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**COPYRIGHT IN THE AGE OF NFTS: IN THE ERA OF DIGITAL
AUTHORSHIP AND INTELLECTUAL PROPERTY PROTECTION**

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Abstract

The introduction of the non-fungible tokens has posed numerous complications within the conventional copyright paradigm, with respect to authorship, ownership, and protection of intellectual property in digital space. This study focuses on the legal and theoretical concerns of tokenization of creative works via block chain, in which the transfer of digital tokens does not necessarily transfer ownership of the underlying work of the copyright.

By studying the interaction of NFT transactions with copyright principles enforced on tangible media, the paper examines the interaction between the concept of NFT transactions and the principles of copyrights. This study points to an ownership paradox: when buying NFTs, buyers can expect to gain rights to the creative work to which that token is linked to, whereas they actually receive a tokenized certificate of authenticity and rights to use it.

In addition to the legal aspects, the study examines aspects related to the digital authorship, such as the tokenization of cultural heritage, environmental impacts of proof-of-work blockchains, and concerns about originality in AI-generated NFT content. This research provides evidence that the legal harmonization should be created by international intellectual property organizations. The author suggests the creation of digital authorship registries with integrated blockchain systems, the standardization of smart contract templates with the clear definition of copyright transfers, and the creation of cross-border enforcement.

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The author explores the methods of rethinking authorship, ownership, and enforcement systems that are suitable in the context of decentralized digital worlds that do not compromise the fundamental principles of intellectual property protection.

Keywords: Digital Authorship, Blockchain Technology, Ownership, Minting, Smart Contracts.

Introduction

The advent of Non-Fungible Tokens (NFTs) has transformed the digital economy and brought new aspects to the discussion of the concepts of ownership, creativity, and intellectual property. NFTs are digital certificates of authenticity and provenance of a digital item that is unique cryptography tokens that are generated on blockchain networks. In contrast to the previous form of cryptocurrency like Bitcoin or Ethereum, which can be exchanged, each NFT has its own unique traits, and it cannot be replaced. Such a distinctiveness makes NFTs a form of property certificate of digital artworks, music, collectibles, and even virtual property in the gaming world and metaverse. To artists and creators NFT has become a revolutionary device to establish ownership and monetize their digital creations like never before in the transparent and easy-to-copy online environment. NFTs are based on blockchain technology which is a decentralized registry that has permanent and transparent transactions. Every NFT that is minted on the blockchain provides a verifiable history of its creation and ownership and brings a bit of authenticity to an otherwise digitally duplicable and pirated world³. It has become a massive phenomena in 2021 after digital artist Beeple sold an NFT, Everydays: The First 5000 Days, at Christie's for an unprecedented sum of \$69 million. This happened to represent the transition of the value of digital creativity in the ways it is appreciated, acknowledged, and exchanged. NFTs have since played a role in a variety of creative industries, both within the music and entertainment world and the sports memorabilia and virtual real estate market, to create a fast-growing economy of digital ownership and creative entrepreneurship⁴.

Nevertheless, these are also the same features that make NFTs innovative, and therefore, complex in terms of the law. The attribute of decentralization and being borderless of the

³Andres Guadamuz, 'The NFT Paradox: Ownership and copyright on the blockchain' (2022) 45 Computer Law and Security Review 105.

⁴ S Kraizberg, 'NFT's and the commodification of creativity' (2023) 57(1) Law and Society Review 76.

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blockchain technology questions the traditional legal systems based on the territorial jurisdiction and material fixation⁵. The traditional copyright legislation which was created to protect tangible entities and distinguishable creators is now being questioned on issues that it was never created to address. The questions of authorship, ownership, and control of digital content are becoming gray. Although an NFT has a potential to prove that one is the owner of a certain token, it does not necessarily grant the right to reproduce, distribute, or edit the work of creativity underlying the token. In the majority of situations, the ownership of the NFT and the ownership of copyright are completely different. This difference causes grave legal confusion. When a lot of people buy NFT, most of them are already thinking that they are purchasing the complete rights to the online piece when in reality, they are only buying a digital certificate that is associated with it. On the other hand, producing an NFT of an already existing work of art and not agreeing with the owner would constitute the infringement of copyright. However, it is hard to enforce, because of the anonymity and global nature of blockchain networks, it is difficult to locate and punish criminals. Copyright laws in place in different jurisdictions, like the Copyright Act of the United States or the Copyright Act of 1957 in India were written at a time when the centralized creation and material fixation were the standard concepts for copyright, both of which do not fit in a decentralized, algorithmic creative environment⁶.

Increasing cases of conflicts on digital authorship, originality, and ownership indicate a critical need to define the law. Artists often complain that their works are being tokenized and resold by other parties without their authorization. OpenSea and Rarible, which form the center of the NFT ecosystem, have been criticized due to their inability to establish solid verification to avert such abuse. With the growing digitalization of creative expression, the lack of international regulations on NFTs and intellectual property poses a question to both creators and consumers and regulators as well. Unless it is reformed, NFTs become prone to perpetuate inequities and power gaps that they were initially touted to disrupt.

⁵H Wang, J Lee and Y Liu, 'The tragedy of ownership: NFT's and intellectual property rights' (2024) 14(3) Technology and Society 66.

⁶A Vashist and R Sonkar, 'NFT's and copyright in India: The need for reform' (2025) 13(2) Indian Journal of Intellectual Property Law 98.

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Essentially, the paper will suggest the argument that the existing legal framework is no more adequate to protect the ownership of the creativity in an era where digital materials cross national boundaries and where human authorship is also being redefined⁷. It demands a new, internationally concerted strategy that acknowledges the unique character of NFTs and assumes blockchain validation measures as a part of the greater framework of intellectual property law. It is exclusively through the connection between technology and legislation that creators can enjoy the benefits of NFTs, and at the same time maintain the integrity and spirit of copyright protection in the future.

Research Purpose and Framework

This study explores the inherent issues that NFT minting and trading pose to the principles of existing copyright law, and whether the existing current legal structures have adequate flexibility to allow blockchain-based creative economies or whether a significant reformation is needed⁸. The paper examines the ways in which the technological capabilities of blockchain, which are immutability, programmability and decentralization, pose a conflict with copyright principles, which have been designed to operate within centralized, mutable, and geographically local creative industries.

The main research question is whether NFT minting has undermined the main principles of copyright such as authorship attribution, originality conditions, and the right of reproduction⁹. It explored whether the act of minting is currently reproduction or publication under the current law, the impact of the automation of smart contracts on the conventions of copyright licensing, and whether blockchain provenance can be used to complement or replace existing systems of copyright registration.

The second question is how existing intellectual property systems fail to address the issue of digital authorship in tokenized ecosystems. Lastly, this study proposes the legal and policy innovations to resolve copyright and blockchain technology, providing frameworks to defend the

⁷S Behzadi, 'NFT's and the illusion of digital ownership' (2022) 25(8) Journal of Internet Law 15.

⁸ Y Dong and L Wang, 'Cross-border copyright regulation for NFT's: Comparative legal approaches, (2023) 7(1) Asian Journal of Law and Policy 58.

⁹P Mezei and S Foerg, 'NFT's and the materiality of copyright fixation' (2025) 21(4), International Journal of Law and Technology 213.

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rights of creators, as well as allow technological innovation. The possible solutions are standardized metadata schemas that have rights information coded into the NFT, reconciled global strategies of blockchain-based copyright issues, and novel collective licensing arrangements that suit decentralized creative economies. The study will make practical contributions to legislative changes, industry self-regulation and judicial interpretation in response to blockchain-based creative production and distribution.

Literature Review

With the development of Non-Fungible Tokens (NFTs), many researchers and scholars have raised numerous debates about the influence of the mentioned concept on copyright, ownership, or the idea of authorship in the digital realm. Since the digital works can be authenticated and traced with the help of the blockchain technology, the use of it has also shaken the traditional norms of intellectual property¹⁰. The current literature acknowledges the fact that although NFTs can be used as digital certificates of authenticity, they do not necessarily allocate or alter lot underlying copyright ownership. Rather, they serve to justify provenance and originality, but leave to purgatory issues with regard to rights to legal property, authorship, and creative control.

Research into this intersection has pointed out the fact that the copyright law was initially formulated with an aim of regulating physical creative work employing a material medium and that works with established territorial jurisdictions. The digital jump has however brought these lines blurred and what some call a culture of a copyless one where ownership has been substituted by accessibility in large part. This change has been accelerated by the growth of digital distribution platforms, which have led to the situation where it is extremely easy to copy and paste content at no cost or quality reduction. In this regard, NFTs became a technological reaction, an effort to introduce scarcity and exclusivity to the digital economy once again. However, the more complex issues of intellectual property rights within a decentralized ecosystem have not been solved with this technological innovation.

It has been stressed in scholarly circles that the process of minting an NFT, despite the fact that it is the core of blockchain functionality, does not equate to authorship, in the legal meaning of the

¹⁰P De Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018).

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word. Minting is a technological process of making a digital document in the blockchain, and authorship is an act of creative production¹¹. This cognitive distinction is essential as it dictates the people possessing rights to control, reproduce and monetize a piece of work. In most of the cases, people have tokenized works that they never created, hence have ended up in ownership and infringement cases¹². This has introduced a gap inconsistency between the technological authorship the blockchain record, and the creative authorship, based on the intellectual act of creativity.

The other theme that is evident in the literature is the symbolic nature of the NFT transactions¹³. Although smart contracts, integrated in NFTs, can automatically implement the mechanism of royalties and determine the transfer of ownership, their legal nature is questionable¹⁴. The existing legislation in most of the jurisdictions is still yet to acknowledge these smart contracts as a legal tool of transferring copyrights. This means that the possession of a token does not necessarily give the possessing party ownership of the creative work that the token represents. This confusion has caused a lot of misinterpretation between the buyers and sellers, most of them believe that when they buy an NFT, they have the rights to the full intellectual property ownership. The legal analysis of various jurisdictions always shows that clearer statutory definitions are required to distinguish between the ownership of a token and copyright ownership.

The decisions indicate that the current copyright and contract principles can still be applied, but they need to be reinterpreted to accommodate the novel technological aspects of blockchain-based assets¹⁵. However, the lack of international harmonization remains a major problem. The copyright law is more or less territorial whereas NFT functions in global networks of decentralization, where national legal frameworks lack the resources to enforce the law.

¹¹M Gultom, 'Legal uncertainties in NFT transactions' (2023) 10(1) Indonesian Journal of Legal Studies 23.

¹² Y Dong and L Wang(n 6) 4 .

¹³ ibid.

¹⁴A Guadamuz, 'Blockchain, smart contracts, and digital copyright enforcement' (2023) 15(1) Journal of Law, Innovation and Technology 45.

¹⁵M Ali, T Khan and R Yusuf, ' The ethics of NFT marketplaces: Ownership, authorship, and accountability'(2023) 19(1) International Journal of Cultural Law 32.

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Other dimensions of complexity are found in ethical and socio-economic debates in the literature. Although NFTs have opened up new opportunities to monetize and gain artists recognition, they have also brought in the risks of exploitation and inequity. The volatility of NFT markets is partly due to their speculative characteristics that allow quick wealth gain by some and financial control and market overcrowding by others¹⁶. In the entire breadth and width of the literature, a single problem remains, namely the lack of existing intellectual property structures to resolve the issue of decentralized and algorithmic forms of creativity.

Legal Implication and Analysis of the NFT- Copyright Nexus.

The assemblance of blockchain technology, NFTs, and copyright is one of the most revolutionary and legally dubious innovations of the twenty-first century. The section gives an analytical discussion of the NFTs posing a challenge to the old concepts of authorship, ownership, enforcement, and regulation in intellectual property law. It is a critical analysis of how the conventional teachings are finding it difficult to adapt to the decentralized character of blockchain-based creativity and suggests the ways such legal adjustments can be made.

1. The Reinvention of Authorship in the Digital World.

The copyright protection has always been based on authorship. The law presupposes that a piece of work has a human author and his/her intellectual contribution can be traced and secured¹⁷. Nonetheless, NFTs do not allow this classical concept by decoupling the creative phase and the minting phase. The minting or the process of registering a digital file on the blockchain does not demand any artistic work or effort but technical implementation. However, the minting act is likely to be confused with authorship in the real-life, and hence, a basic legal-ethical quandary¹⁸.

In digital space, and particularly in blockchain systems, the principle of authorship is being broken down. NFTs often have several participants, such as visual artists, coders that produce algorithmic functions, and even autonomous artificial intelligence systems that produce visual or

¹⁶R Bohadana Martis, 'NFT's, authenticity, and creative identity in digital environments' (2023) 9(2) Law and Technology Review 77.

¹⁷ Andres Guadamuz(n 1) 2.

¹⁸P Samuelson, 'The future of copyright in the digital economy' (2024) 38(1) Harvard Journal of Law and Technology 1.

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musical art on their own. This has led to what can be referred to as multi-authorship as the creative product cannot be associated with one identifiable individual but instead it is a network of collaborators or intelligent systems. Conventional copyright systems, based on a human approach of individual creativity, are not well placed to deal with this kind of collective or automatic creation.

The controversies surrounding human originality are also aggravated by the fact that AI is used in the creation of NFTs. When an AI model generates art due to the application of machine learning algorithms that are trained on large datasets, the question arises as to who owns the result; the developer, the end user who entered the query, or the algorithm itself¹⁹. In such situations, the reliance of copyright law on the originality of humans becomes a problem. This leads to the widening of the technological authorship-legal authorship divide, indicating that the authorship concept might have to be changed so as to incorporate collaborative or hybrid creativity enabled by machine and decentralized systems.

2. The Ownership Paradox

The lack of connection between the ownership of the token and the ownership of copyright is one of the most burning issues of NFT jurisprudence²⁰. Buying an NFT gives the buyer power over a unique cryptographic token, but not the intellectual property rights directly relating to the work that it represents. In the majority of jurisdictions, the possession of a token does not amount to possession of copyright, which is retained in the hands of the creator unless transferred expressly. This misconception has created a commotion between collectors and buyers of NFT markets who tend to believe that by purchasing an NFT they automatically obtain all the rights to the digital work.

This is further complicated by smart contracts, which are commonly stored in NFTs transactions.²¹ These online contracts have the ability to encode the language of royalty payments or resale commissions, giving the impression that they are enforced automatically. Nonetheless,

¹⁹Al Ajaddan, Al AlZahrani and M AlShehri, ' NFT's and blockchain innovation: Legal and economic perspectives' (2025) 14(2) Journal of Digital Economics 45.

²⁰M D Murray, 'NFT Ownership and copyrights'(2023) 56 Indiana Law Review 367.

²¹F Limongelli and L Sposini , 'Smart contracts and cross border IP challenges'(2025) 13(2) Journal of European Law and Technology 54.

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the use of smart contracts in practice is a de facto license that is not legally recognized in most jurisdictions. They operate effectively in the technological aspect but do not have legal power of formal contracts in the traditional copyright law. In the absence of a legislative framework to acknowledge their validity, any conflict relating to ownership, licensing, or royalties is prone to misunderstanding and inequality in application.

Metadata systems that are characterized by transparency and interoperability are also of importance in eliminating ambiguity in ownership. Metadata in each NFT uniquely identifies it with the digital file it corresponds to, although the structure of metadata in different platforms varies, resulting in the fracturing and incoherence of rights management. Standardization of metadata protocols might guarantee the accuracy of capturing information on authorship, ownership of copyrights, and licensing conditions and make it universal. That would help bring about legal clarity and minimize the number of conflicts caused by the misconception of ownership in NFT deals.

3. Problems of Jurisdiction and Enforcement.

The blockchain technology presents a high enforcement and jurisdictional challenge to copyright protection due to its decentralized nature. Blockchain is decentralized, allowing parties in various jurisdictions to create, sell or transfer NFTs anonymously. This decentralization although bringing transparency to transactions, also undermines the power of national legal systems to impose or enforce copyright rules²².

In case of an NFT infringement, e.g., the unauthorized minting of a copyrighted work, the question appears: what laws and which court applies to which country? The territoriality principle of the copyright law is a challenge to apply to blockchain because of the borderless character of blockchain²³. This leaves the rightsholders with enormous problems in seeking redress in law courts. More so, anonymity of blockchain networks enables infringers to conceal

²² Y Dong and C Wang, 'Copyright protection on NFT digital works in the metaverse' (2023) 2 Security and Safety art 2023013.

²³L Wang, 'Cross border copyright regulation for NFTs :Comparative legal approaches.'(2023) 7(1) Asian Journal of Law and Policy 58.

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their identities behind pseudonymous wallet addresses, and creators have little to do to enforce the law.

The other issue is the implementation of breach of smart contract. Although smart contracts have the ability to automatically enforce the predetermined terms, they cannot cover the situation related to fraud and misrepresentation, as well as a violation of moral rights. No international system exists to adjudicate the conflicts which emerge due to these self-executing digital contracts. The lack of legal solutions cannot be relied upon to enforce smart contracts as a tool of copyright administration, which requires a legal framework that works in between automated blockchain reasoning and the human aspect of adjudication.

4. Legal Reforms and harmonization

In order to address them, there should be international cooperation and legal reform. Exploration of the implications of blockchain on intellectual property management has already been initiated by the World Intellectual Property Organization (WIPO), yet no full-scale framework on how NFTs can be regulated exists²⁴. The national IP offices have to work together with devising standards that are consistent and reflective of the realities of the decentralized technologies and to support the principles of creative protection.

One of the ways to gain momentum is through the creation of Digital Authorship Registries in NFT sphere. Such registries might be used as official lists of proven creators of their tokenized work, and thus a plausible source of authorship verification. Such registries when integrated with the national copyright databases would reinforce international acknowledgement of ownership of creativity.

A standardized smart contract template to copyright licensing would also form an important step²⁵. These templates might help to minimize conflicts and ensure fairness in NFT markets by ensuring that NFT transactions involve legally binding terms on transfer of copyright, royalties, and moral rights. Moreover, the acceptance of blockchain-based provenance systems as valid

²⁴L Dume , 'Blockchain transparency and intellectual property enforcement'(2023) 12(2) Journal of Information Law 121.

²⁵ F Limongelli and L Sposini(n 19) 8.

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evidence in court would increase the evidentiary nature of blockchain records, which will provide creators with a solid source of proving ownership and originality²⁶.

Ethical and cultural considerations should also be put to direct harmonization efforts. The balance between innovation and protection must be desired and not protection should prevent the democratizing potential of NFTs by legal uncertainty or exploitation. An international framework would assist in protecting the rights of creators and at the same time trade in digital assets worldwide with accountability and transparency.

Moral, Social, and Ecological Aspects of NFT-Creativity:-

The blistering rise of Non-Fungible Tokens (NFTs) has not only reshaped the digital economy of the entire world but has also cast important ethical, cultural, and environmental concerns. Although NFTs provide unparalleled chances of creative empowerment, they also reveal weak points in the shape of arts, culture, and ecology. The moral rights of authors, safeguarding of cultural heritage, and the ecological price of blockchain technologies are currently becoming key to the comprehension of how NFTs interconnect with the law and society²⁷. This paragraph examines these dimensions in terms of law and morality, which indicate the necessity of responsible governance and sustainability of the NFT economy.

1. Ethics of the Creators in the Token Economy.

Intellectual property regimes around the globe are based on the moral and ethical rights of creators. Conventionally, these are the right of attribution and integrity, the guarantee that an author is not misidentified as the creator and that their work is not wrongly distorted, cut or used in a way that damages his/her reputation. These rights are challenged in a new way in the world of NTFs, though. The tokenization of a digital work entails affecting the work by having it lose

²⁶ P De Filippi and A Wright(n 8) 5.

²⁷E Fauchart and M Gruber, ‘ Ethics and authorship in decentralized creative economies’(2024)Journal of Digital Ethics.

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its original context and be propagated in an endless manner across platforms with little to no involvement or permission of the author²⁸.

Erosion of digital moral rights is one of the most significant ethical issues. NFTs as a technological product are traceable and transparent; however, ironically, the creators do not typically have control over the usage or representation of their tokenized art. Bootlegging of artworks - meaning where people are tokenizing other artists work without their consent- has become a common issue. Blockchain, though being a reliable source of immutable evidence about transactions, does not check who is the author at the time of the minting. Consequently, the integrity and ethical right to digital works is at stake of abuse.

Derivative NFTs also make the ethical environment more difficult. As soon as an original work has been tokenized, other actors may easily produce a copy which has been modified or otherwise inspired, forming a network of derivative artworks which obscures the line between homage and infringement²⁹. The process of such derivative minting can take advantage of the artistic work of the original artist and redirect the money to third parties who were not authorized to receive it. Furthermore, NFT markets have spawned speculative trading which creates interventionary behaviour like artificial scarcity, price bubbles, and organised pump-and-dump, manipulative activities, questioning the integrity of digital art as a cultural and moral enterprise.

Moral rights of creators in the tokenized economy can only be safeguarded by a two-pronged strategy, in which technology enables the NFT metadata to incorporate the authorship integrity of the work, and the law acknowledges the concept of the digital moral right firmly in domestic laws. In their absence, NFTs have the potential to transform creativity into a commercial enterprise and convert the work of artists into sellable code instead of human expression³⁰.

2. Cultural Heritage and the Issue of Appropriation.

²⁸A Lapatoura ,‘ Cultural heritage in the digital age: Tokenization and appropriation’(2021) 18(3) Ethics and Cultural Property 142.

²⁹M Caron and N Curien , ‘Decentralized creativity and fragmented moral rights: A legal economic perspective’ (2023) 18(4) Journal of Intellectual Property Law& Practice 301.

³⁰ European Commission, Sustainable Blockchain Directive(COM/2024/114, Publications Office of the European Union 2024) (Brussels).

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In addition to the actions of individual creators, NFTs have triggered debates in the entire world over cultural appropriation and commodification of common heritage³¹. Monetization of traditional, communal, and indigenous art has been facilitated by the possibility to tokenize nearly all kinds of digital content without the authorization of the community. It is a process that is usually guided by profit motives and it transforms shared cultural expressions into individual property and heritage and turns it into a commodity.

An example of such cultural appropriation is the digital creators who are not part of a community minting tokens that represent traditional symbols, crafts, or rituals and posing them as unique digital assets³². It does not only compromise the ethical purity of cultural expressions, but also brings about legal issues of ownership and custodianship of intangible heritage. The indigenous population is at special risk in this matter³³. Most of them do not have formal systems established to declare ownership of their cultural products and thus are at the mercy of being exploited by digital means. The lack of law to guard communal authorship allows foreigners to make money off cultural productions of profound spiritual and social importance. In addition to economic exploitation, this kind of digital appropriation has added to cultural distortion and loss of authenticity.

3. Environmental Concerns

NFTs may be considered a novelty in the digital economy, but they still have one of the most debatable ethical impacts on the environment. Most of the initial NFT operations were based on the proof-of-work (PoW) blockchain networks, including the Ethereum network prior to its upgrade³⁴. The systems are very energy consuming in terms of carbon emissions since they consume huge computational energy to validate transactions. The cumulative environmental cost of blockchain operations is increased with every NFT minted using a proof-of-work scheme and this creates significant concerns regarding the sustainability of the NFT ecosystem.

³¹UNESCO, Safeguarding intangible cultural heritage in the digital era (2023).

³²R Chakraborty, 'Community-authored NFTs and inclusive heritage governance'(2024) 9(1) Asian Cultural Policy Journal 56.

³³ World Intellectual Property Organisation (WIPO), Digital Cultural IP registry: Protecting Indigenous rights in blockchain markets(2021).

³⁴ A de Vries, 'The environmental impact of blockchain: Empirical insights from Ethereum's transition' (2023) 7(3) Nature Climate Policy 221.

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The environmental criticism of NFTs criticizes the belief that the development of technology must be socially or ecologically accountable. As an example, there is the case of high-profile digital art sales that use as much energy as thousands of households daily that expose the lack of a connection between innovation and sustainability³⁵. The ethical conundrum is that NFTs provide an art and activist with a creative and influential platform, but the technology that allows them to do so can lead to climate degeneration.

The incorporation of sustainability principles in the governance of NFT is not only a case of environmental-related issue but also one of ethical consistency. Since the society is shifting towards digital economies, it is necessary to make sure that technological innovation does not lead to the loss of ecological health. The future of NFTs, thus, is determined by whether the industry is able to meet the global sustainability objectives and remain accessible and innovative³⁶.

Future Research Pathways and Legal Recommendations.

NFTs are expanding very fast, and the relevant legal frameworks are lagging behind, leaving behind considerable regulatory and ethical gaps. Although blockchain technology is an innovative source of empowerment and economic prospects, it threatens the very basis of copyright, authorship and ownership³⁷. This part has major policy and legal suggestions to align NFTs with the international intellectual property law, and then instructions on further research and comparative analysis.

1. Legal Recognition of Smart Contracts

Royalties, licensing and transfer transfers Smart contracts are the operational basis of NFT transactions, since they automate the transfer operations. Nonetheless, their legal position is not certain at the present in different jurisdictions. The states of the United States like Arizona, Tennessee, and Nevada have recognized limited use of blockchain-based contracts, although

³⁵European Commission, Sustainable Blockchain Directive(COM/2024/114, Publications Office of the European Union 2024) (Brussels).

³⁶L Reins and T van der Linden , 'Green Copyright: Embedding environmental sustainability into digital IP Law'(2024) 26(1) Environmental Law Review 45.

³⁷ M Mujevic, 'NFTs and future of Ownership:Legal Perspectives from Europe'(2023) 15(3) European Journal of Legal Studies88.

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these laws concentrate more on the commercial enforceability of contracts as opposed to intellectual property transfers. The federal copyright laws are yet to include the section that specifically covers smart contracts as a means of licensing or assigning rights.

Conversely, the European Union has also started considering the enforceability of the concept of code as contract in its **DigitalServices Act (2022)**³⁸ and in its planned **EU Data Act (2023)**³⁹, as self-executing agreements in digital trade are possible. The vast majority of member states are still wary of this, however, it is noted that consent, clarity and legal personality are still necessary to have contractual validity, which are not always present in smart contracts.

In order to achieve coherence, smart contracts must be regarded by legislators across the world as enforceable in intellectual property-related legislation, so long as they conform to the basic requirements of contract law including mutual consent, clarity of terms, and a history of transaction. It would help legalize NFTs, making resale royalty, attribution provisions, and licensing restrictions having a binding force in the court as any written contract does. This would also improve trust, transparency, and investor confidence in the NFT economy, which will limit conflicts between creators and buyer.

2. Enforcement Mechanisms across borders through WIPO

The very concept of blockchain technology implies that it is not confined to any single nation, and it forms a decentralized network that poses a challenge to the territorial legal framework. Transactions of NFTs in most cases cut across various jurisdictions, which makes unilateral implementation ineffective⁴⁰. With this international aspect, the World Intellectual Property Organization (WIPO) is in a unique position of helping to coordinate the creation of an international governance system of NFTs. The framework might be based on the already existing WIPO digital copyright programs, including the WIPO Blockchain Task Force, to devise a unified set of standards and interoperable systems to control NFTs. A WIPO-led multilateral

³⁸ European Union, 'Regulation(EU) 2023/2065 of the European Parliament and of the Council on a single market for DigitalServices(Digital Services Act) [2023]OJ L 277, 1.

³⁹ European Union, 'Regulation(EU) 2023/2854 of the European Parliament and of the Council on harmonized rules on fair access to and use of data (Data Act) [2023]OJ L 238,1.

⁴⁰ India Intellectual Property Office, Blockchain Integration in national IP systems:Pilot project report (Government of India Press 2025) (New Delhi).

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structure can bring a number of innovations. First, it would allow the harmonization of the definition of digital authorship, such that, under the new system, the works produced in collaboration or due to an algorithm would be recognized in all jurisdictions. Secondly, WIPO might develop the minimum requirements of the enforceability of smart contracts, especially of the contracts that regulate digital ownership and royalty distribution. Such harmonization is necessitated by divergent national approaches. In the U.S., the judiciary has been very reliant on the use of precedent to apply the conventional IP principles to the digital world⁴¹. Criminal cases, e.g. **Hermes international v. Rothschild**⁴² (2023) and **Miramax v. Tarantino**⁴³ (2022) reiterated that NFTs might violate the current trademarks and copyrights, which points out that digital objects are not outside the established law. European Union on the other hand has focused on consumer rights and morals in the digital economy. The Directive on Copyright in the Digital Single Market (2019)⁴⁴ provides creators with the right to maintain attribution and integrity, in even a digital resale case. Simultaneously, China views NFTs as digital collectibles, not as financial assets, and regulates the sale of such items more tightly, but at the same time, the country acknowledges the potential of these tools in terms of culture and creativity. Even in the context of blockchain regulation, India is in the process of development and is still controlled by the Copyright Act of 1957⁴⁵, which is yet to include decentralized digital works. However, Indian policymakers have moved to create task forces to investigate the use of blockchains in IP registration, which is an indication that they are ready to change.

An architecture guided by WIPO can thus serve as a legal system that ensures uniformity, good governance, legal predictability and upholding of national sovereignty. Such a system will be able to provide trust and stability in the global NFT marketplace by aligning international standards without sacrificing the local flexibility.

3. The Obligatory publicity of copyright conditions at Minting.

⁴¹ United States Copyright Office ,Blockchain and copyright recordation: Policy Review (Library of Congress 2023) (Washington ,DC).

⁴² *Hermes International v. Rothschild* 590FSupp 3d 647(S.D.N.Y. 2023).

⁴³ *Miramax LLC v. Tarantino* No. 2:21-cv-08979-FMO-JEM (C.D.Cal. 2022).

⁴⁴ Directive(EU)2019/790 of the European Parliament and of the Council on Copyright and related rights in the Digital Single Market[2019] OJ L 130.

⁴⁵India,The Copyright Act 1957(Act No. 14 of 1957, as amended by the Copyright Amendment Act 2012) Ministry of Law and Justice, Government of India 1957) (New Delhi).

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The fact that the NFT is being minted is a crucial aspect of accountability, as well as legal transparency, which is essential in ethically accountable NFT transactions. The misconception that many buyers have is that the purchase of an NFT transfers copyright privileges, which is not true in most instances because the buyer acquires only the token. To overcome this misconception, it is necessary to introduce mandatory disclosure systems within the framework of which the rights related to each transaction must be clearly formulated before the minting. Within the framework of such a system, NFT platforms would show uniform data that defines whether the purchaser would obtain only a digital token or also certain usage rights, including reproduction, open display, or creation of derivatives. Such a measure would be reflective of the principles of transparency principles that have been instituted in consumer protection and e-commerce laws, where sellers must reveal material information prior to the completion of a transaction.

The Digital Markets Act (2022)⁴⁶ by the European Union already enforces transparency and accountability in digital trading, which is already a precedent that may be transferred to the NFT marketplaces. Similarly, the United States has a set of truth-in-digital-advertising regulations by the Federal Trade Commission (FTC), which may be applied to the sale of NFTs to establish that any misrepresentation of digital ownership is a type of consumer deception. In addition, there would be an opportunity to introduce standardized metadata templates, which would allow attaching copyright ownership and licensing conditions to NFTs. This metadata would impartially enter the token, and buyers, creators, and regulators would be able to check the ownership rights correctly. This would enhance consumer confidence and ethical principles of digital art, making it a stronger statement of the idea that technology is not an instrument to hide the light but is a means against darkness.

Future research directions

The continued development of NFTs presents numerous research possibilities on a legal, technological, and ethical scale. These are some of the areas that deserve specific academic consideration.

⁴⁶European Union , ‘Regulation(EU) 2023/1114 of the European Parliament and of the Council on Single Market in Crypto-Assets(MiCA)’[2023]OJ L 150, 40.

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1. Artificial Intelligence-generated NFTs and its legal status as a person:

Digital art and NFTs have now become significant production by artificial intelligence without often needing human authorship. The next generations of research need to address the topic of whether AI-generated creative works are entitled to copyright protection and what their ownership must be allocated to, a developer, a user of the algorithm, or a system as a whole. The development of law concerning machine-led creativity may offer early guidance to determine authorship in machine-led creativity through legislative debates in the European Union, particularly in the proposed **AI Act (2024)**⁴⁷, and in the United States, where the Copyright Office is conducting an analysis of AI-created works⁴⁸.

2. Digital Rights of Morality and Blockchain Authentication:

The moral rights especially the attribution and integrity rights will have to be redefined in the decentralized setting. Decentralized authorship registries, which creators can use to store their digital moral rights in an unalterable form, may be possible using blockchain technology. The future research should examine the possibility of such models coexisting with the moral rights traditions of countries such as France, Germany, and Japan, where the authorial integrity is still a pillar of the cultural policy.

3. Comparison of Jurisprudence and Internationalization:

Although the U.S. and EU courts have established the principles to base a case on NFT disputes, there is a vast absence of comparative studies in the Global South. Countries like India, Brazil, South Africa, and Indonesia have their unique legal traditions that can contribute to understanding of NFT regulation in the world. The approach of these countries to digital taxation, the verification of authorship, and the enforcement of IP needs to be documented in future scholarship and thus become a part of a more inclusive and representative international legal system.

4. Interdisciplinary Integration:

⁴⁷ European Union, 'Regulation(EU) 2023/2854 of the European Parliament and of the Council on harmonized rules on Artificial Intelligence(AI)Act'[2023]OJ L238, 1.

⁴⁸ D Gervais, 'Comparative copyright law in the digital age' (2023) 26(2) Journal of World Intellectual Property 89.
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NFT scholarship needs not to be limited to the conventional legal studies. The interplay of the field of economics, environmental studies, and cultural anthropology provides fresh ideas on how digital assets transform value, community, and sustainability. The conceptualization of NFTs as socio-legal, but not necessarily technological, artifacts will enable future researchers to present holistic and ethical governance systems.

Conclusion:-

NFTs are positioned on the nexus of technological disruption and legal change, both the evolutionary and challenge to the conventional concept of intellectual property. They have established a fresh paradigm where creativity and technology intersect since they have reinvented ownership, creation, and trade of digital assets. NFTs can give creators the ability to exercise ownership of their work in a digital world that has traditionally been full of duplication and piracy due to the ability of creators to provide verifiable proof of authenticity through blockchain technology. There are complexities to this empowerment though. The lack of connection between token ownership and copyright ownership has introduced legal ambiguity and the decentralized nature of blockchain makes it harder to enforce, establish jurisdiction, and hold responsibility. Unless controlled coherently, the potential of NFTs may be ruined through exploitation, misinformation, and unfair competition in the market.

The future of copyright in the NFT age is the ability to balance between the innovations and responsibility and to find a balance between technology and strong law and ethics. The acknowledgment of smart contracts as an enforceable agreement would give both creators and investors the legal assurance that all parties can rely on, and the national and international copyright registries with blockchain identifiers would help to bridge the gap between decentralized verification and formal recognition. To legitimize the definitions of digital authorship, licensing rights and resolutions to issues, cross-border cooperation with institutions such as the World Intellectual Property Organization (WIPO) is needed. Moreover, requiring transparency in NFTs minting by requiring the platform to reveal copyright ownership, rights to use, and resale provisions would ensure that consumers are not misled by the misguided actions of digital market actors and strengthen trust in the digital markets. It is also critical to incorporate sustainability into the NFT regulation. The ecological impacts of energy intensive blockchain

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operations are the concern of the global community and governments, as well as platforms need to seek more greener proof of stake protocols and transparent carbon accountability guidelines. As countries keep on evolving and experimenting on the regulatory systems, it is important that they find a balance between innovation and responsible stewardship.

Finally, the future stage of copyright needs to maintain the same values on which it is built of fair recognition, creative integrity and equitable reward, but to confront the realities of a decentralized, digital economy. NFTs are the embodiment of the paradox between the advancement and conservation, and the future of legal systems will rely on the effective delivery of technological freedom and justice, responsibility, and sustainability.

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