs enhance digital identity through memorable Ethereum addresses, tradable on platforms like Ethereum Name Service (ENS).

Physical Assets (Tokenization): NFTs tokenizing real estate and fashion offer ownership transfer and collateral for decentralized loans.

Investments & Collateral DeFi Evolution: NFTs become collateral, expanding borrowing options for those with valuable NFTs.

Tokengating: NFTs validate ownership for exclusive content and events, enriching experiences. NFTs redefine interaction, ownership, and engagement, fostering a new era of possibilities.

Who should acquire knowledge?

In this article, we provide a concise overview of learning resources for the basics of blockchain and NFTs. While we focus on artists and creatives the knowledge is also relevant for many other stakeholders from the creative industry and beyond.

Stakeholders in the art sector include curators, intermediaries such as auction houses, galleries, and other parties involved in the sale of (crypto) art, but also exhibitors such as museums, art

spaces, or exhibition organizers. Furthermore, the topics are relevant for tech start-ups, organizations and communities, policymakers, researchers, and media.

Ultimately, understanding the technology can be relevant for many more individuals and companies who want to educate themselves in the direction of digital assets.

We provide a range of resources that enable individuals not only to understand these technologies but also to harness their transformative power for both their craft and the industries they touch.

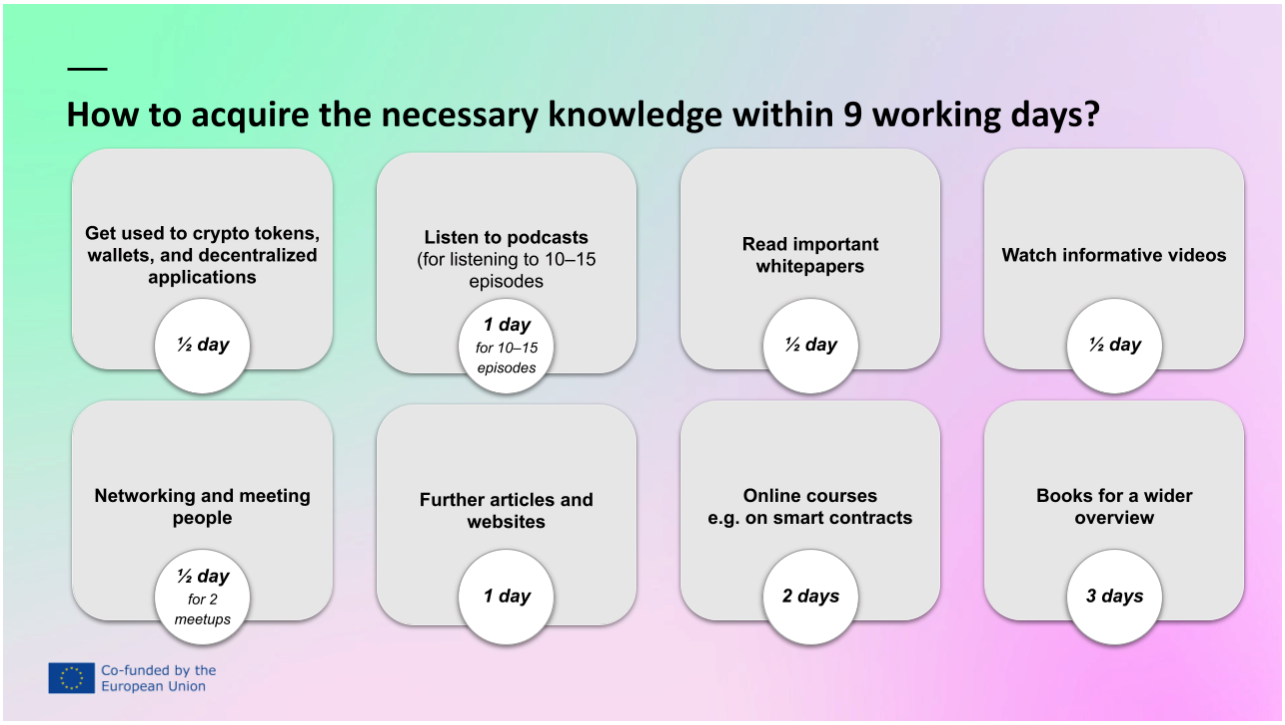


Figure 2: How to acquire blockchain & NFT knowledge with a workload of 9 days?

How to gain knowledge?

For learning about about NFTs and blockchain we suggest an approach of using various sources to gain comprehensive knowledge and a network of like-minded individuals to build synergies. You can listen to various **podcasts** to hear the opinions of experts who might have had the same struggles as you have now. Explore varied content through **reading** – from **online articles** to in-depth **books**. **Network** with others in regional meetups, online gatherings, or workshops to learn and share knowledge. Join **online classes** that guide you step by step. Try out new things in hands-on workshops. By using all these ways, you'll build a complete picture of how NFTs and blockchain work.

What is the level of understanding that should be acquired?

To navigate the wide range of blockchain & NFTs, a comprehensive understanding of key fundamentals is essential. Firstly, you should understand the basics of blockchain and distributed Ledger Technology (DLT) as a ground layer for the secure distribution of data across networks. Afterward, dive into smart contract platforms like Ethereum. We believe that you should be able to at least read and write very simple smart contracts, which form the groundwork for token creation. Dive into token standards such as ERC-20 (fungible tokens) and ERC-721 (non-fungible tokens)

and get familiar with self-custodial wallets such as MetaMask. Now it is time to delve into the topic of Non-Fungible Tokens (NFTs). This includes creating NFTs from scratch, managing metadata, exploring various file storage solutions, and understanding royalty fees, an important topic for creatives.

NFT Marketplaces play an important role. You should be familiar with their functionalities such as creating, listing, buying, and selling NFTs. Compare also the differences between centralized and decentralized marketplaces. If you have already finished the basics of blockchain & NFTs it might be worth diving deeper into specific topics such as Web3 marketing strategies or intellectual property rights and NFTs.

By following these foundational elements, you will be able to build a solid framework to understand the transformative potential of blockchain and NFTs, enriching your engagement in this evolving landscape.

Get used to crypto tokens, wallets, and decentralized applications

Time needed: ½ day

Gaining theoretical knowledge is very important but it can never replace the effectiveness and learning of actually doing things on your own. The following section describes how to get crypto tokens use them in a self-custodial wallet and actually connect them to decentralized applications (dApps).

Besides gaining some theoretical knowledge, it is very important for understanding this technology that you operatively “get your hands dirty”. This works as follows and provides interested persons with the most important learning about what blockchain technology actually is. The best start is to purchase the most common cryptocurrency used in dApps, Ethereum, and transfer it around. Please find a step-by-step guide below:

Getting cryptocurrency: Currently, the crypto ecosystem is still a closed cosmos with certain entry points. In order to use dApps it is necessary to acquire cryptocurrencies first. The following are the most common ways to purchase cryptocurrencies:

- Opening an account at a centralized exchange (CEX) e.g. coinbase.com or binance.com
- Using a fiat “on-ramp” service such as moonpay.com or banxa.com to purchase cryptocurrencies with fiat money. Please note that you need a self-custodial wallet in order to do so and usually a service fee is charged. This step can be also done directly in self-custodial wallets such as Metamask.
- Buying cryptocurrencies at certain banks or neo brokers (not recommended as transfer to self-custodial wallets is usually not supported)

Setting up a self-custodial wallet: This step is more advanced but necessary in order to understand the core of smart contract platforms and connect to decentralized applications. In order to access the Ethereum network directly and to store your Ether in your own wallet we recommend you to use the MetaMask plug-in for Google Chrome.

Add the MetaMask plug-in to your browser open an account and generate your own wallet address. Then transfer some of your Ether from your centralized exchange account to your wallet address or

alternatively use the fiat “on-ramp” (see “Getting cryptocurrency”).
Please be aware that in case of making mistakes with public or private keys, funds can be lost irreversibly. Following these steps of transferring your cryptocurrencies from one wallet to another is of course everybody’s own decision.
Obtain a wallet address from the self-custodial wallet which looks similar to 0xd42899dcC146d4788649e6aa5B09f129fC269127 for Ethereum. Please be aware that the wallet needs to be connected to Ethereum Mainnet in order to get the Ethereum wallet address.
Transfer a fraction of the Ether you have purchased to this address. Note that addresses for other blockchains than Ethereum are different, so be cautious and do not mix them up.
Now you can see that value can be sent around the world within a few clicks and a couple of seconds.

Connecting to decentralized applications (dApps):

Self-custodial wallets are powerful as they allow you to directly access smart contract platforms such as Ethereum and to store your crypto tokens in your own wallet without the need for central intermediaries. But besides that the functionalities of wallets are mostly limited to transferring crypto tokens. If you want to explore the full potential of smart contract platforms you should get familiar with decentralized applications and their functionalities.

Here are the currently most relevant types of dApps

- **Decentralized Exchanges** (DEX) e.g. uniswap.org, dydx.exchange, or pancakeswap.finance
- **Lending protocols** e.g. aave.com or compound.finance
- **NFT Marketplaces** e.g. opensea.io, rarible.com, or artblocks.io

At the moment dApps exist mainly in the field of decentralized finance (DeFi) targeting nothing less than to replace the need of the traditional finance sector. There are many other types of dApps existing and to be invented in the future. In its simplest form, a dApp only allows the connection of a wallet in order to log in.

Alternative: If you are unwilling or unable to invest any real money you can also connect your wallet to a **testnet** (e.g. Sepolia as an Ethereum testnet) where you can get test crypto tokens from faucets to your Metamask wallet and experiment with these tokens instead. Established dApps also have a testnet version so that developers can test functions (e.g. testnets.opensea.io). Read more about testnets e.g. here. Please be aware that in case of mixing up testnet and mainnet funds can be lost irreversibly.

Listen to podcasts

Time needed: 1 day for listening to 10–15 episodes

There are very insightful and informative podcasts from experts in the field of blockchain, NFTs, and Web3. You can listen to various podcasts to hear the opinions of experts to get basic knowledge and get a feeling about which topics are important.

Most relevant podcasts:

- NFT Catcher Podcast: Jennifer Sutto & Michael Keen speak about relevant NFT projects focusing on market dynamics and valuation. Access the podcast via Spotify or Apple Podcasts.

- PROOF: Comprehensive NFT coverage, featuring interviews with NFT artists, exploration of generative art, NFT gaming, and discussions with founders shaping tools for creators and collectors. Access the podcast via Spotify or Apple Podcasts.
- Bankless: The ultimate guide to crypto finance including DeFi, NFTs, and cryptocurrencies. Access the podcast via Spotify or Apple Podcasts.
- GreenPill: All about crypto-economic systems fostering positive global and local impacts, particularly in the regenerative finance space, featuring insightful discussions with Ethereum blockchain innovators. Access the podcast via Spotify or Apple Podcasts.
- ReFi Podcast: All about the regenerative finance movement, exploring the intersection of Web3 and climate as it seeks to redesign money for environmental healing. Access the podcast via Spotify or Apple Podcasts.
- The DeSci Podcast: Decentralized Science (DeSci) movement, explores the convergence of Web3 and science, providing insights into the blockchain's potential to revolutionize scientific research and development. Access the podcast via Spotify or Apple Podcasts.
- Crypto Altruism: Weekly conversations with web3 leaders on how to use crypto, blockchain, and web3 to build a better world. Access the podcast via Spotify or Apple Podcasts.
- The Blockchain Socialist: Exploring blockchain's use cases from a left-wing perspective, emphasizing its diverse and evolving nature beyond political boundaries. Access the podcast via Spotify or Apple Podcasts.

German podcasts

- Block 52: Weekly interviews about Blockchain, Crypto Assets, and DLT by Prof. Dr. Philipp Sandner with experts in the field of blockchain in Germany. Access the podcast via Spotify or Apple Podcasts.
- w3.talk: Weekly talks about recent news in NFTs, Metaverse, Crypto, Blockchain, and Web3. Access the podcast via Spotify or Apple Podcasts.
- NFT Talk: Weekly episodes with exciting guests from the NFT scene. Access the podcast via Spotify or Apple Podcasts.

Read important whitepapers

Time needed: ½ day

Want to know where crypto assets started? Begin by checking out the whitepapers for key crypto assets like Bitcoin and Ether. You don't need to fully understand the technical details just yet. These papers give you a broad view of what these cryptocurrencies are and how the technology functions. Even if you're not a tech expert, reading these whitepapers helps you get a handle on where blockchain comes from and what it can do. It is common for web3 projects that launch their own (fungible) token to publish a whitepaper before the public launch. This means there are now lots of whitepapers existing. While it is recommended to study the whitepaper of a token before investing in it, for the start we recommend sticking to the whitepapers of the key projects.

The public media often uses the term cryptocurrency, but we believe the term crypto assets or token is actually more appropriate to consider the entire to include the entire crypto landscape.

Most relevant whitepapers:

- **Ethereum white paper**: Buterin, V. (2013): Ethereum White Paper: A Next Generation Smart Contract and Decentralized Application Platform, http://blockchainlab.com/pdf/Ethereum_white_paper-a_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf.
- **Bitcoin white paper**: Nakamoto, S. (2008): Bitcoin: A Peer-to-Peer Electronic Cash System, https://bitcoin.org/bitcoin.pdf.

Watch informative videos

Time needed: ½ day

Building on your foundational understanding of blockchain through readings on Bitcoin and Ethereum, videos offer an exciting way to learn more. These visual resources help you go deeper into the technology's different parts. Check out our recommended videos below—they show the exciting possibilities of blockchain and smart contract platforms and how they can change things.

Most relevant videos:

- Tapscott, D. (2016): How the Blockchain Is Changing Money and Business, TED Talk, https://www.youtube.com/watch?v=Pl8OlkkwRpc.
- Strickler, E. (2022): NFTs, the Metaverse and the Future of Digital Art, TED Talk, https://youtu.be/oupHYHv_me0?si=3XF5vNWF8Tz9ZRAD
- Voshmgir, S. (2018): Web3, Blockchain, cryptocurrency: a threat or an opportunity?, https://www.youtube.com/watch?v=JPGNvKy6DTA
- Buterin, V. (2022): Ethereum in 30 minutes, https://www.youtube.com/watch?v=UihMqcj-cqc
- Brownworth, A. (2016): Blockchain 101 - A Visual Demo, https://www.youtube.com/watch?v=_160oMzblY8.
- Schär, F. (2022): NFTs and ERC721 Token Standard, https://youtu.be/UlJlPiu2Xb8?si=mSJ4febfAJCkjub2

Further relevant videos:

- Frankfurt School Blockchain Academy: Panel discussions & presentations about blockchain, Tokenization, DeFi, NFTs, and Metaverse with industry experts.
- Generation Blockchain Learning Videos: Blockchain Demo, Basics of Ethereum, Smart Contracts & NFTs

Networking and meeting people

Time needed: ½ day for attendance at 2 meetups (mostly, for free)

If you have understood the basics we recommend stepping into the blockchain community to engage and network with blockchain experts. By doing so you will get a deeper understanding of important topics and might find synergies to work on projects together as the blockchain community is currently still a very active space. Attending physical events in your region will give you the opportunity to bond with people faster, however, you can also visit online events if there are no appropriate meetups in your region.

Research on Eventbrite, LinkedIn, Twitter, Meetup, or the search engine of your choice for events, meetups & conferences.

Events, conferences & meetups

- Regional Meetups: Usually there are various regional blockchain meetups in popular cities around the globe. They provide an easy way to discuss your thoughts and questions with blockchain enthusiasts nearby.
    - When you are especially interested in Art & NFTs, look for events at art and NFT galleries
- Conferences: If you are willing to invest more time and looking to learn & network further, research for conferences in your region. Additionally, you can research websites for crypto events, e.g. here.

If there are not appropriate events in your region you have two options, either initiate a meetup in your region to bring together like-minded people or attend online events. You can join online web3 & NFT communities, online panels, and online conferences.

Read articles and websites

Time needed: 1 day

As you should have gained a basic knowledge about the technology by following the recommended steps it is now time to dive deeper into the topic with the following list of curated articles and websites:

Most relevant articles:

- Ethereum Foundation: Intro to Ether and What are NFTs?
- Finzer, D. (2020): The Non-Fungible Token Bible: Everything you need to know about NFTs
- Xie, L. (2021) Linda Xie: A beginner's guide to NFTs
- Steinwold, A. (2020): Quick Overview of the NFT Ecosystem
- Turley, C. (2021): NFT Issuance Landscape
- Foundation Team (2020): NFTs are transforming the digital art world
- Matthew (2021): Analyzing Cryptoart Marketplaces
- Cone, J. (2021): The skeptics' introduction to cryptoart and NFTs for digital artists and designers
- Cointelegraph Magazine (2020): The Cointelegraph Quick Guide To NFTs
- Zunino, A. (2023): Tokenization And The Future Of Finance: Unleashing The Power Of Blockchain In Global Markets

FSBC working papers and articles

- Study: The Carbon Emissions of Bitcoin From an Investor Perspective (November 2021, Internet)
- Programmable Money and Programmable Payments (September 2020, Internet)
- The future of payments: Programmable payments for the Internet-of-Things (IoT) (July 2021, Internet)

- How Will Blockchain Technology Transform the Current Monetary System? (March 2020, Internet)
- Decentralized Finance — A Systematic Literature Review and Research Directions (February 2022, Internet)
- Legal Aspects of Blockchain Technology for Industrial Use Cases (May 2022, Internet)
- Liechtenstein Blockchain Act: How can nearly any right and therefore any asset be tokenized based on the Token Container Model? (October 2019, Internet)
- How to invest in the Metaverse? Stocks or tokens? (April 2023, Internet)

More relevant websites:

- Ethereum Developer Resources: Documentation on foundational concepts, development stack, and tutorials
- Remix: Web IDE for Solidity development
- CryptoZombies: Learn to Code Blockchain DApps by Building Simple Games
- NonFungible: News, data, learning ressources for NFTs
- CryptoArt: Overview about artwork and artist data
- Dune Analytics: Provides market data and dashboards (e.g. Ethereum NFT market overview)

Online courses: e.g. on smart contracts
Time needed: 1 day for the Web3 University course on smart contracts

After reading, watching, listening and discussing with experts about the technology it is now time to get practical again as these experiences are essential for a deeper understanding of the technology. As a next step we recommend participating in an online course about blockchain technology and smart contracts. Writing your own smart contracts will bring you to the next level of understanding which is not possible with theory only. Get ready for some hands-on experience

Most relevant online courses

- Web3 University: How to create your first smart contract (4-5 hours), How to build your first NFT (4-5 hours), and The Road to Web3 (10 weeks)
- Generation Blockchain Online Course: Blockchain Technology Online Course
- University of Basel Lecture: Smart Contracts and Decentralized Finance
- Questbook: Different courses to build on Ethereum, Polygon, Solana or NEAR
- Coursera/INSEAD: Introduction to Blockchain Technologies
- Udemy smart contracts course: The Udemy course on smart contracts

You can find further courses at edX, class central, or Developer DAO Blog

Further courses (with more time commitment):

- NFT Talents: An 18-Week Mentoring Program Empowering Talent for Leadership in the NFT Space (free)
- University of Nicosia: MOOC - Digital Currency (free)
- Blockchains at Princeton: Elements of Decentralized Finance (free)

- Blockchain university courses: Frankfurt School of Finance, Blockchain Competence Center Mittweida, University of Nicosia

The practical training takes time and concentration but should not be skipped. At least one course e.g. from Web3 University about smart contracts should be done in order to realize what exactly a smart contract is, what it looks like, and how it can be executed.

Books for a wider overview

Time needed: 1-2 days

We recommend you to read the book Token Economy by Shermin Voshmgir as the book explores the transformative potential of blockchain technology and tokenization. It delves into the implications of digital tokens for finance, business, and society, offering insights into the emerging token economy and its impact on traditional industries. Of course, there are further books, which are worth reading later on.

Tip: If you are struggling to find enough time to read books there are also summaries of key messages of books in short articles or even audiobooks available (e.g. Blinkist). Besides that AI tools can be used to create summaries of books. However, the ability of AI to correctly summarize the content of books should always be critically questioned.

Books about Blockchains, Token, DApps & Web3:

- Voshmgir, S. (2020): Token Economy: How the Web3 reinvents the Internet. More Information.
- Tapscott, D. and Tapscott, A. (2018): Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World. More information.
- Surfing with Satoshi. Art, Blockchain and NFTs, Domenico Quaranta. More information.
- Brekke, J. K. et al. (2019): The White Paper. More information.
- Russo, C. (2020) The Infinite Machine: How an Army of Crypto-hackers Is Building the Next Internet with Ethereum. More information.
- Resch, M. and Gryn, T. (2022): How To Create And Sell NFTs. A Guide For All Artists. More information.
- Fortnow, M. and Terry, Q. (2021): The NFT Handbook: How to Create, Sell and Buy Non-Fungible Tokens. More information.

Further reading about digital art, decentralization, and more:

- Catlow, R. and Rafferty, P. (2022): Radical Friends: How DAOs Could Change The Art World. More Information
- Dekker, A. (2021): Curating Digital Art: From Presenting and Collecting Digital Art to Networked Co-Curation. More information
- Waelder, P. (2020): You can be a Wealthy/ Cash-Strapped Art Collector in the Digital Age. More Information.
- Lovink, G. (2022): Stuck on the Platform: Reclaiming the Internet. More information
- Gloerich, I, Lovink, G. and de Vries, P. (2018): MoneyLab Reader 2: Overcoming the Hype. More Information
- Portanova, S. (2022): Whose Time Is It?: Asocial Robots, Syncholonialism, and Artificial Chronological Intelligence. More Information

- Taffel, S. (2019): Digital Media Ecologies. Entanglements of Content, Code, and Hardware. More Information.
- Stalder, F. et al. (2022): From Commons to NFTs. More information.
- Birnbaum, D. and Kuo. K (2018): More Than Real: Art in the Digital Age. More information.
- After the Internet: Digital Networks Between Capital and the Common, Tiziana Terranova. More information.

And now?

If you followed our recommended steps, you should have learned a lot during the last 9 days. You should now be able to understand the basics and the potential of blockchain & NFTs.

Now it is time to actually use the technology and create or build things on top of it. The success of public blockchains depends heavily on the adoption of the technology.

Let us know whether you followed our recommendations. Tell us if you have further ideas, on how to approach blockchain. If you have used other sources to gain or increase your blockchain knowledge, we would be delighted if you could share them with us.

About the Authors

Prof. Dr. Philipp Sandner *has founded the Frankfurt School Blockchain Center (FSBC). From 2018 to 2021, he was ranked among the "top 30" economists by the Frankfurter Allgemeine Zeitung (FAZ), a major newspaper in Germany. Further, he belonged to the "Top 40 under 40" — a ranking by the German business magazine Capital. He has been a member of the FinTech Council and the Digital Finance Forum of the Federal Ministry of Finance in Germany. He is also on the Board of Directors of FiveT Fintech Fund, 21e6 Capital and Blockchain Founders Group — companies active in venture capital financing for blockchain startups and crypto asset investment management.*

Marc Anders *is a Business Engineer and Research Associate at the Frankfurt School Blockchain Center (FSBC), where he leads the NFT Talents Mentoring Program, among other things. Before entering the blockchain sector he gained experience in business planning and development in the automotive industry and research and data analysis for renewable energy. He researches and lectures in the web3 ecosystem including DeFi, DApps, DAOs, and NFTs but is also interested in the industrial application of DLT & blockchains.*

Remarks

If you like this article, we would be happy if you forward it to your colleagues or share it on social networks. You can find more information about the Frankfurt School Blockchain Center on the Internet, on Twitter, or on LinkedIn.

ARTeCHÓ is a European initiative to unleash the potential of the emerging arts ecosystem, created by five European institutions: SERN – Startup Europe Regions Network; Zaragoza City of Knowledge Foundation/Etopia; Meet Digital Center; Baltan Laboratories; and Frankfurt School Blockchain Center (FSBC).

B. Cryptoart & NFT 101 - Definitions

Airdrop
An airdrop of tokens is a giveaway of tokens to promote a project or reward token holders to build a stronger community and add more value and utility to the existing tokens.

(Public) Blockchain
Decentralized, transparent, and immutable distributed ledger that can be accessed and used by anyone without permission and without reliance upon a trusted third party to maintain the ledger (e.g. Ethereum, Bitcoin, or Polygon). Transactions on public blockchains can be tracked transparently in a block explorer e.g. etherscan.io.

Blue chip
Stable, strong, and well-recognized NFT projects.

Cryptocurrency
Digital medium of exchange secured by a blockchain-based ledger.

Crypto
Is Short for everything related to cryptocurrencies.

DAO
A Decentralized Autonomous Organization (DAO) is a collectively-owned, blockchain-governed organization working towards a shared mission. It has no central leadership, it's transparent and encoded on the blockchain.

Decentralization
The concept of moving the control and execution of processes away from a central entity to a distributed network such as a blockchain.

Delist
Taking down an NFT listing from a marketplace.

Deploy
Sending a transaction containing the compiled code of the smart contract to make it available to users of a blockchain network.

Derivative
The creation of an NFT derivative from the original art, like an art reproduction by another artist.

Drop
Common way of announcing a new digital collectible.

DYOR
DO Your Own Research.

ERC
Ethereum Request for Comment is a technical specification used to propose and discuss improvements or standards for the Ethereum blockchain

Ethereum
Ethereum is a blockchain platform and a cryptocurrency itself called Ether (Eth).

Fiat currency
Type of currency that derives its value from the trust and confidence of the people who use it, rather than from being backed by a physical commodity like gold or silver (e.g. Euro, Dollar).

Floor price
The lowest price available to buy an NFT.

Gas fee
Fee to complete a transaction on the blockchain e.g. Ethereum.

Generative art
The process in which the artist designs a system or set of rules and then creates new aesthetics and possibilities with the help of an algorithm.

WAGMI
Short for "we're going to make it." An optimistic and supportive term used in the NFT community.

Holders
Owners of certain Tokens.

Liquidity
Measure how quickly an NFT can be traded or exchanged in the market.

Marketplace
Centralized or decentralized platform to mint, buy and sell tokens.

Metadata
Contains information such as title, description, creator, artwork or media file, and other relevant data. May be saved on-chain or on centralized or decentralized storage solutions.

Metaverse
Virtual universe where users interact in shared immersive space

Minting
NFT minting is the process of creating a unique digital token on a blockchain to represent ownership of digital content.

NFT - Non-Fungible Token
Unique digital token that represents digital ownership on a blockchain.

PFP
Profile picture; this type of NFT is gaining popularity, and holders are now using these on their social media profiles.

Rarity
One of the crucial factors to determine the value of an NFT. Each NFT has unique and different properties or traits.

Roadmap
Explains and shares future actions for the NFT project and allows the community to see what's coming.

Royalties
NFT royalties are a percentage of revenue paid to the original creator of an NFT each time it is sold, providing ongoing compensation for their work.

Rug pull
Fraudulent practice in the crypto space where the creators of a project suddenly exit or abandon the
project, taking with them the funds invested by users, resulting in financial losses.

Secondary market
Trading of previously minted NFTs through NFT marketplaces, allowing for the exchange of ownership of digital assets after their initial minting.

Smart contract
Code stored on a blockchain that automatically executes predefined actions when certain conditions are met, enabling secure and transparent transactions without intermediaries.

Smart contract address
The blockchain address for the code that governs the execution of the smart contract (e.g. for a token)

Snapshot
A snapshot records the information in the blockchain ledger at a specific time. For example, the record includes fees and transactions.

Token
Representation of ownership stored on a blockchain which can represent various forms of value, including currency, property, or utility.

TokenID
A unique identifier that is associated with a specific NFT to distinguish individual tokens within a collection.

URI - Uniform Resource Identifier
Standardized web address that contains metadata about an NFT, such as token name, description, link to media, and other details, used to provide additional context and content related to the token.

Utility
NFTs can offer use cases beyond their valuation such as membership benefits, access to gated content, communities, or real-world experiences.

Wallet
Digital application or device that securely stores private keys used to access and manage crypto assets on a blockchain and is linked to a certain address.

Wallet address
Unique alphanumeric string used to send, receive, and store digital assets, such as crypto assets, on a blockchain network