ISSN 2616-7433 Vol. 5, Issue 15: 18-23, DOI: 10.25236/FSST.2023.051504

Digital Art Copyright Management and Protection Based on Non-Fungible Tokens

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Abstract: *Since the emerge of NFT artworks in 2019, countless users have begun to flood the NFT trading market. As a non-fungible token, NFT not only provides a new art form, but also can provide a new way for the copyright protection of current artworks. This paper will choose literature analyzing method and comparative analysis method. A detailed analysis will be given to explain the operation and related copyright protection of mainstream NFT trading platforms at home and abroad. Combined with the analysis of actual domestic NFT transactions and the situation of copyright protection, from the three levels of law, technology and management, this paper proposes countermeasures and suggestions for digital art copyright management and protection which based on NFT, that is, non-fungible tokens. We expect to analyze the mainstream NFT trading platforms at home and abroad comprehensively and objectively, summarize their characteristics and commonalities, enrich the application of NFT in the field of copyright protection, provide reference opinions for the construction of the domestic NFT copyright protection environment, and promote the development and prosperity of the cultural industry.*

Keywords: *Non-fungible Tokens, NFT trading platform, copyright management and protection*

1. Introduction

Beginning in 2019, the value of NFT digital original artwork traded internationally in auctions continues to heat up, and by April 2022, the total value of the NFT market has surpassed $55 billion.

As a non-fungible token, NFT not only provides a new form of art, but also can provide a new way out for the pain point of copyright protection of artwork at present. Each NFT has a unique serial number, which can be used to link different categories of digital or physical objects to create unique digital creations[1]. Information and transaction data related to NFTs are recorded and stored on the blockchain and cannot be modified arbitrarily. Therefore, blockchain technology can be regarded as a favorable countermeasure against piracy of digital art works.

This paper analyzes the current situation of copyright protection by investigating the operation of NFT trading platforms at home and abroad, and puts forward countermeasures on the use of non-fungible tokens for the protection and management of digital art copyrights from the three levels of law, technology and management in the light of the actual situation in the country, with a view to providing references for the better promotion of the construction of a good environment for the protection of copyrights of domestic NFTs.

2. Related Concepts and Theories

2.1 NFT related Concepts and Theories

NFT is an abbreviation for Non-fungible Token, which generally translates to Non-fungible Pass, and is often referred to as Non-fungible Token, in contrast to Fungible Token, which is interchangeable. NFT embodies an irreplaceable trait in that different NFTs cannot be substituted for each other. This irreplaceable quality of NFTs stems from the origins of NFTs, which are based on a P2P network protocol improved by Bitcoin to enable a decentralized virtual asset transaction. Ethereum has spawned

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the development of many gaming projects, among which "CryptoKitties" is considered the first gaming application that applies ERC-721, one of the implementation standards of the NFT[2], in which players can not only raise and trade virtual pet cats in the game, but also keep track of the ownership of virtual cats in the block. The transfer movement has attracted widespread attention. Since then, NFT has become a hot spot in many fields[3].

In addition, NFT is an electronic asset recorded on the blockchain that utilizes a smart contract to transact the ownership of the NFT, in addition to visually witnessing, recording, and tracking the full direction of ownership movement by recording the movement history on the blockchain.

In the last few years, NFT artwork has jumped into the limelight, with Beeple's "Everydays: the first 5000 days" selling for $69,346,250 on March 11, 2021, the first time a physical auction house has sold NFT artwork in NFT format. This auction was the first time that a physical auction house auctioned NFT artworks in NFT format, and it not only broke the world's highest price for a digital artwork at auction, but also achieved the highest prices for several bids. NFT art has become the windfall of the future of art, and with more and more artists pouring into this new art field, the prosperity of NFT art is unstoppable.

2.2 Blockchain related Concepts and Theories

Blockchain technology is an important cornerstone in the achievement of the NFT art boom. Blockchain can be viewed as a comprehensive collection of technologies that includes several types of technology applications. The core advantages possessed by blockchain technology are decentralization, smart contracts, immutability, and traceability.

The overall system of blockchain usually consists of a data and information base layer, a network protocol mechanism layer, a consensus algorithm mechanism layer, an incentive layer, a contract layer, and a practical application layer, respectively, to form a complete structure[4].

3. NFT and Blockchain in Digital Rights

3.1 Applications of NFT to Digital Rights

NFT can provide more possibilities in copyright application in addition to realizing copyright rights and rights maintenance. NFT optimizes the copyright licensing process and relies on smart contracts to simplify the transaction, so that users do not have to decipher the complex terms and conditions, and only need to buy and sell freely in the compliant NFT trading market.

Due to the irreplaceability of NFT, each Token is given a unique serial number on the blockchain, and works with NFT certification are equivalent to having a unique electronic certification, which can be freely traded in the decentralized network, bringing more value-enhancing space for NFT.

3.2 Applications of Blockchain to Digital Rights

The application of blockchain technology in digital copyright is arguably the most promising application scenario. Due to the traceability and immutability of blockchain, it is suitable for solving problems in digital copyright. It solves the past pain points such as unclear information related to buying and selling in the field of digital copyright, difficulty in proving infringement, and copyright distribution[5]. It provides a clear and transparent database, an immutable record, and decentralization and smart contracts that simplify the process and increase the income of digital copyright holders.

4. Comparison of NFT Trading Platform and Copyright Status Analysis

4.1 Introduction to Domestic and International NFT Ttrading Platforms

We analyzed several mainstream NFT trading platforms at home and abroad, and selected OpenSea, SuperRare, NFT China, Topnod, and Huanhe as the main objects of analysis and research. The selection angle takes into account the differences in countries, the differences in the main operating NFT categories, platform popularity and other considerations.

OpenSea is the world's largest NFT trading platform, with three different trading methods, namely,

ISSN 2616-7433 Vol. 5, Issue 15: 18-23, DOI: 10.25236/FSST.2023.051504

selling at a fixed price, Dutch auction and British auction.

Through an in-depth analysis of the platform's operation mechanism and other features, it was found that the unique features of OpenSea can be divided into three categories: integrated and comprehensive transactions, 0 Gas fee uploading of NFT works, and low barrier to entry and fee transparency.

SuperRare is an NFT platform for professional and established artists, and one of the first NFT platforms to be established. SuperRare is not only vetted by a series of audits, but also has a better mechanism to protect the copyright of the works. SuperRare offers a smart contract system that allows the creators of art to receive a fee, similar to royalties, from the resale price[6]. This provides financial stability for creators.

NFT China is the largest comprehensive NFT trading platform in China, which not only sells digital artworks, but also trades physical artworks and promotes NFT art by attracting creators and audiences through online and offline channels. NFT China adopts the original "de-coin storage chain" side-chain technology, which saves 95% of the Gas fee, reduces the cost of creators in releasing their works, and incentivizes the creators' enthusiasm for creation[7]. Unlike other domestic NFT trading platforms, the platform has a secondary market where users can resell their purchased NFT works. In terms of copyright protection, the NFT China platform chooses a combination of technical and manual double auditing mechanisms to ensure the originality of works[8].

Topnod, as one of the first NFT digital collection platforms to enter the domestic NFT trading field, has accumulated considerable traffic. Topnod's digital collections cover a wide range of fields such as the cultural industry, sports derivative projects, and cultural and artistic creations, and it has cooperated with museums, cultural units, central enterprises, and cultural and tourism organizations to launch digital collections.

Huanhe is a digital collectibles trading platform supported by Tencent. Huanhe launched the digital collectibles project to the original zxin-Chain this alliance chain related technology agreement and on-line trading, does not allow users to give each other goods or resale and other ways of collection transfer, not open the secondary trading market. At present, the NFT works on Huanhe platform rely on the platform to contact the creators, and are not open to the public for individual creation and distribution.

4.2 Comparative Analysis of NFT Trading Platforms

4.2.1 Comparison of Platform Architectures

Based on blockchain, transaction method, payment method, transaction logic, ownership and underlying technology, the five NFT trading platforms described in the previous section are compared as follows.

Table 1: Comparison of NFT Platforms

Trading Platform	Blockchain	Transaction Method	Payment Method	Transaction Logic	Ownership	Underlying Technology
OpenSea	Ether Chain	On-chain Transactions	More than 10 cryptocurrencies	Flowable, closed loop circulation	Purchaser has ownership and is the only	Ethereum
SuperRare	Ether Chain	On-chain Transactions	Ether only, RARE Coin	Flowable, closed loop circulation	Purchaser has ownership and is the only	Ethereum
NFT China	Ethereum Public Chain (Sidechain)	Full Chain Transactions	Digital RMB or CNY	Tradable	Purchaser has ownership and is the only	Ethereum Public Chain
Topnod	Alliance Chain: Ant Chain	Sold on the chain, payment methods are separated from the chain	Chinese Yuan (CNY)	Non-tradable, support full 180 days to transfer the gift, re-transfer need to be full 2 years	Purchaser has no copyright, but owns the right to use	Ant Chain BaaS Platform
Huanhe	Affiliate Chain: Zxin-Chain	Sold on the chain, payment methods are separated from the chain	Chinese Yuan (CNY)	Not transferable or tradable	No copyright for purchasers	Chang'an chain

In OpenSea, NFT images and statistical values are stored in a distributed storage project backed by IPFS technology, while metadata is located outside the blockchain and is exposed to the risk of

ISSN 2616-7433 Vol. 5, Issue 15: 18-23, DOI: 10.25236/FSST.2023.051504

potential tampering, which could change the characteristics of NFT. To address this issue, OpenSea has introduced a frozen metadata feature to prevent subsequent purchasers from modifying it. The Ethernet network ensures the security of the main chain, while PolygonPoSChain provides additional Ethernet main chain security measures. In China, Topnod uses the underlying technology of the Ant Chain BaaS platform, while Tencent Huanhe NFT uses the homegrown Chang'an Chain, and the NFT files are stored on the Trusted Depository Blockchain, which is jointly constructed by Tencent and three other companies.

By comparing the information tables, the payment methods of domestic NFT platforms do not involve cryptocurrencies, but use RMB and digital RMB as the NFT transaction currency. The NFT works released by domestic platforms are mainly digital collectibles, and speculation is restricted. For secondary trading of collections, most platforms maintain a cautious attitude and clearly state that they do not support secondary trading of digital collections, but some platforms are also exploring the field of secondary trading. For example, Topnod trading platform stipulates that the purchaser must hold the digital collectibles for half a year, after the account real name authentication, in order to initiate the transfer, and the recipient also needs to comply with the age authentication stipulated by the platform. In order to curb speculation, the donee must successfully trade and hold the digital collection for at least 2 years before it can be regifted again. Despite the conditions, this behavior still preserves the space for over-the-counter transactions to a certain extent, and increases the value of digital collections through the time limit.

4.2.2 Comparison of Business Models

On the other hand, foreign NFT trading presents a mature business model combined with cryptocurrencies, which is now compared in terms of platform positioning and NFT categories.

Table 2: Comparison of Business Models

Trading Platform	Platform Positioning	NFT Categories	Release Threshold	Royalties	Gas Fee	Sales Fee
OpenSea	Comprehensive NFT Trading Platform	Comprehensive NFT on Art, Music, Sports, etc.	No threshold	Self-setting, up to 10%	Creator pays Gas fee for first release, later covered by buyer	2.5%
SuperRare	Artwork Collection Platform	Art NFT	Audit required	10% + collector's royalty	Creator bears	Primary sales: 15%
NFT China	Comprehensive Platform	Art NFT	No threshold	2.5%	33 RMB	Secondary Sales: 3%
Topnod	Digital Collections Platform	Digital Collections of Culture and Art	Self-submitted audit signing mechanism	/	/	/
Huanhe	Digital Collections Platform	Digital Collections of Culture and Art	Platform invites creators	/	/	/

Different NFT trading platforms have positioned the content of their NFT works and utilized their unique positioning and influence to attract users' attention.SuperRare has upgraded the positioning of its platform by only allowing artists who have passed the tedious vetting process to post their works, restricting the entry of ordinary creators. This entry restriction is actually a manifestation of the platform's differentiation, accurately attracting the user base and enhancing the quality of NFT artworks on the platform.NFT China focuses on the creation of original domestic artists and studios, creating a clear difference in content categories compared to Topnod and Huanhe platforms, which focus on existing IP or cultural tourism-related creations. Therefore, this approach enables precise categorization of users and promotes diversity in the online video market.

Analyzing the platform's operation mechanism, OpenSea simplifies the steps of creating NFTs to attract more creators. Users only need to upload an existing NFT work or cast an NFT, add attributes, description, name, set a price and pay the required contract fee. The process takes only a few minutes. However, OpenSea's simplification of the NFT creation process has led to delays and oversights in its review mechanisms. Review of the content and verification of copyright of NFT works is virtually non-existent, often relying on the platform to passively receive reports, which are then reviewed and validated. This situation means that once a work is reported and taken down due to copyright or content issues, buyers who have already purchased the NFT on the platform are invariably the most affected parties.

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5. Countermeasures for Digital Art Copyright Management and Protection Based on Non-Fungible Tokens

5.1 Problems and Analysis of the Current Status of NFT Transactions in China

Analyzed under the current regulatory situation of China's tight control over cryptocurrencies, domestic NFT platforms may be able to demonstrate a kind of NFT rights enforcement value by taking advantage of the characteristics of NFTs. Domestic NFT platforms can focus on copyright protection, and utilize the irreplaceability and information traceability of NFT to realize copyright authentication. The future space of China's NFT may take a new NFT path that is different from the international mainstream NFT market operation mode.

At present, most of the mainstream large-scale NFT trading platforms in China have launched NFT series collections based on existing IP, which limits the diversity of NFT and does not fully reflect the irreplaceability of one-to-one correspondence between NFT and assets, and the scarcity and non-replicability of works. Purchasers use RMB to buy digital collections, but they are limited by secondary market transactions and copyright use, and they do not really get the digital assets associated with NFT. Most domestic NFT trading platforms have certain centralized qualities and use legal tender, which is in line with domestic cryptocurrency control. Reasonable use of the domestic NFT transaction environment may be able to bring more opportunities and development space for copyright protection.

Most of the international NFT platforms are structured on top of decentralized public chains and have close ties with virtual currencies, which can be sold and transferred on public chains, so there is a certain risk of using virtual currencies for speculation. Domestic mainstream NFT platforms basically rely on the operation of the alliance chain, which is not completely decentralized, with restricted transaction scope and lack of interoperability, deviating from the decentralized characteristics of the blockchain.

Public chain information uploading is completely decentralized, which means higher security of information. Union chain, on the other hand, relies on the alliance parties to determine the consensus mechanism, and relatively speaking, the information security is lower.

5.2 Analysis of the Current Situation and Problems of Copyright in China

The complexity of traditional copyright registration applications and the long period of copyright registration acceptance may, to a certain extent, discourage creators from registering their own copyrights, which is not conducive to the development of copyright protection. In addition, the forms of artworks that can be subject to copyright registration are limited. Traditional copyright registration cannot meet the increasingly diversified forms of art, especially in the field of NFT digital art, the face of the copyright protection problem is more diversified, need to be able to meet the development trend of the art of the corresponding copyright protection registration method to deal with.

At present, China's copyright-related industry has been growing rapidly, and the scale of the industry has been steadily increasing. The rapid growth of the copyright industry has become a new phenomenon of national economic growth, and can be regarded as the key industry of China's economic development in the new era[9].

5.3 Countermeasures and Suggestions for Digital Art Copyright Management and Protection Based on NFT

Digital art copyright protection and management based on non-fungible token technology cannot be separated from the cooperation of three major aspects: law, technology and management, and the specific points and suggestions are as follows: First, it is necessary to clarify the important position of government agencies in the formulation of relevant laws and regulations to ensure the norms and legitimacy of the NFT field. Second, a clear blockchain technology standard system is established to facilitate the construction of a standardized and smooth digital copyright protection and management system. Finally, to deal with the endless crisis of NFT scams, legal propaganda should also be increased to users.

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6. Summary and Outlook

This paper launched a research and analysis on the application of NFT for copyright protection in China, specifically studied the operation of mainstream NFT trading platforms at home and abroad and copyright-related mechanisms, and conducted a comparative analysis of the domestic NFT transactions, examined the application environment of NFT in China and the current situation of copyright protection, and drew the following conclusions:

Domestic NFT will walk out of a unique road of NFT transaction, and NFT is more embodied as a kind of confirmatory value. NFT may change the traditional copyright registration method, provide a new way to solve the infringement, and is expected to solve the existing copyright problems by utilizing its traceability and tamper-proof characteristics.

But on the other hand, it is necessary to utilize NFT correctly, give full play to its characteristics, improve the digital art copyright management environment, and create a good digital art copyright management and protection environment.

Acknowledgement

This research was funded by China Youth and Children Research Association (Grant No. 2023B18), the Fund of University of Shanghai for Science and Technology (Nos. 22SLCX-ZD-005, SH2023253 SH2023254, XJ2023515); the Fund of University of Shanghai for Science and Technology (2023QYKTLX3-18); China Foundation for Youth Entrepreneurship and Employment (2023A03-01); the Fund of University of Shanghai for Science and Technology, Research on the factors influencing the flexible employment choice of female college students in the context of common wealth and counter measures.

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