

Toward a Legally Interoperable NFT Ecosystem: A Hybrid Framework for Intellectual Property Governance in Digital Assets

Bixiao Luo¹

¹ The University of Manchester, UK

Correspondence: Bixiao Luo, The University of Manchester, UK.

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Abstract

This paper investigates the unresolved intellectual property challenges posed by non-fungible tokens (NFTs), a rapidly growing class of digital assets that blend decentralized technologies with creative content distribution. Despite widespread adoption across art, entertainment, and gaming sectors, the legal infrastructure surrounding NFTs remains fragmented, creating uncertainty for creators, buyers, and platforms alike. The objective of this study is to critically evaluate existing theoretical models—including property-based, contract-based, and provenance-centered approaches—and assess their adequacy in governing NFT-related rights and obligations.

Methodologically, the paper employs a comparative legal analysis of current NFT licensing practices, supported by interdisciplinary review of blockchain architecture, smart contract functionalities, and relevant international IP frameworks. Based on legal theory, technical standards, and case studies, the paper identifies critical gaps in enforceability, rights attribution, and jurisdictional clarity.

In response, the study proposes a hybrid legal-technical framework comprising seven interconnected components: Smart Licensing Infrastructure (SLI), an On-Chain Provenance and Rights Registry, Embedded Royalty Clauses with Legal Backing, Token-Linked Legal Contracts (TLCs), along with dispute resolution and jurisdictional compatibility. These elements collectively aim to bridge decentralized code execution with enforceable legal standards, facilitating clearer licensing arrangements, more reliable royalty enforcement, and scalable dispute resolution mechanisms.

It presents a novel blueprint for technical capabilities of NFTs with the foundational requirements of intellectual property law. By incorporating legal metadata, verifiable authorship records, and jurisdictional parameters directly into NFT structures, the framework strengthens legal predictability without restricting innovation. This research contributes to academic discourse by advancing a multidimensional governance approach for digital assets, offering actionable pathways toward regulatory coherence and sustainable development within the NFT ecosystem moving forward.

Keywords: NFTs, intellectual property, smart contracts, digital rights

sparked significant legal questions about their fundamental nature, ownership implications, and fit within established intellectual property systems. As NFTs increasingly serve as vehicles for cultural expression, artistic dissemination, and digital commerce, clarifying their legal character becomes essential for addressing intellectual property concerns.¹ This paper examines the conceptual separation between NFTs and the digital assets they point to, tackles widespread misunderstandings about ownership rights, and places NFTs within property law's wider context.

1.1 The Concept and Characteristics of NFT

NFTs do not actually hold the digital artwork, music file, or other creative content they represent.² Instead, they operate as “cryptographic tokens” recorded on a blockchain, functioning as verifiable pointers to specific assets typically stored off-chain. The creation and management of NFTs occur through smart contracts—self-executing programs deployed on blockchain platforms like *Ethereum* or *Solana*.³ These contracts automate core functions including minting, transfers, and enforcement of token-related conditions. Unlike interchangeable cryptocurrencies such as Bitcoin, where each unit holds identical value, NFTs derive uniqueness from distinct metadata and identifiers that make every token irreplaceable.⁴

This metadata conventionally includes the creator's wallet address, the timestamp of minting, and a *Uniform Resource Identifier (URI)*⁵

linking to the referenced digital content. Critically, NFT architecture fundamentally separates the token from its associated asset. While serving as a verifiable certificate of authorship and provenance, the token neither contains nor embodies the actual creative work. Typically, the digital file resides externally—hosted either on traditional servers or decentralized storage solutions like the *InterPlanetary File System (IPFS)*,⁶—and remains under the original creator's or hosting platform's control.

1.2 Legal Misconceptions of Digital Ownership

A primary source of confusion in the NFT market stems from the widespread yet mistaken belief that purchasing an NFT automatically grants full ownership of the underlying digital asset or its intellectual property rights.⁷ As a matter of fact, such rights don't actually transfer through the blockchain transaction alone. Intellectual property ownership or usage rights require explicit authorization—typically via written agreement, licensing terms, or smart contract provisions—that clearly spells out what rights are being conveyed.⁸

This misconception echoes long-standing ambiguities in intellectual property law. Consider how purchasing a physical artwork doesn't automatically give the owner reproduction or distribution rights, which needs to be clearly transferred through separate agreement. Similarly, acquiring an NFT associated with a digital image doesn't actually grant permission to adapt, reproduce, distribute, or commercially exploit the underlying content. Without explicit contractual terms, copyright and related rights remain with the original creator or rights holder as the default legal position.

In most cases, NFT purchasers receive only a limited license, typically for personal or

¹ Gultom, A., & Asril, F. (2023). Key Issues of NFT (Non-Fungible Token): How Transfer of Copyright Should Adapt?. *Perspektif Hukum*. <https://doi.org/10.30649/ph.v23i1.197>.

² Troitskiy, V. (2023). Neither Tinder nor Karaoke: Approaching the Legal Status of Non-Fungible Tokens (NFTs). *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4581840>.

³ Kamkuemah, M., & Sanders, J. (2023). NFT formalised. *ArXiv*, abs/2310.14600. <https://doi.org/10.48550/arXiv.2310.14600>.

⁴ Mishra, P., Singhal, A., Thakur, V., Sharma, D., & Bedi, M. (2024). Beyond Traditional Intellectual Property: Rise of Non-Fungible Tokens (NFTs) and Role of Blockchain in Protecting Digital Art. *Journal of Intellectual Property Rights*. <https://doi.org/10.56042/jipr.v29i3.2636>.

⁵ Razi, Q., Devrani, A., Abhyankar, H., Chalapathi, G., Hassija, V., & Guizani, M. (2024). Non-Fungible Tokens (NFTs)—Survey of Current Applications, Evolution, and Future Directions. *IEEE Open Journal of the Communications Society*, 5, 2765-2791. <https://doi.org/10.1109/OJCOMS.2023.3343926>.

⁶ Dolganin, A. (2021). Non-fungible tokens (NFT) and intellectual property: The triumph of the proprietary approach?. *Digital Law Journal*. <https://doi.org/10.38044/2686-9136-2021-2-3-46-54>.

⁷ Abubakar, M., Gunathilake, N., Buchanan, W., & O'Reilly, B. (2023). A Review of the Non-Fungible Tokens (NFT): Challenges and Opportunities. In: Tan, Z., Wu, Y., Xu, M. (eds) Big Data Technologies and Applications. BDTA 2023. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, vol 555. Springer, Cham, 171-190. https://doi.org/10.1007/978-3-031-52265-9_12.

⁸ Davtyan, T. (2023). Navigating the Legal Landscape: An Analysis of NFTs Under Armenian Law. *Bulletin of Yerevan University C: Jurisprudence*. <https://doi.org/10.46991/bysu:c/2023.14.1.034>.

⁹ Öztürk, Ö. (2023). Intellectual Property in NFTs and Legal Challenges. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4322697>.

non-commercial use, such as displaying the content on digital platforms or within virtual environments. Any broader permissions—such as commercial use, derivative creation, or sublicensing—need to be expressly set out in the metadata, licensing terms, or accompanying documentation. Without such clarity, the scope of rights remains narrowly construed in favor of the original rights holder.

1.3 The Controversial Legal Identity of NFTs

A central legal issue in the ongoing discourse surrounding NFTs concerns their ontological classification: should NFTs be treated as property, as licenses, or as a distinct legal category altogether? ¹ Although legal systems have not yet reached consensus, NFTs are increasingly regarded as a form of intangible personal property, comparable to digital assets such as domain names, in-game items, or dematerialized financial instruments.

Under the framework of common law, NFTs generally fall under personal property principles, while civil law systems often define them as digital movable goods or assign them to *sui generis* categories based on domestic statutes. ² Although blockchain transactions transfer the token itself, they don't automatically transfer actual rights to the linked digital content to third parties—that requires clear licensing agreements or contractual frameworks. This fundamental disconnect prompts serious questions about whether NFTs truly fit within traditional property law frameworks. The real problem is compounded by regulatory authorities' and courts' lack of clear guidance regarding NFTs' legal status across different contexts, which doesn't help resolve the confusion.³

In bankruptcy proceedings⁴, where it's still unclear whether NFTs constitute recoverable

digital assets holding real economic value or merely symbolic tokens without enforceable legal claims. Tax authorities similarly haven't figured out whether to treat NFTs as collectibles, software licenses, or financial instruments.⁵ Each category carrying dramatically different tax obligations. These unresolved doctrinal gaps create substantial challenges extending beyond intellectual property enforcement to consumer protection concerns, compliance headaches for businesses, and ultimately undermining transaction stability across digital markets.

2. Copyright Challenges in NFT Transactions

2.1 Restrictions on Rights Transfer in NFT Sales

A persistent challenge in NFT-related copyright law stems from the widespread but mistaken belief that owning a token equates to holding copyright in the associated digital work. This confusion not just mislead buyers, it's created significant legal unpredictability across NFT markets. Crucially, while purchasing an NFT confers ownership of a verifiably unique cryptographic token recorded on-chain, it does not transfer any copyright interests without separate explicit contractual terms in the underlying creative content. These terms are protected separately by intellectual property law.

A widely cited example occurred in March 2021, when a blockchain-focused collective purchased Banksy's limited-edition print *Morons*⁶ for approximately \$95,000, incinerated the physical artwork during a live-streamed event, and minted a non-fungible token representing a video of its destruction. The NFT later sold for approximately \$380,000. Notably, neither Banksy nor Pest Control (the only entity authorized to authenticate Banksy's works) endorsed the act or transferred any reproduction or copyright rights in connection with the NFT. This incident illustrates a key doctrinal point: purchasing an NFT, even one tied to a physical or symbolic event, does not, in itself, grant the legal authority to reproduce, distribute, or publicly display the associated content. Rather, the buyer

¹ Tan, C. (2024). Rights in NFTs and the flourishing of NFT marketplaces. *Int. J. Law Inf. Technol.*, 32. <https://doi.org/10.1093/ijlit/eaee018>.

² Kim, Y. (2024). Analysis and Implications of the Spanish First Instance Court's Decision of Mango NFT's Copyright Infringement Case: Focusing on Property Owner's Lazy Minting, Use in Metaverse, and Application of U.S. Fair Use Doctrine. *Korea Copyright Commission*. <https://doi.org/10.30582/kdps.2024.37.4.5>.

³ Alqarni, A. (2024). A blockchain-based solution for transparent intellectual property rights management: smart contracts as enablers. *Kybernetes*. <https://doi.org/10.1108/k-04-2024-1074>.

⁴ Polezhaev, O. (2023). NFT Assets in the System of Legal Rights: Problems of Legal Qualifications. *Zakon*. <https://doi.org/10.37239/0869-4400-2023-20-9-68-75>.

⁵ Dwitanti, A., & Simatupang, D. (2022). Tax Imposition and Legal Enforcement on the Digital Asset of Non-Fungible Token (NFT). *Unram Law Review*. <https://doi.org/10.29303/ulrev.v6i2.250>.

⁶ Internet & Technology Law Blog. (2021, March 18). *The Fungible Banksy NFT: What Did the Buyer Really Get?* Morrison Foerster LLP. Retrieved from <https://www.internetandtechnologylaw.com/fungible-banksy-nft-copyright-digital-art>

merely obtains a token that references a digital file. As *Murray* (2022) have emphasized, the process of tokenization does not, by itself, transform possession of a file into ownership of enforceable intellectual property rights.¹ Thus, even where high prices are involved, the legal interest remains confined to the token, not the content it points to.

Although most NFT projects provide minimal or no intellectual property rights to holders, the Bored Ape Yacht Club (BAYC)², created by Yuga Labs, represents a notable exception. Each purchaser is granted a broad commercial license to use the specific image of their ape in merchandising, branding, and creative ventures. However, these rights are not embedded in the NFT's smart contract but are instead articulated in off-chain Terms and Conditions. As such, their enforceability depends on traditional contract law doctrines, which require, among other things, clear notice and assent—often satisfied through mechanisms such as clickwrap agreements or conspicuous disclosure. Further complexity arises in the context of secondary sales. Since subsequent purchasers may not be made aware of or affirmatively consent to these licensing terms, it remains unsettled whether the license transfers automatically upon resale. This example underscores that the legal rights associated with NFTs continue to be governed by conventional legal frameworks and highlights ongoing uncertainty regarding rights succession in secondary markets.

2.2 Unauthorized Tokenization and Infringement

The dispute in *Miramax vs. Tarantino* (2021)³ illustrates the legal uncertainties that arise when legacy intellectual property agreements are tested by emergent digital formats like NFTs. In this case, director Quentin Tarantino announced plans to auction NFTs containing digitized excerpts from his handwritten *Pulp Fiction* screenplay, prompting a lawsuit from Miramax,

the studio that produced the film. Miramax argued that its 1993 contract with Tarantino granted it exclusive rights to all media and derivative uses of the film—including those arising from future technological developments. Tarantino, by contrast, maintained that he retained “publication rights” to the screenplay, and that the NFTs fell within that category. Central to the dispute was the question of whether NFTs—cryptographic tokens referencing content stored off-chain—constituted a new form of “publication” or a distinct commercial exploitation requiring separate rights clearance. Although the case settled privately in 2022 without judicial resolution, it brought into sharp relief the legal ambiguity surrounding how pre-digital contracts allocate rights in relation to tokenized content. It further underscores that the act of minting an NFT implicates not only ownership of the token, but also underlying rights in the associated work—particularly when the work is governed by pre-existing intellectual property arrangements. As such, the case serves as a cautionary precedent for creators and rights holders navigating the intersection of legacy IP and novel digital asset commercialization.

The case of *Nike vs. StockX* (2022)⁴, further illustrates how NFT transactions can give rise to significant trademark liability when digital tokens are linked to branded physical goods without authorization. StockX, a resale platform for sneakers, launched a series of “Vault NFTs” representing physical Nike shoes it held in storage. Nike alleged that the use of its trademarks and product images in these NFTs constituted unauthorized commercial use, potentially misleading consumers into believing that the NFTs were endorsed or issued by Nike. The lawsuit raised multiple claims under U.S. trademark law, including infringement, dilution, and unfair competition. StockX defended its Vault NFTs as digital receipts analogous to traditional product listings on e-commerce platforms, invoking both the first-sale doctrine and fair use defenses. However, the legal dynamics shifted when Nike amended its complaint in 2023 to include counterfeiting and

¹ Murray, M. (2022). Transfers and Licensing of Copyrights to NFT Purchasers: A Brief and Pleasant Guide to NFTs and Copyright Law, Part 2. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4152475>.

² Skadden, Arps, Slate, Meagher & Flom LLP. (2022, June). *NFTs and IP: The Growing Complexity of Commercial Rights*. Retrieved from https://www.skadden.com/-/media/files/publications/2022/06/skadden_discusses_the_growing_complexity_of_commercial_rights_issues_in_nfts.pdf

³ *Miramax, LLC v. Tarantino*, No. 2:21-cv-08979 (C.D. Cal. filed Nov. 16, 2021). Retrieved from <https://www.meshiplaw.com/litigation-tracker/miramax-v-tarantino>

⁴ *Nike, Inc. v. StockX LLC*, No. 1:22-cv-00983 (S.D.N.Y. filed Feb. 3, 2022) District Court, S.D. New York. Retrieved from <https://www.courtlistener.com/docket/62654048/nike-inc-v-stockx-llc/>

false advertising, after discovering that some sneakers sold via StockX's platform were inauthentic. In March 2025, the federal court granted Nike partial summary judgment on the counterfeiting claim, affirming that even digitally-mediated representations of physical products can trigger trademark liability if they imply unauthorized origin or endorsement. This case highlights how NFTs, though technically distinct from the underlying goods, function in practice as brand-linked commercial assets, and thus fall squarely within the regulatory scope of trademark law. It also underscores the limitations of traditional doctrines like first-sale and fair use when applied to blockchain-based tokens that are not merely descriptive or passive representations, but actively circulated as high-value digital commodities.

The landmark case of *Hermes International vs. Mason Rothschild (MetaBirkins)* (2023)¹, provides a pivotal illustration of how NFT-based artistic expression may still infringe trademark rights when commercial confusion is likely. In this case, digital artist Mason Rothschild created and sold a series of NFTs titled *MetaBirkins*—stylized digital renderings of faux-fur Birkin-style handbags—which closely evoked Hermes' iconic luxury product line. Although Rothschild claimed his works were protected under the First Amendment as artistic commentary, Hermes argued that the NFTs misappropriated its trademarked brand elements and created a false association with its products.

The federal jury ruled in favor of Hermes, finding Rothschild's use of the Birkin trademark constituted infringement, dilution, and cybersquatting, ultimately awarding the fashion company \$133,000 in damages. Crucially, the court dismissed Rothschild's defense positioning the NFTs as purely conceptual artworks—concluding their design and marketing deliberately exploited Hermes' brand equity to mislead customs.² This landmark case makes it clear that trademark protections absolutely reach into digital markets. Crucially, it establishes that turning art into NFTs will not shield creators from commercial responsibility

when their tokens effectively operate as brand symbols. Even more important, the decision appeals a fundamental truth: judging NFTs' legal standing demands looking beyond their technological wrapping to examine their real-world marketplace behavior and how consumers actually perceive them. *Hermes v. Rothschild* now stands as concrete precedent, showing how creative freedom and brand protection might coexist within NFT commercial constantly shifting landscape.

In conclusion, these legal battles spanning film studios, luxury brands, and retail giants expose an undoubtable truth: turning physical or digital assets into NFTs routinely happens in legal gray zones. In these misty spaces, IP rights often exist in vague limbo, where poorly defined, erratically licensed, and frequently impossible to enforce in practical terms. Whether people are seeing pirated content minted without permission, or using NFTs to infringe brand trademarks with artistic disguising. These conflicts reveal how NFT deals spotlight traditional intellectual property systems' failure to handle digitally-native value transactions. They also lay bare how vintage legal tools—first-sale copyright doctrine or fair use defenses—just fail to translate effectively when applied to decentralized code-driven assets. While courts build NFT-specific case law, one fundamental principle is non-negotiable: minting and trading NFTs must follow the same core intellectual property rules that bind old-school media. Technological innovation is not supposed to become a legal loophole for dodging obligations.

2.3 Platform Practices and Their Limitations

NFT marketplaces such as OpenSea, Rarible, Foundation, SuperRare, and Zora serves for the creation, circulation, and monetization of NFTs.³ Despite of their pivotal role in shaping the NFT economy, these platforms operate within fragmented and underdeveloped legal regimes, particularly in relation to copyright governance. Enforcement practices across platforms remain inconsistent and opaque, with limited vetting of uploaded content, few proactive mechanisms to prevent unauthorized minting, and a general absence of standardized disclosures regarding intellectual property rights.

¹ United States District Court of the Southern District of New York [2023]: *Hermes Int'l v. Rothschild*, No. 22-CV-384-JSR, 2023 WL 1458126 (S.D.N.Y. Feb. 2, 2023), <https://www.wipo.int/wipolex/en/members/profile/WIPOLEX>

² Elzweig, B., & Trautman, L. (2022). When Does a Nonfungible Token (NFT) Become a Security?. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4055585>.

³ Wang, R., Lee, J., & Liu, J. (2024). Unwinding NFTs in the Shadow of IP Law. *ArXiv*, abs/2501.03556. <https://doi.org/10.1111/ablj.12237>.

Platform enforcement practices remain wildly inconsistent and opaque. Most exhibit inadequate content vetting, almost no preventive measures against unauthorized minting, and generally missing standardized IP disclosures.¹ Consequently, creators face substantial infringement risks, while buyers often don't really grasp what rights, are actually conveyed through their NFT purchases. This contractual ambiguity and copyright non-compliance across marketplaces has created a legal breeding ground where token ownership is routinely confused with content ownership, turning rights uncertainty into the default marketplace condition rather than an occasional exception.

OpenSea, the biggest NFT marketplace by volume, demonstrates the contradictions in current platform governance around intellectual property protection. While its Terms of Service technically prohibit minting unowned content, enforcement remains minimal and largely reactive. The platform depends almost entirely on a *Digital Millennium Copyright Act* (DMCA)² takedown system, which requires copyright holders to file formal complaints before any action occurs. This approach allows infringing NFTs, including plagiarized art and unlicensed media, to stay publicly listed and actively traded for weeks or even months before removal.³ The situation gets worse significantly in 2021 with OpenSea's "lazy minting" tool⁴ coming out, which allowed NFT creation without upfront gas fees. Though intended to democratize access, this tool enabled industrial-scale unauthorized minting due to near-zero verification barriers. By early 2022, OpenSea admitted over 80% of NFTs created were fraudulent works, plagiarized, spam, or outright

scams⁵. This shocking news exposing flaws of their governance model.

Although the platform implemented temporary restrictions, like disabling the functionality and limiting free minting capabilities, but these fixes did not last for a long time. Following objections from user communities, the measures were promptly withdrawn. Consequently, NFT marketplaces face an urgent mandate: to implement robust content screening mechanisms, establish verifiable creator authentication systems, and develop binding licensing frameworks. The governance measures remain essential to prevent operational convenience from undermining copyright integrity.

A frequently referenced incident on *Rarible*⁶ reveals systemic defaults in NFT platforms to prevent copyright infringement. In this notable case, a digital artist discovered their complete artistic portfolio had been minted and sold by an impersonator without authorization. The unauthorized party replicated not only the images but also the original titles and descriptions, successfully generating thousands of dollars in NFT sales before the infringement came to light. Although *Rarible* ultimately removed the counterfeit tokens, the platform offered no restitution to either the original artist or the misled buyers, who had unknowingly purchased unauthenticated digital assets. This case illustrates a broader structural deficiency: most NFT marketplaces expressly disclaim responsibility for verifying the legitimacy of user-submitted content, framing themselves as neutral intermediaries akin to web hosts or content platforms.⁷ While such provisions may offer platforms legal protection, they also create a permissive environment for abuse, in which the burden of enforcement falls disproportionately on individual creators.

3. Academic Perspectives and Theories of Legal

¹ Bobek, H. (2025). To mint or not to mint: non-fungible tokens and the right of publicity. *Russian Journal of Economics and Law*. <https://doi.org/10.21202/2782-2923.2025.1.141-174>.

² Davis-Fox, N. (2025). World Wide Whac-a-Mole: The Inadequacies of the DMCA to Protect Copyright Holders Online and Why Artificial Intelligence is the Solution. *Texas A&M Journal of Property Law*. <https://doi.org/10.37419/jpl.v11.i2.5>.

³ Wiryanthi, N. (2025). Copyright Infringement in Online Media: Corporate Legal Liability. *Al-Adalah: Jurnal Hukum dan Politik Islam*. <https://doi.org/10.30863/ajmpi.v10i1.7681>.

⁴ Fang, M., Fang, Y., Gao, C., Leung, A., & Ye, Q. (2025). The Impact of "Lazy Minting" on Seller Performance in NFT Marketplaces—A Transaction Cost Economics Perspective. *Journal of Operations Management*. <https://doi.org/10.1002/joom.1368>.

⁵ Pearson, J. (2022, January 28). *More than 80 percent of NFTs created for free on OpenSea are fraud or spam, company says*. Retrieved from <https://www.vice.com/en/article/more-than-80-of-nfts-created-for-free-on-opensea-are-fraud-or-spam-company-says/>

⁶ Stephen, B. (2021, April 22). NFT mania is here, and so are the scammers. *The Verge*. Retrieved from https://www.theverge.com/2021/3/20/22334527/nft-scams-artists-opensea-rarible-marble-cards-fraud-art?utm_source

⁷ Helman, L., & Tur-Sinai, O. (2023). Bracing Scarcity: Can NFTs Save Digital Art?. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4378570>.

Interpretation

The explosive growth of NFTs has ignited vigorous academic debate about their intersection with intellectual property regimes. While NFTs provide novel mechanisms for verifying digital ownership and provenance, established IP frameworks have largely failed to adapt, exposing transactions to widespread misinterpretation, systemic exploitation, and persistent litigation. To bridge this gap, scholarly discourse now centers on four dominant frameworks for conceptualizing NFTs' legal status concerning copyright, licensing, and authenticity: first, property-based approaches; second, contractual and licensing models; third, provenance and authenticity paradigms; and finally, hybrid or reformist perspectives. Each offers pathways for clarifying NFT-related legal uncertainties, yet each also grapples with significant limitations that complicate practical implementation.

3.1 Property-Based Approaches

One influential perspective in the scholarly debate conceptualizes NFTs as a form of intangible personal property. Advocates contend that granting NFTs explicit property status would better align buyer expectations with enforceable rights and provide a coherent framework for digital ownership. Werbach, K. (2022)¹, for instance, draws a compelling analogy to domain names, which are recognized in legal systems as choses in action—intangible rights enforceable through legal remedies. Like domain names, NFTs derive their value not from any inherent material form but from their uniqueness, transferability, and recognized control within economic markets.² This analogy highlights the potential of a property-based framework to integrate NFTs into established legal categories while addressing the market demand for clear and secure ownership structures.

This framework carries clear appeal for those seeking stability in the NFT market. Treating NFTs as property could give buyers a much

stronger sense of security, since ownership would translate into legally enforceable rights rather than just a blockchain record. Besides, it would resonate with the widespread assumption that purchasing an NFT is essentially equivalent to purchasing “the work” itself, an expectation that currently leads to frequent misunderstandings. It could also foster greater confidence among investors, as a settled property status would provide a more reliable foundation for using NFTs in trading or even as collateral in securitization schemes.

While civil law systems like Turkey³, Japan⁴ and Netherlands⁵ have experimented with classifying NFTs as “digital movables,” they remain hesitant to extend traditional property frameworks built for tangible goods into the digital realm. As the *OECD Digital Assets Report (2021)*⁶ observed, global recognition of NFTs as property remains fragmented and unsettled, leaving cross-border transactions especially uncertain.

3.2 Contractual and Licensing Approaches

Some scholars argue that NFTs should not be seen as property but instead as evidence of certain contract-based rights.⁷ Under this view, the value and meaning of an NFT depend on the terms set out in smart contracts and related licensing agreements.

These smart contracts are bits of code recorded

¹ Werbach, K. (2022). Digital Asset Regulation: Peering into the Past, Peering into the Future. *William & Mary Law Review*, 64(1), 185–245. Retrieved from <https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=3984&context=wmlr>

² Yu, M. A. (2023). From code to contract: Understanding NFTs as enforceable rights. *Northwestern Journal of Technology and Intellectual Property*, 21(1), 77–102. <https://scholarlycommons.law.northwestern.edu/njt看/vol21/iss1/4>

³ Çağlayan Aksoy, P. (2023). The applicability of property law rules for crypto assets: considerations from civil law and common law perspectives. *Law, Innovation and Technology*, 15(1), 185–221. <https://doi.org/10.1080/17579961.2023.2184140>

⁴ Manon Fafet. (December 2024). Introducing a droit de suite through NFTs in Japan: legal hurdles. *Journal of Intellectual Property Law & Practice*, 19(12), 908–916. <https://doi.org/10.1093/jiplp/jpae087>

⁵ Zimmermann, Katja. (2022). “What’s New in European Property Law?: An Overview of Publications in 2019–2021.” *European Property Law Journal*, 11(1-2), pp. 105–128. <https://doi.org/10.1515/eplj-2022-0004>

⁶ OECD. (2021). Regulatory Approaches to the Tokenisation of Assets, OECD Blockchain Policy Series, www.oecd.org/finance/Regulatory-Approaches-to-the-Tokenisation-of-Assets.htm

⁷ Fairfield, J. A. T. (2022). Tokenized: The law of non-fungible tokens and unique digital property. *Indiana Law Journal*, 97(4), Article 4. Retrieved from <https://www.repository.law.indiana.edu/ilj/vol97/iss4/4/>; Putranti, D., & Putri, U. (2024). Enforcement of Copyright Law on Non-Fungible Token (NFT) Through Smart Contracts. *Kosmik Hukum*. <https://doi.org/10.30595/kosmikhukum.v24i1.18476>; Marias, M. (2022). I Want My NFT!: How an NFT Creative Commons Parallel Would Promote NFT Viability and Decrease Transaction Costs in NFT Sales. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4210589>.

on the blockchain. They help carry out tasks like transferring ownership or paying royalties automatically. However, they usually do not explain what specific intellectual property rights the buyer actually receives. As Ellul and Revolidis (2023)¹ note, smart contracts “facilitate the execution of transactions, but not the interpretation of rights,” which often leaves buyers confused about what they legally own. Many buyers assume that because the transaction is handled securely and automatically, the legal ownership must be clear as well. But in reality, the legal side is often much more complex—and this gap between expectation and legal reality can cause real problems.

Despite of the existed challenges, viewing NFTs as evidence of contractual rights still offers important advantages. It supports copyright protection by allowing creators to keep control over how their work is reproduced or modified, which reinforces long-standing legal norms. In addition, the structure is flexible. Projects can design licenses that match their goals, whether for commercial, personal, or community use. This adaptability is especially useful in a fast-changing digital environment. Another strength lies in its legal compatibility. Many NFT platforms now use licensing models², which are already familiar in both legal and creative fields. This makes it easier to connect NFTs with existing systems, lowering barriers for users and reducing potential misunderstandings.

The limitations of this framework are hard to ignore. A study titled *2024 NFT PFP Project IP License Report* conducted by the University of San Francisco³ analyzed 100 profile picture (PFP) NFT projects and revealed notable inconsistencies in licensing practices. The findings show that only 41% of the projects adopted the NFT 2.0 license, a figure that is equal to the percentage of projects that offered no license at all. Among those using the NFT 2.0

framework, 65% imposed restrictions on the transfer of image rights, while only 17% allowed full transfer of those rights. However, this figure rises to 31% when projects that allow full transfer of image rights—excluding the transfer of moral rights—are also taken into account. A well-known example involves *NBA Top Shot Moments*, where buyers later discovered they were only granted personal use rights. This restriction came as a surprise to many, especially given that the marketing materials had implied broader permissions.

3.3 Provenance and Authenticity Approaches

Another way of understanding NFTs focuses less on legal ownership or licensing rights and more on their role as proof of authenticity and origin.⁴ In this view, the primary function of an NFT is to confirm that a digital work comes from a specific creator. Rather than acting as a legal title or contract, the NFT serves as a certificate of provenance, helping to distinguish original works from copies in a digital space where duplication is easy and often indistinguishable.⁵

This concept closely mirrors practices in the traditional art world. A certificate of authenticity does not transfer copyright to the buyer, but it plays a crucial role in confirming the work’s originality and supporting its market value.⁶ In much the same way, NFTs can verify the source and legitimacy of digital creations. This is particularly important in online spaces, where digital files can be copied endlessly without any loss of quality. By linking a work to its creator through blockchain records, NFTs offer a way to maintain trust and traceability in digital art and media markets.

This authenticity-based model offers several practical benefits. One of its key strengths is transparency. Because NFTs record minting dates and link works to specific wallet addresses, they create a public and verifiable

¹ Ellul, J., & Revolidis, I. (2023). *Non-fungible tokens (NFTs), smart contracts and contracts: The need for legal and technology assurances*. SSRN. <https://doi.org/10.2139/ssrn.4325415>

² García, R., Cediél, A., Teixidó, M., & Gil, R. (2022). Semantics and Non-fungible Tokens for Copyright Management on the Metaverse and Beyond. *ACM Transactions on Multimedia Computing, Communications and Applications*, 20, 1-20. <https://doi.org/10.1145/3585387>.

³ Belle, Charles, NFT PFP Project IP License Report (October 25, 2024). Available at SSRN: <https://ssrn.com/abstract=5044481>

⁴ Sviridova, E. (2022). NFT tokens in the context of copyright on the works. *Gosudarstvo i pravo*. <https://doi.org/10.31857/s102694520021581-0>; Tarasenko, L. (2022). NFT — the latest digital copyright object or form of expression. *Theory and Practice of Intellectual Property*. <https://doi.org/10.33731/22022.259748>.

⁵ Kartasheva, A., & Trubina, M. (2024). Between Crypto Art and Copyright: NFT Tokens as Tools for Confirming the Authenticity of Art Objects. *Changing Societies & Personalities*. <https://doi.org/10.15826/csp.2024.8.2.285>.

⁶ Kedlaya, S., R, S., & H, N. (2024). NFT Based Secure Platform for Copyright Images. *International Journal of Advanced Research in Science, Communication and Technology*. <https://doi.org/10.48175/ijarsct-15370>.

trail of authorship. It helps reduce fraud and increases trust in digital art markets. ¹Another advantage is that it avoids conflict with copyright law. By not claiming to grant intellectual property rights, this approach respects the limits of what NFTs can legally do.² It also sets realistic expectations for consumers. Buyers are more likely to understand that they are purchasing a certificate of authenticity rather than acquiring ownership of the underlying work itself.

It is inevitable that provenance on the blockchain can be manipulated. Fraudsters have been known to mint digital assets without permission from the original creators, thereby producing false records of authorship. A well-known case in 2021 involved a Twitter user who minted thousands of images scraped from *DeviantArt*, linking them to their own wallet. Despite repeated takedown efforts, these unauthorized NFTs continued to appear on multiple platforms.

3.4 Hybrid and Reformist Approaches

In light of the limitations found in existing NFT frameworks, some scholars have suggested alternative paths. These include hybrid models³ that blend elements of current approaches, as well as calls for legal reform aimed at providing clearer guidance in the evolving digital landscape.

Hybrid models attempt to bridge the gap between consumer expectations and legal certainty. They recognize the NFT token as a form of property while also embedding machine-readable licenses directly within smart contracts. ⁴By doing so, the rights attached to an

NFT can be specified in a clear, accessible, and automated manner. This structure may help avoid the confusion caused by off-chain terms and improve both legal enforceability and user transparency. As *Fenwick and Kaal (2023)* explain, hybrid models provide “the best prospect for aligning NFT markets with legal predictability while preserving flexibility for innovation.” Their view reflects a growing interest in frameworks that can adapt to market needs while still offering robust legal foundations.

In response to the limitations of current NFT frameworks, some scholars propose hybrid models that integrate blockchain-based smart contracts with traditional legal systems. These models identify NFTs as digital assets and directly embed machine-readable license terms into the smart contracts of the tokens. This approach ensures that rights are clearly defined, accessible and automatically enforced, bridging the gap between consumer expectations and legal certainty. It is designed to eliminate the confusion usually caused by off-chain terminology and enhance transparency and enforceability. *Compagnucci et al. (2023)* ⁵ emphasized that these hybrid frameworks combine NFTs with traditional licensing structures, providing a balanced solution that integrates technological innovation with legal predictability. This flexibility allows a market-driven customization, while protecting the intellectual property rights and ensuring its enforceability. In the end, the mixed mode represents the combined NFT market and legal definition, while maintaining the digital innovation dynamic quality of the most promising method.

Undoubtedly, implementing hybrid frameworks or developing new legal regimes is often complex and time-consuming. It would likely require a high level of international coordination, which can be difficult to achieve in practice. There is also concern about the risk of overregulation. If new laws are too strict or burdensome, they could limit innovation or make it harder for smaller creators and startups to participate in the NFT space. As the

¹ Mishra, P., Singhal, A., Thakur, V., Sharma, D., & Bedi, M. (2024). Beyond Traditional Intellectual Property: Rise of Non-Fungible Tokens (NFTs) and Role of Blockchain in Protecting Digital Art. *Journal of Intellectual Property Rights*. <https://doi.org/10.56042/jipr.v29i3.2636>.

² Radermecker, A., & Ginsburgh, V. (2023). Questioning the NFT “Revolution” within the Art Ecosystem. *Arts*. <https://doi.org/10.3390/arts12010025>.

³ Compagnucci, M., Nilsson, N., Wagner, P., Olsson, C., Fenwick, M., Minssen, T., & Szkalej, K. (2023). Non-fungible tokens as a framework for sustainable innovation in pharmaceutical R&D: a smart contract-based platform for data sharing and rightsholder protection. *International Review of Law, Computers & Technology*, 38, 66-85. <https://doi.org/10.1080/13600869.2023.2233803>.

⁴ Notland, J., Notland, J., & Morrison, D. (2020). The Minimum Hybrid Contract (MHC): Combining Legal and Blockchain Smart Contracts. *Proceedings of the 24th International Conference on Evaluation and Assessment in Software Engineering*. <https://doi.org/10.1145/3383219.3383275>.

⁵ Compagnucci, M. C., Nilsson, N., Wagner, P. S., Olsson, C., Fenwick, M., Minssen, T., & Szkalej, K. (2023). Non-fungible tokens as a framework for sustainable innovation in pharmaceutical R&D: a smart contract-based platform for data sharing and rightsholder protection. *International Review of Law, Computers & Technology*, 38(1), 66-85. <https://doi.org/10.1080/13600869.2023.2233803>

technology continues to evolve, striking the right balance between structure and flexibility remains a central challenge for both legal scholars and policymakers.

3.5 Conclusion

Nowadays, NFTs span a wide range of applications and sit at the crossroads of technological innovation, creative practice, and legal regulation. From my perspective, none of the current theoretical models offers a complete solution that meets the practical and legal demands of the evolving NFT landscape. While each existing framework brings something valuable, most of them fall short in critical ways. Some offer robust technical systems but lack enforceable rights protections, while others prioritize legal certainty at the expense of the open, decentralized character that defines much of the NFT ecosystem.

This lack of coherence reflects a broader challenge: the pace of NFT innovation continues to outstrip the development of legal, economic, and governance structures. To respond effectively, a more flexible and forward-looking approach may be necessary. A hybrid strategy that draws from multiple models could provide the balance needed—combining legal enforceability to safeguard creators and rights holders, increased transparency through on-chain licensing and metadata, and enough creative freedom to preserve the community-driven spirit of NFT development. Any framework with high feasibility should take into account two realistic factors: the global influence of digital content and the uniqueness of NFTs. Only in this way can the decentralized system of blockchain be truly linked with the traditional legal structure.

With this in mind, the next section will introduce a new approach specifically designed to address intellectual property challenges related to NFTs, aiming to link the decentralization of blockchain with stronger legal protection for digital works. The core of this framework is to carefully balance the demands among creators, buyers and platforms, support innovation while maintaining ownership and legal clarity.

4. A Novel Institutional Framework

NFT transaction methods have evolved rapidly; the corresponding legal frameworks have not kept pace yet. Key issues related to intellectual property, rights allocation, and enforcement

remain unresolved, lead to significant uncertainty among stakeholders and inconsistent regulatory practices. In light of these challenges, this section introduces a structured legal framework aimed at addressing these persistent gaps. The framework strives to create a more reliable and transparent system for managing intellectual property in the NFT space with combining unique technical features of blockchain and established legal principles. Ultimately, the goal is to foster long-term trust and accountability while preserving the creative and economic opportunities that NFTs continue to offer.

4.1 Smart Licensing Infrastructure (SLI)

The proposed Smart Licensing Infrastructure (SLI)¹ resolves these challenges by encoding explicit licensing terms directly into NFTs via smart contracts and machine-readable metadata. Unlike traditional approaches that depend on off-chain agreements or generic terms of service, SLI enables creators to select from standardized license options—including exclusive rights, non-commercial use, or customized restrictions—during the minting process. These terms are permanently embedded in the token's smart contract, ensuring their visibility and enforceability across all transactions, including secondary market resales and cross-platform transfers.

The direct integration of machine-readable licensing terms into NFTs via smart contracts represents a substantial improvement in establishing legal certainty and reducing transactional ambiguity. In contrast to traditional off-chain agreements, which remain sensitive to alteration, misplacement, or disputes, these embedded on-chain licenses create a permanent, auditable record of asset rights that travels with the token throughout its lifecycle. This technical innovation provides market participants with explicit understanding of permitted uses while both addressing the enforcement challenges that have plagued previous approaches to digital asset governance.

¹ D. Di Francesco Maesa, F. Tietze and J. Theye. (2021). Putting Trust back in IP Licensing: DLT Smart Licenses for the Internet of Things, 2021 IEEE International Conference on Blockchain and Cryptocurrency (ICBC), Sydney, Australia, pp. 1-3, doi: 10.1109/ICBC51069.2021.9461145.

As Madine et al. (2023)¹ demonstrate, incorporating licensing agreements directly into NFT smart contracts creates a self-enforcing system that automatically clarifies ownership and usage rights during all subsequent transactions. This embedded approach removes the interpretive ambiguity that frequently arises when digital assets change hands, particularly in secondary market transfers where traditional off-chain agreements often prove inadequate. This approach is aligned with the core principles of blockchain technology, particularly decentralization, and provides a trustless, automated solution that benefits both creators and consumers by ensuring clear rights and preventing disputes. By reducing reliance on centralized intermediaries, this framework fosters decentralized content governance and streamlines content distribution and rights management.

4.2 On-Chain Provenance and Rights Registry

A key structural limitation in today's NFT landscape is the absence of a reliable and transparent system for verifying authorship and tracking intellectual property rights. In digital markets where copying and redistribution are nearly effortless, "provenance" is essential. While this concept is well established in the traditional art world, it remains underdeveloped in blockchain-based ecosystems. The introduction of an on-chain rights registry could address this gap by offering a tamper-resistant, publicly accessible ledger that records authorship claims, licensing agreements, and the transfer of IP rights over time.

As Razi et al. (2024)² explain, the use of blockchain technology ensures an immutable record of ownership, making it virtually impossible for fraudulent transactions or counterfeit works to go undetected. By taking advantage of blockchain's built-in timestamping and immutability, such a registry would allow each NFT to be definitively linked to its original creator. All changes in ownership or rights could be recorded in an unalterable, chronological

order. This would give creators stronger protection and provide collectors and platforms with an authoritative source of truth. For example, a music producer issuing tracks as NFTs could register their authorship and clearly document any licenses for derivative uses, such as sampling or remixing. These records would then be visible to buyers and enforceable across marketplaces.

4.3 Legally Supported Embedded Royalty Clauses

Although many NFT platforms currently support programmable royalty functions through smart contracts, these mechanisms often operate in isolation.³ Their effectiveness is typically limited to the platform where the NFT was minted, and resale royalties are bypassed in many cases. As a result, creators may lose out on compensation when their works are resold on secondary markets that choose not to honor the original terms. This undermines one of the key promises of NFTs—the ability for artists and digital creators to receive ongoing revenue from the value their work generates over time.

As Liu et al. (2024)⁴ emphasize, well-designed royalty systems benefit not only creators but also enhance overall market efficiency by encouraging the production of high-quality content. The proposed system, which aligns smart contracts with established contract law principles, ensures that resale royalties become a reliable revenue stream for creators. By integrating internationally recognized standards, such as those set by UNCITRAL (*United Nations Commission on International Trade Law*), these royalties can be enforced across different jurisdictions and platforms, ensuring the long-term sustainability and stability of NFT-based economies.

4.4 Token-Linked Legal Contracts (TLCs)

Integrating Token-Linked Legal Contracts (TLCs) directly into NFTs offers a promising solution to address the legal limitations of blockchain-based transactions. While smart contracts are efficient in automating actions such

¹ M. Madine, K. Salah, R. Jayaraman and J. Zemerly. (2023). NFTs for Open-Source and Commercial Software Licensing and Royalties. *IEEE Access*, 11, pp. 8734-8746, doi: 10.1109/ACCESS.2023.3239403.

² Razi, Q., Devrani, A., Abhyankar, H., Chalapathi, G., Hassija, V., & Guizani, M. (2024). Non-fungible tokens (NFTs)—Survey of current applications, evolution, and future directions. *IEEE Open Journal of the Communications Society*, 5, 2765-2791. <https://doi.org/10.1109/OJCOMS.2023.3343926>

³ Harris, E. (2022). Mint, sell, repeat: Non-fungible tokens and resale royalties for Indigenous artists. *Alternative Law Journal*, 48(1), 11-16. <https://doi.org/10.1177/1037969X221141096> (Original work published 2023)

⁴ Liu, X., Xu, H., & Zhu, S. X. (2024). Optimizing the Nonfungible Token Ecosystem: Effects of Business Models, Secondary Markets, and Royalties. *IEEE Transactions on Engineering Management*, 71, 15525-15539. <https://doi.org/10.1109/TEM.2024.3500359>

as payments and ownership transfers, they often fall short of providing the legal language, clarity, and jurisdictional specificity required by traditional contract law. This regulatory gap presents considerable challenges for both content creators and purchasers in enforcing rights or resolving disputes through conventional legal methods. Tokenized License Contracts (TLCs) address this critical limitation by encoding royalty agreements and usage terms directly into the asset smart contract. This integration ensures automatic enforcement while establishing formal legal standing, thus, in the event of a breach of contract, appropriate remedial measures can be provided to the creator.

As *Putranti & Putri (2024)*¹ points out, smart contracts alone cannot adequately address the complex legal requirements of intellectual property enforcement. The integration of legally binding Tokenized License Contracts (TLCs) within NFT metadata provides creators and buyers with stronger legal protections as a complement of blockchain's technical capabilities. These embedded contracts establish clear parameters for acceptable use, designate governing jurisdictions for disputes, and outline termination procedures — creating a hybrid framework that combines automated execution with enforceable legal terms. This approach significantly enhances transactional certainty in NFT markets by bridging the gap between decentralized technology and established legal systems.

4.5 Dispute Resolution

As legal disputes involving NFTs become more frequent and complex, while traditional court systems are often too slow, costly, or too hard to handle the unique features of blockchain-based transactions. At the same time, most NFT platforms lack formal procedures for addressing intellectual property conflicts, including cases of unauthorized use, unclear licensing, or breach of token-linked agreements.

To address this gap, the on-chain intellectual property dispute resolution layer can offer an alternative solution, similar to DAOs

(*decentralized autonomous organizations*)². These bodies would evaluate disputes using blockchain-based evidence, including transaction records, metadata, and contract clauses. While their rulings would be binding within participating platforms, they could also be designed to meet procedural standards that make them admissible in formal legal contexts, where needed.

Such a mechanism could significantly reduce friction in enforcing rights and resolving licensing conflicts, especially across international jurisdictions where legal norms differ.

4.6 Jurisdictional Compatibility

A persistent challenge in NFT regulation is determining which legal system governs transaction. The borderless nature of blockchain technology complicates jurisdictional issues, particularly when buyers, sellers, and platforms operate across different countries with varying legal frameworks. Lack of clarity often results in legal uncertainty, making enforcement inconsistent and difficult in cross-border disputes.

It could be a potential solution to this challenge is that allow creators and purchasers to define the governing law and dispute resolution forums at the time of minting. By embedding these choices directly into the NFT's metadata in a standardized, machine-readable format, the relevant information becomes easily accessible and transparent throughout the asset's lifecycle. For example, an artist in Germany could specify that the NFT is governed by the EU Digital Copyright Directive and designate a Germany arbitration institution for dispute resolution. This would ensure that all subsequent owners and platforms clearly understand the legal framework, reducing confusion and preventing conflicting interpretations.

5. Conclusion

This paper examines the legal standing and conceptual nature of NFTs, technologies that persistently test conventional boundaries of ownership, licensing, and intellectual property protection. The analysis base on the fundamental technical architecture of NFTs,

¹ Putranti, D., & Putri, U. T. (2024). Enforcement of Copyright Law on Non-Fungible Token (NFT) Through Smart Contracts. *Kosmik Hukum*, 24(1), 40–51. <https://doi.org/10.30595/kosmikhukum.v24i1.18476>

² Prakash, I. B., Tiwari, A. K., & Hariharan, U. (2023). Fully on-chain DAO to invest in NFTs. *2023 4th International Conference on Smart Electronics and Communication (ICOSEC)*, 1–8. <https://doi.org/10.1109/ICOSEC58147.2023.10275875>

highlighting their role as cryptographic proof of authenticity and ownership history rather than as carriers of digital assets themselves. This crucial distinction explains the prevalence of legal conflicts in NFT markets, particularly when purchasers incorrectly believe acquiring a token automatically grants them underlying intellectual property rights.

The paper systematically examines how existing legal frameworks lack of governing NFT transactions. Through analysis of highlight case studies, it demonstrates how traditional legal doctrines and disconnected regulatory systems fail to resolve the unique challenges. These issues are further deepened by marketplace practices, as leading platforms often ignore to verify uploaded content or disclose the specific rights relevant to NFT sales. As a result, durable uncertainty affects all market participants, from artists and collectors to legal professionals in this field.

To address these challenges, this paper critically evaluates four dominant theoretical approaches to NFT classification and governance: property-based approaches, contractual and licensing frameworks, provenance-centered models, along with hybrid reform perspectives. While each approach offers valuable analytical insights, the analysis reveals key operational limitations in all of them. Property-based frameworks often conflict with established copyright doctrines; contractual models depend too heavily on unclear off-chain agreements; provenance systems ensure stable certification but fail to establish enforceable rights; and hybrid solutions, despite potential in theory, lack fully developed implementation strategies and face considerable jurisdictional barriers to adoption.

In light of these limitations, this paper proposes a novel governance framework specifically designed for NFT ecosystems. The model intentionally integrates legal principles with blockchain infrastructure to settle decentralized technologies with established enforcement systems. Unlike rigid regulatory approaches, this adaptive framework evolves alongside technological and market developments while preserving fundamental legal protections. It aims to protect intellectual property through transparent system, reach buyer expectations with legally recognized rights, and foster innovation within clear legal boundaries. As NFT applications grow swifter, such integrated

governance solutions will be crucial to build market confidence and supporting responsible growth in this rapidly developing field.

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