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ALGORITHMIC AND TERRITORIAL FRICTION: RETHINKING INTELLECTUAL PROPERTY RIGHTS, JUDICIAL NORMS, AND HYBRID ENFORCEMENT SOLUTIONS IN VIRTUAL ECOSYSTEMS

~ Subhranshu Acharya & Mehana Chakraborty

Abstract

As the world is witnessing the emergence of Metaverse, which is an immersive decentralised digital environment, there has been a sudden rise in unprecedented cross border economic and social activities which has facilitated transactions through the medium of virtual goods, NFTs, digital avatars and user generated content. This shift deviates from the conventional definition of Intellectual property and hence presents a notable threat in the territorial and national legal systems that is built on the roots of these grundnorm leading to substantial jurisdictional and enforcement gaps. This paper adopts a systemic literature review method by blending academic research, legal precedents, and policy documents to put forward how the core concepts of metaverse like user anonymity, decentralized blockchain structures, instantaneous duplication of digital assets, and borderless virtual economies unsettle the framework of traditional frameworks of intellectual property. With the help of comparative analysis of landmark case like *Hermès International v. Rothschild*, *Nike v. Stock X*, and *Juventus F.C. v. Blockeras,* the study puts forward the different challenges that the modern-day courts are facing in tackling with emerging virtual disputes while implementing the copyright and trademark doctrines. The paper further delves into the efficiency of international agreements like TRIPS and the Berne Convention in underlining the dispersion in global regulatory services. Alongside problem identification, this paper also proposes a hybrid framework that would bring together blockchain verification, cryptographic rights management, AI-based monitoring, legal harmonization with the help of model treaties and statutory reforms accompanying

decentralised arbitration mechanisms. The study concludes that effective, equitable, and sustainable IP enforcement in the metaverse requires coordinated international cooperation, collaborative multi-stakeholder governance models balancing robust IP protection with innovation incentives, user empowerment, and inclusive access. This research provides not only gives theoretical contributions to IP jurisprudence but also actionable recommendations for policymakers, platform operators, and creators.

Keywords: Metaverse Governance, Intellectual Property Enforcement, Jurisdictional Challenges, NFTs and Digital Assets, Hybrid Legal Framework

Introduction

The metaverse is a union of virtual reality, augmented reality and the internet which reflects a profound shift in how humans react, interact, create, and execute commerce in digital spaces.[1] A metaverse is a decentralized, immersive three-dimensional environment which is powered by blockchain technology. Metaverse has accelerated unprecedented economic activity. The global metaverse market is valued at $92.46 billion in 2023 and is projected to have an annual growth of 38.31 percent to touch $2,369.70 billion by 2033.[2] Within this broad ecosystem, the market for virtual goods alone is expected to reach 261.36 billion USD by 2030.[3] Users are transacting extensively through digital assets like non-fungible tokens (NFTs), virtual real estate, avatars, and user-generated content, thus creating a parallel virtual economy which challenges the traditional digital commerce.[4] However this rapid expansion has exposed the existing intellectual property framework to critical vulnerabilities.

Traditional intellectual property was structured for territorial nation-states where jurisdictional authority was described with the help of physical borders and rights holders can identify and pursue infringers within defined legal systems. But the metaverse shatters these assumptions. This is because users in the metaverse are getting involved in borderless cross-jurisdictional transactions, making the conventional IP doctrines which are based on the concepts of

[1] How Blockchain Powers the Metaverse Economy, Eur. Inst. Mgmt. & Tech. (Nov. 6, 2024), https://www.eimt.edu.eu/how-blockchain-powers-the-metaverse-economy.
[2] Metaverse Market Size, Share, and Trends 2024 to 2034, Precedence Research (May 29, 2025), https://www.precedenceresearch.com/metaverse-market.
[3] Virtual Goods Market Size, Forecast Report, Drivers & Trends, Mordor Intelligence (July 3, 2025), https://www.mordorintelligence.com/industry-reports/virtual-goods-market.
[4] Metaverse Virtual Assets – Worldwide, Statista (Jan. 8, 2025), https://www.statista.com/outlook/amo/metaverse/metaverse-virtual-assets/worldwide.

territoriality inadequate.[5] These tensions are reflected in high profile cases like in *Hermès International v. Rothschild,* where the primary question was if virtual replicas of trademarked goods constitute infringement. Then in *Nike v. Stock X,* the central question revolved around trademark dilution in digital marketplaces. Further in *Juventus F.C. v. Blockeras,* the issue was that blockchain-based asset creation challenged traditional notions of ownership and jurisdictional reach.[6] The prevailing enforcement mechanisms are not sound enough for the dynamic nature of metaverse.

The inability of current legal frameworks to address virtual economies represents a large problem that this paper is based upon. The four core questions this research will discuss are: (1) In what way do core metaverse technologies defeat traditional IP doctrines? (2) What are the substantive and procedural issues presented by attempting to apply copyright and trademark law to disputes in the metaverse? (3) To what extent are TRIPS and the Berne Convention able to meet the demands of protecting IP in virtual, borderless environments? and (4) What hybrid governance mechanisms will enable effective and fair metaverse IP enforcement?

This paper puts forward that effective metaverse IP governance can only be achieved with integrated hybrid frameworks that unite legal approaches with technological development. Sustainable protection requires harmonized international cooperation, multi-stakeholder models of governance, and harmonized statutory reforms in tandem, protecting rights holders and incentivizing innovation while preserving user empowerment and inclusive access. By systematically analysing the academic literature, comparative case law, and international legal instruments, this study identifies critical enforcement gaps and advances actionable remedies.

1. Metaverse Technology and Contemporary IP Framework: Foundational Concepts and Research Gaps

This section lays down the theoretical foundations integrating core metaverse technological characteristics with traditional intellectual property frameworks and identifying the areas that require a hybrid governance approach.

[5] IP Law in the Metaverse: Navigating New Challenges, Global Patent Filing (Mar. 5, 2025), https://www.globalpatentfiling.com/blog/The-Metaverse-Intellectual-Property-Challenges-in-a-Virtual-World.
[6] Intellectual Property Rights in the Metaverse: Protecting Digital Assets, Bar & Bench (Mar. 27, 2025), https://www.barandbench.com/view-point/intellectual-property-rights-in-the-metaverse-protecting-digital-assets-virtual-real-estate.

A. Core Metaverse Concepts

As we already know that the technical architecture of metaverse is fundamentally distinct from traditional digital platforms, and the most defining characteristic of it is definitely user anonymity. Blockchain based identity protocols enable users to engage in transactions and creative activity all of which by maintaining cryptographic privacy because of decentralized identity systems rather than centralized corporate verification.[7] Unlike conventional platforms where corporate databases store identifying information, decentralized identity solutions allow users to only disclose personal attributes through blockchain-secured credentials. This allows to preserve anonymity alongside enabling reputation and transaction verification.[8] This feature of pseudonymous interaction although enhance the user privacy and autonomy butat the same time is the reason behind the complication face by rights holder to identify infringers and pursue enforcement action.

Blockchain infrastructure and smart contracts is the foundation on which metaverse economics work. Smart Contracts are self-executing code that are present in distributed blockchain networks which automatically transfer digital assets, execute licensing agreements, and distribute royalties when the conditions which are decided beforehand gets satisfied.[9] These immutable transparent transaction records replace the traditional centralized intermediaries which allow peer-to-peer commerce in virtual goods without requiring to trust the platform operators or financial institutions.[10] The ERC-721 and ERC-1155 standards establish the inoperable protocols for creating and managing non-fungible tokens, this helps in encoding ownership information and transaction history directly into blockchain records instead of relying into centralized databases.[11]

Instantaneous digital asset duplication is another technical capacity which is not there in traditional copyright economies. Digital works which are stored as NFT metadata can be replicated with perfect results at virtually near to zero costs and infinite speed, distinguishing

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[7] Identity Decentralization and Blockchain, Identity Management Institute (Feb. 12, 2024), https://identitymanaementinstitute.org/identity-decentralization-and-blockchain.
[8] Assessing Privacy Risks for Emerging Metaverse and Web3 Environments, IEEE Dig. Priv. (May 12, 2025), https://digitalprivacy.ieee.org/publications/topics/assessing-privacy-risks-for-emerging-metaverse-and-web3-environments-and-pla.
[9] What Is an NFT Smart Contract?, Hedera (Sept. 11, 2022), https://hedera.com/learning/smart-contracts/nft-smart-contract.
[10] NFTs Use Smart Contracts — But What Exactly Are They?, AI Multiple (July 24, 2025), https://research.aimultiple.com/smart-contract-nft/.
[11] Id

metaverse infringement from physical counterfeit production.[12] Once this digital asset is reproduced and minted as a new NFT, the copy becomes cryptographically indistinguishable from the original except through examination of blockchain provenance records. This makes detection and remediation way too complex in comparison to traditional IP enforcement.

Borderless virtual economies operate across jurisdictions without geographic constraint of national borders. Users are using multiple metaverse platforms whether it be to purchase virtual goods, trading assets, and engaging in commerce using cryptocurrency or blockchain-based tokens in place of national currencies.[13] User-generated content and digital avatars are the central part of metaverse economics. Users create customized visual representations, clothing, accessories, and virtual real estate modifications. These creations comprise of personal expression and thus are potential intellectual property protected by copyright or trademark law.[14] This ambiguity of whether user-generated modifications constitute derivative works requiring protection remains unresolved with the prevailing framework.

B. Traditional IP Framework Overview

Intellectual Property is essentially based on the territorial principles grounded in national sovereignty. Each country has its exclusive right to grant IP and enforce it within its borders, thereby generating a fragmented landscape where rights granted in one jurisdiction provide no automatic protection in others.[15] This territorial model emerged from the pages of history where physical goods can be controlled at borders but these assumptions collapse in borderless virtual environments.[16]

Copyright, trademark, and patent protections create exclusive rights that allow creators to control the reproduction, distribution, and commercial exploitation of their works.[17] Copyright provides authors with exclusive rights of reproduction and adaptation. Trademark law protects signs that distinguish sources of commodified goods and services. Patent law grants

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[12] IP In The Metaverse: Protecting Rights In The Virtual World, LESI (Jan. 5, 2025), https://lesi.org/article-of-the-month/ip-in-the-metaverse-protecting-rights-in-the-virtual-world/.
[13] Decentralization In The Metaverse: How Blockchain Enhances Metaverse Development Platforms, Kalp Studio (Nov. 24, 2024), https://www.kalp.studio/blog/decentralization-in-the-metaverse-how-blockchain-enhances-metaverse-development-platforms.
[14] Metaverse and NFT IP Rights: Protecting your Digital Assets, Sagacious Research (Mar. 27, 2023), https://sagaciousresearch.com/blog/metaverse-and-nft-ip-rights-protecting-your-digital-assets/.
[15] IP Rights & Borders: Understanding the Territorial Principle, Sion IP (May 5, 2025), https://sion-ip.com/en/blog/understanding-the-territorial-principle-in-intellectual-property-protection/.
[16] Principle of Territoriality – National Rights, IP-PorTal, https://www.ippt.eu/legal-texts/fundamentals-eu-ip-law/2-international-harmonisation-ip-rights/fundamentals-eu-ip-law-1.
[17] Treaties for Intellectual Property Rights (IPR) Protection, IP Leaders (May 11, 2024), https://blog.ipleaders.in/leading-international-instruments-related-to-intellectual-property-rights/.

exclusivities to novel inventions for specified times. Each doctrine presumes identifiable owners, discrete infringing events, and a centralized enforcement apparatus-apparent prerequisites that metaverse applications often undermine, as duplication is instant, owners may use pseudonyms, and infringement takes place across a multitude of decentralized platforms.

The grundnorm concept of Hans Kelsen's legal positivism is that national legal systems derive authority from fundamental constitutional principles that are accepted by the people who are subject to be ruled.[18] Hence when virtual disputes arise involving users from multiple jurisdictions, no single legal system can claim absolute authority over the matter without infringing on the authority of the other.

C. Literature Review and Research Methodology

Systemic literature review methodology provides a rigorous way to identify and integrate existing scholarship on metaverse IP challenges. It is derived from structured searches across databases, journals, policy documents, and legal precedents using preset criteria, followed by thematic synthesis. This ensures that there is a comprehensive coverage and clearly highlight the research gaps unlike selective citation.

The key scholarly debates reveal persistent tensions between different approaches to governance. Scholarship bifurcates between those who advance technological approaches-blockchain verification, automated monitoring, and cryptographic watermarking-and others who advance legal harmonization and regulatory reform.[19] A substantial corpus of scholarship highlights that technology-only approaches suffer from democratic illegitimacy and neglect issues of distributional consequence, while law only approaches are considered inapt for rapidly changing technical systems.[20] There is an incipient consensus that effective, sustained metaverse IP governance requires an integrated approach that coordinates technological, legal, and governance mechanisms.

It discusses critical enforcement gaps that are inadequately addressed in the existing literature. The application of the territorial model to borderless virtual economies remains largely

[18] Territoriality in Intellectual Property Law: Examining the Tension Between Securing Societal Goals, Script-ed (Oct. 28, 2018), https://script-ed.org/article/territoriality-in-intellectual-property-law-examining-the-tension-between-securing-societal-goals.
[19] The Case of Copyright, Trademarks and the NFT Technology, Oñati Socio-Legal Series (Mar. 12, 2025), https://aber.apacsci.com/index.php/met/article/view/3056.
[20] Exploring Intellectual Property Rights In The Metaverse: Legal Challenges, NLU Assam (2024), https://www.nluassam.ac.in/docs/Journals/IPR/vol3-issue-1/5.%20Shakshi%20Gupta.

unaddressed; likewise, the interaction between instantaneous digital replication and traditional copyright remedies-which assume discrete infringing copies-deserves more detailed attention.[21] Cross-platform coordination of enforcement, interoperability standards that would allow asset migration across metaverse platforms, and decentralized mechanisms for dispute resolution are examples of topics that have emerged but are in great need of further development.[22]

International comparisons show significant divergence in the metaverse IP approach. While TRIPS and the Berne Convention establish some baseline international standards, their application to virtual economies remains uncertain; different jurisdictions-the European Union, the United States, Singapore, and China-are experimenting with divergent regulatory approaches, creating forum-shopping risks and global regulatory fragmentation.[23] The scholarly consensus is that there is an urgent need for harmonized international frameworks, but there is significant disagreement over what the optimal design parameters are.

2. Comparative Case Analysis: Emerging Judicial Responses

This section examines the three landmark metaverse IP disputes that shows how court applies the traditional IP doctrines to virtual goods and NFTs exposing the prevailing legal gaps and the procedural challenges.

A. *Hermès International v. Rothschild*

In February 2023, the U.S. District Court for the Southern District of New York observed artist Mason Rothschild liable for trademark infringement because of the sale of "MetaBirkin" NFTs, which is a digital artwork depicting stylized bags that had a close resemblance to the iconic Hermès Birkin handbags. It was minted as NFTs and sold for around $ 42000 per token.[24]

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[21] Supra note 19.
[22] Global Perspectives on Intellectual Property, CUSB Law Journal (2025), https://www.cusb.ac.in/images/dept/law/Journal_vol_1/Ms.%20Pooja%20Negi_Global%20Perspectives%20on%20IP.pdf.
[23] Overview of the Main International Conventions on Intellectual Property, Dreyfus Law (Oct. 7, 2025), https://www.dreyfus.fr/en/2025/10/08/overview-of-the-main-international-conventions-on-intellectual-property/.

[24] Case Review: Hermès International v. Rothschild, Arts L. (May 6, 2024), https://itsartlaw.org/case-review/case-review-hermes-v-rothschild/.

Hermès who had extensive trademark registrations for "Birkin" sued against Mason for copyright infringement and cybersquatting.[25]

The jury found that MetaBirkin NFTs infringed trademarks of Hermès and rejected Rothschild's defense of First Amendment artistic expression.[26] Under the test enunciated in *Rogers v. Grimaldi*, the court analysed whether the use of a trademark in an artistic work could be considered infringement based on both artistic relevance and the level of consumer confusion about the source or sponsorship of the work. While the Rogers test applied to expressive works, the jury found that the artistic relevance for MetaBirkins was slight, since Rothschild's motives were actually ones of commercial exploitation, especially in light of Hermès' announcement of its own authorized metaverse NFTs.[27]

In determining the case against Rothschild, the court invoked traditional territorial principles: U.S. consumer targeting, dollar-denominated transactions, and apparent U.S.-based infringement.[28] The judgment, however, opens up territorial assumption vulnerabilities: Rothschild could have moved himself to permissive jurisdictions, transferred domains internationally, or minted replacement NFTs on alternative blockchain networks. Further, a damage award of $133,000 proves laughably insufficient in light of instantaneous capability to duplicate NFTs.

The opinion in Hermès creates binding precedent for the proposition that trademark law applies to NFTs, but offers little useful guidance on distinguishing legitimate artistic expression from infringing commercial exploitation in metaverse contexts. The Rogers test, which was developed for discrete artistic titles, is poorly calibrated for metaverse creators who continuously create variants and deploy them across platforms. The judgment also has nothing to say about user-generated content that modifies protected designs, or how exhaustion doctrine will be applied to infinitely reproducible NFTs.

B. *Nike v StockX*

[25] Metaverse and IP- Hermes v. Rothschild, SS Rana (Oct. 24, 2023), https://ssrana.in/articles/run-for-your-runway-rights-in-the-metaverse/.
[26] Lessons Gleaned from the MetaBirkin Case on Appeal, Venable LLP (Nov. 4, 2024), https://www.venable.com/insights/publications/2024/11/lessons-gleaned-from-the-metabirkin-case-on.
[27] Supra note 27.
[28] A Critical Analysis of Hermès v. Rothschild, Indian J. Arts & L. Rev. (Mar. 5, 2023), https://ijalr.in/volume-3-issue-3-2023/a-critical-analysis-of-hermes-v-rothschild-vis-a-vis-trademark-infringement-dilution-and.

Nike initiated trademark infringement claims against StockX in February 2022 in the U.S. District Court for the Southern District of New York.[29] StockX had launched "Vault NFTs" enabling customers to authenticate and trade physical Nike shoes through blockchain-based digital tokens representing ownership claims.[30] Nike alleged prominent trademark use, marketing leveraging brand goodwill, and sales at inflated prices to consumers likely believing the NFTs were authorized by Nike. StockX defended conduct as permissible under trademark exhaustion doctrine and nominative fair use.[31]

The NFTs of StockX simultaneously served as authentication certificates for physical goods, tradeable investment assets commanding resale premiums, and trademark-bearing product representations.[32] Nike was primarily concerned that consumers would be confused into thinking Vault NFTs were authorized Nike collectibles rather than third-party authentication tokens, especially in light of Nike's own concurrent launch of an NFT program. This is where trademark rights and authentication function intersect, and there is real doctrinal tension.

In August 2025, Judge Valerie Caproni granted Nike's summary judgment on counterfeiting claims, finding that StockX had sold counterfeit Nike shoes. Nike and StockX later settled in August 2025 before trial under confidential terms, likely prompting StockX to discontinue its Vault NFT program. This enforcement outcome illustrates how courts are able to force changes in platform behaviour by the threat of litigation, but gives little indication as to how operations in permissive jurisdictions can be dealt with.

Nike-StockX reveals critical gaps: trademark exhaustion assumes discrete products moving through traditional commerce, its application to infinitely reproducible NFTs is undecided. Trademark law has limited guidance on how to differentiate permissible nominative fair use from impermissible infringement when marks are used to create authorization confusion. Lack of NFT authentication standards puts platforms in a position to manipulate brand goodwill by implicit association rather than honest trademark use.

C. *Juventus F.C. v Blockeras*

[29] Nike Settles Lawsuit Against StockX Over NFTs, Counterfeiting, Reuters (Aug. 29, 2025), https://www.reuters.com/legal/litigation/nike-settles-lawsuit-against-stockx-over-nfts-counterfeiting-2025-08-29/.
[30] Nike v. StockX: A Timeline Behind the Trademark Lawsuit, The Fashion L. (Aug. 31, 2025), https://www.thefashionlaw.com/nike-v-stockx-a-timeline-behind-the-trademark-lawsuit/.
[31] Nike vs StockX: Trade Marks, NFTs and the Metaverse, Wilson Gunn (June 29, 2022), https://www.wilsongunn.com/resource/news/nike-vs-stockx-trade-marks-nfts-and-the-metaverse.
[32] Supra note 30.

In January 2023, the Rome Court of First Instance in Italy issued a preliminary injunction against Blockeras, holding that unauthorized NFT trading cards featuring Juventus players wearing the club's distinctive jersey and displaying registered "JUVENTUS" marks infringed the trademark.[33] While Blockeras licensed images of the players, Juventus had not given permission to reproduce its trademarks or represent its jersey design.[34] Blockeras similarly argued that trademark registrations did not expressly claim "NFT" categories, and player image reproductions were protected under copyright law.[35]

The source of the Rome court's jurisdiction was traditional territorial principles: Blockeras maintained EU operations, and NFTs were accessible to EU consumers. However, practical enforceability depends critically on Blockeras' compliance; the ruling provides no mechanism for compelling removal from globally-operated blockchain networks.[36]

Blockeras evaded EU injunctions by shifting operations abroad, revealing decentralization's limits to enforcement. Unlike U.S. cases based on centralized platforms, its model raised questions when NFTs remained accessible outside Italian oversight. Juventus v. Blockeras followed Hermès v. Rothschild with regard to trademarks, but Italy emphasized confusion/unfair competition over expressive use. Metaverse trademark law is evolving differently: U.S. courts often focus on expressive use; Europe focuses on consumer protection.

3. International Legal Framework Assessment

A. TRIPS Agreement Analysis

The TRIPS Agreement sets minimum standards of IP protection that all WTO member states are required to implement domestically.[37] TRIPS was architected on fundamental territorial assumptions-that rights holders can identify jurisdictions where infringement occurs, national

[33] Juventus FC Secures Landmark Ruling Securing Trade Mark Rights For NFTs, Law in Sport (n.d.), https://www.lawinsport.com/topics/item/juventus-fc-secures-landmark-ruling-securing-trade-mark-rights-for-nfts.
[34] NFT Infringes Trade Mark Rights - Italian Court Grants Injunction, HSF Kramer (Jan. 9, 2023), https://www.hsfkramer.com/notes/ip/2023-01/nft-infringes-trade-mark-rights-finds-italian-court-in-juventus-case.
[35] Supra note 36.
[36] Bollywood Buzzing Over NFTS, Anand & Anand (Oct. 25, 2023), https://www.anandandanand.com/news-insights/bollywood-buzzing-over-nfts/.
[37] Trade-Related Aspects of Intellectual Property Rights (TRIPS), World Trade Org., https://www.jeanmonnetprogram.org/wp-content/uploads/WTO-Unit-11-TRIPS-2016-editon.pdf.

courts possess authority to remedy violations within borders, and domestic enforcement mechanisms adequately address infringement.[38]

Application to metaverse environments raises several critical challenges. Virtual goods, NFTs, and user-generated content were not envisioned when TRIPS was negotiated in 1994; the agreement provides little guidance on whether digital asset reproduction constitutes copyright infringement.[39] More broadly, TRIPS presumes that member states are able to apply IP rights consistently within territories; yet metaverse transactions take place simultaneously across multiple jurisdictions, instantaneously creating copies of protected works and making it impossible to determine the location of infringing activity.[40] Jurisdictional constraints become extreme: when the creation of an NFT takes place in multiple countries with decentralized blockchain activity, TRIPS offers no means for determining which jurisdiction's copyright law applies or which courts have authority.[41] The resulting jurisdictional fragmentation gives rise to enforcement arbitrage-that is, rights holders cannot reliably pursue infringers.

B. Berne Convention Evaluation

The Berne Convention for the Protection of Literary and Artistic Works, which 181 nations have signed, requires that contracting parties extend to authors exclusive rights of reproduction and adaptation regardless of the form in which the expressive work has been embodied.[42] Nevertheless, the Convention has very limited provisions addressing copyright protection in digital environments, especially instantaneous reproduction and distribution carried out through decentralized networks.

Copyright protection for virtual works presents unresolved challenges. While the Convention grants exclusive reproduction rights, in metaverse environments instantaneous, perfect-fidelity duplication occurs trivially—a metaverse user can copy digital artwork with technological cost

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[38] Introduction to TRIPS Agreement, Japan Patent Off., https://www.jpo.go.jp/e/news/kokusai/developing/training/textbook/document/index/TRIPs_Agreement.pdf.

[39] Building An IP Governance Framework For The Metaverse, Int'l J. L. Soc. & Soc. Servs. (Aug. 4, 2025), https://ijlsss.com/building-an-ip-governance-framework-for-the-metaverse-lessons-from-traditional-and-digital-ip-regimes/.

[40] Supra note 40.

[41] Jurisdiction and Enforcement Issues in the Metaverse, Int'l Trademark Ass'n (Dec. 18, 2023), https://www.inta.org/wp-content/uploads/public-files/advocacy/committee-reports/20231218_JURISDICTION-AND-ENFORCEMENT-ISSUES-IN-THE-METAVERSE.

[42] The Metaverse, NFTs and IP Rights: To Regulate or Not to Regulate, WIPO Magazine (June 18, 2022), https://www.wipo.int/en/web/wipo-magazine/articles/the-metaverse-nfts-and-ip-rights-to-regulate-or-not-to-regulate-42603.

approaching zero.[43] Traditional reproduction doctrine assumes discrete, deliberate copying acts; metaverse architecture renders duplication a default characteristic, complicating whether unauthorized reproduction has occurred.[44] User-generated content creates additional complexity: when users create derivative works and transformative content based upon protected works, Berne Convention frameworks offer minimal guidance regarding whether such activity constitutes infringing reproduction.[45] The national treatment principle presumes centralized enforcement mechanisms; in decentralized platforms where content replicates across multiple jurisdictions, identifying which national treatment obligations apply becomes indeterminate.

C. Regulatory Dispersion

Without comprehensive international metaverse IP governance, individual jurisdictions apply divergent approaches that produce global regulatory fragmentation.[46] The European Union focuses on copyright protection through the Digital Services Act; the United States keeps Section 230 immunity for platforms; Singapore tests blockchain-based IP registries; and India is considering an expansion of trademark classification to virtual goods.[47] This regulatory divergence generates forum shopping by rights holders seeking litigation in friendly jurisdictions, and jurisdictional arbitrage by infringers locating in permissive jurisdictions. No international institution has the authority or power to harmonize metaverse IP rules; although WIPO coordinates policy, it lacks the enforcement ability to force decentralized platforms operating across national sovereignty to conform to uniform standards.

4. Bridging Governance Gaps: From Jurisdictional Challenges to Hybrid IP Solutions

A. Identifying Critical Challenges

Traditional IP law presumes national court jurisdiction over geographically identifiable infringement. Decentralized blockchain networks and metaverse transactions across multiple

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[43] Copyright Protection for AI-Generated Works: Exploring Originality's Impact on Copyright Regulations, Cambridge J. Int'l L. (Jan. 5, 2025), https://www.cambridge.org/core/journals/asian-journal-of-international-law/article/copyright-protection-for-aigenerated-works-ex.
[44] User-Generated Content and Copyright Dilemma in Web, Diva Portal (2019), https://www.diva-portal.org/smash/get/diva2:1324356/FULLTEXT01.pdf.
[45] Supra note 45.
[46] Metaverse - European Parliament (2024), https://www.europarl.europa.eu/cmsdata/268589/eprs-briefing-metaverse_EN.pdf.
[47] Emerging Regulations in the Metaverse, Deloitte Insights (Oct. 6, 2025), https://www.deloitte.com/us/en/insights/industry/technology/emerging-regulations-in-the-metaverse.html.

jurisdictions simultaneously upset that presumption.[48] User anonymity makes it impossible for rights holders to identify infringing parties, complicating traditional litigation. Instantaneous digital asset replication, enabling perfect-fidelity copying at no cost, renders obsolete traditional copyright remedies premised on discrete infringing copies.[49] Blockchain immutability creates enforcement paradoxes: courts can issue takedown orders, yet NFTs remain operational on immutable distributed ledgers outside the judicial jurisdiction.[50] Cross-platform interoperability enables asset migration across environments, complicating enforcement coordination. Doctrinal frameworks-territoriality principles, exhaustion doctrine, and fair use analysis-fail when applied to instantaneous, infinitely reproducible virtual assets because they were designed for a world of centralized, scarce goods.

B. Proposed Integrated Solutions

Smart contract-based rights registries using blockchain verification systems create tamper-proof ownership records and allow for the automation of licensing enforcement at the moment of transaction execution.[51] Cryptographic rights management through digital watermarking embeds ownership markers imperceptible to compression and editing, thus enabling the automated detection of unauthorized copies.[52] Standardized NFT metadata schemas tracking creator identity, transaction history, licensing permissions, and royalty distribution allow for interoperability within and across metaverse platforms. AI-powered monitoring systems use perceptual hashing algorithms that identify visually similar images in billions of indexed assets and detect infringement in 24-48 hours.[53]

Model treaty frameworks should clearly acknowledge virtual goods and NFTs as subject matter of copyright and trademark protection, providing that creation of digital replicas is actionable infringement, regardless of the geography of the platform on which such replication occurs.[54]

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[48] Jurisdiction and Enforcement Issues in the Metaverse, Int'l Trademark Ass'n (Dec. 18, 2023), https://www.inta.org/wp-content/uploads/public-files/advocacy/committee-reports/20231218_JURISDICTION-AND-ENFORCEMENT-ISSUES-IN-THE-METAVERSE.
[49] IP In The Metaverse: Protecting Rights In The Virtual World, LESI (Jan. 5, 2025), https://lesi.org/article-of-the-month/ip-in-the-metaverse-protecting-rights-in-the-virtual-world/.
[50] Legal Challenges in Virtual Worlds and Digital Assets, SSRN (May 19, 2025), https://papers.ssrn.com/sol3/Delivery.cfm/5267789.pdf?abstractid=5267789&mirid=1.
[51] How Blockchain Powers the Metaverse Economy, Eur. Inst. Mgmt. & Tech. (Nov. 6, 2024), https://www.eimt.edu.eu/how-blockchain-powers-the-metaverse-economy.
[52] AI Content Protection: Watermarking, Blockchain & Leak Detection, Tech Arion (Nov. 10, 2025), https://techarion.com/blog/protecting-ai-generated-content-watermarking-blockchain-leak-detection.
[53] Supra note 53.
[54] Building An IP Governance Framework For The Metaverse, Int'l J. L. Soc. & Soc. Servs. (Aug. 4, 2025), https://ijlsss.com/building-an-ip-governance-framework-for-the-metaverse-lessons-from-traditional-and-digital-ip-regimes/.

Statutory reform is warranted to bring copyright law current with recognition that NFT storage is reproduction requiring authorization, and to revise trademark law to provide that virtual replicas constitute trademark use in commerce. Presumptive damages frameworks-US$750-30,000 per work-calibrated to the instantaneous duplication capability of the metaverse-provide remedies proportionate to the enforcement challenge.[55] Conflict-of-law rules should be uniform in providing that IP rights are governed by the domicile of the rights holder at the time of infringement to ensure consistent protection across jurisdictions.

Multi-stakeholder governance models ensure legitimacy across diverse jurisdictions with authority distributed across platform operators, creators, users, and regulatory authorities.[56] The blockchain-based arbitration mechanisms with smart contract enforcement avoid post-award delays from traditional systems since disputed assets are automatically transferred on cryptographic verification that settlement conditions are satisfied.[57] Incentive structures through automated royalty distribution using smart contracts put in place sustainable creator monetization. User-empowerment provisions, which guarantee creators the right to revoke licenses on platforms and to migrate assets by interoperability standards, avoid platform capture of creator value. This integration of technology verification, legal harmonization, and participatory governance Responds to systematic governance failures of purely technological or purely legal approaches at establishing equitable, sustainable, and scalable metaverse IP enforcement.

5. Conclusions and Recommendations: Toward Sustainable Metaverse IP Governance

Effective metaverse intellectual property enforcement requires integrated coordination of technological, legal, and governance mechanisms, rather than siloed approaches. This paper has shown, through comparative case analysis, that while contemporary courts recognize NFT trademark infringement as actionable, they employ divergent doctrines that provide inconsistent guidance on critical questions regarding exhaustion, fair use, and appropriate

[55] NFTs and Copyright Law: The Collision of Digital Ownership, Smart Contracts, and the Right of Attribution, CSR IP & Law (July 3, 2025), https://csriprnusrl.wordpress.com/2025/07/04/nfts-and-copyright-law-the-collision-of-digital-ownership-smart-contracts-and-the-r/.
[56] Decentralization In The Metaverse And Metaverse Governance, Games Pad (Jan. 8, 2024), https://gamespad.io/decentralization-in-the-metaverse-and-metaverse-governance-who-is-in-control/.
[57] Decentralized Dispute Resolution: Using Blockchain Technology and Smart Contracts in Arbitration, Pepperdine Disp. Resol. L.J. (2024), https://digitalcommons.pepperdine.edu/cgi/viewcontent.cgi?article=1547&context=drlj.

remedies.[58] International frameworks such as TRIPS and the Berne Convention, premised on territorial assumptions, are patently ill-suited to resolve questions arising out of borderless virtual economies in which instantaneous digital asset duplication and decentralized platforms now overcome traditional jurisdictional boundaries.[59]

It does this by proposing a hybrid framework that incorporates blockchain verification systems, cryptographic rights management, AI-based monitoring, coordinated legal harmonization through model treaties, statutory reforms, and decentralized multi-stakeholder governance to address systematic enforcement gaps.[60] It recognizes that technology alone lacks democratic legitimacy; legal reform absent technological implementation remains aspirational; and governance structures must remain adaptable as the metaverse technologies evolve.[61]

Legislators need to create statutory reforms that clearly protect virtual goods and NFTs under copyright and trademark law and provide presumed damages calibrated to metaverse infringement characteristics. International organizations such as WIPO must negotiate binding treaties that set minimum IP standards applicable across jurisdictions, with conflict-of-law rules specifying that IP rights are governed by rights holder domicile.[62] Platform operators should adopt industry-standard content recognition and verification systems and should be subject to liability for infringements they fail to remediate. Finally, IP practitioners must be updated on how to pursue jurisdictional strategies, blockchain-based evidence standards, and alternative dispute resolution mechanisms.

It must protect the exclusive rights of creators, incentivize further innovation, preserve user participation and creative expression, and ensure inclusive access by preventing economic barriers to entry in the metaverse.[63] On the one hand, multi-stakeholder governance models, in which stakeholders can vote on enforcement parameters, institutionalize ongoing calibration rather than impose fixed rules. Solution implementation would call for phased approaches, such

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[58] Case Review: Hermès International v. Rothschild, Arts L. (May 6, 2024), https://itsartlaw.org/case-review/case-review-hermes-v-rothschild/.
[59] Building An IP Governance Framework For The Metaverse, Int'l J. L. Soc. & Soc. Servs. (Aug. 4, 2025), https://ijlsss.com/building-an-ip-governance-framework-for-the-metaverse-lessons-from-traditional-and-digital-ip-regimes/.
[60] How Blockchain Powers the Metaverse Economy, Eur. Inst. Mgmt. & Tech. (Nov. 6, 2024), https://www.eimt.edu.eu/how-blockchain-powers-the-metaverse-economy.
[61] AI Content Protection: Watermarking, Blockchain & Leak Detection, Tech Arion (Nov. 10, 2025), https://techarion.com/blog/protecting-ai-generated-content-watermarking-blockchain-leak-detection.
[62] Jurisdiction and Enforcement Issues in the Metaverse, Int'l Trademark Ass'n (Dec. 18, 2023), https://www.inta.org/wp-content/uploads/public-files/advocacy/committee-reports/20231218_JURISDICTION-AND-ENFORCEMENT-ISSUES-IN-THE-METAVERSE.
[63] Decentralization In The Metaverse And Metaverse Governance, Games Pad (Jan. 8, 2024), https://gamespad.io/decentralization-in-the-metaverse-and-metaverse-governance-who-is-in-control/.

as baseline standardization, piloting of blockchain-based arbitration, and gradual scaling of AI-powered monitoring capabilities, allowing iterative refinement based on real-world performance data.

This research contributes both theoretical insights to IP jurisprudence and actionable recommendations for policymakers, showing that the equitable and effective enforcement of metaverse IP arises through concerted international cooperation, collaborative multi-stakeholder governance, and balanced protection mechanisms advancing simultaneously the interests of creators, platform innovation, and user empowerment.