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INTELLECTUAL PROPERTY AND THE METAVERSE: NEW FRONTIERS OF VIRTUAL OWNERSHIP

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Abstract

The Metaverse is more than just a passing tech trend—it represents a dramatic change in how people connect online. It merges physical and digital realities, forming immersive spaces where users do more than message or browse—they create, possess, and exchange digital assets. All of this is powered by decentralized technologies like block chain, distributed ledgers, artificial intelligence, and both augmented and virtual reality. These aren't just bells and whistles. They force a revaluation of basic legal ideas: What does property mean? Who qualifies as a person online? Who is liable when problems arise in a world that barely intersects with the physical one? This paper explores the transformation of digital property rights within the Metaverse. It examines Web3, NFTs, and smart contracts—technologies that go beyond buzzwords and are actively redefining concepts of ownership and exchange. Property in these digital spaces isn't just about controlling a password or private key; genuine ownership requires recognition that's deeper than holding a few tokens. The research also scrutinizes smart contracts, contending that regulation can't be left solely to code. What's needed is a hybrid—solid technological frameworks supported by real human oversight. That's essential for fairness and meaningful consent. Jurisdiction presents some of the most complex challenges. Decentralized environments disregard national borders, making traditional rules of legal authority inadequate. Who bears responsibility—the user, the platform, or a dispersed set of anonymous developers? There's no settled answer yet, highlighting the urgent need for international standards that truly reflect how these environments function. The paper also focuses on data ownership and privacy, insisting that people must have genuine control over their personal information—a principle digital law can no longer ignore. From my viewpoint, the Metaverse is not just another digital space. It is pushing legal thinking into new realms. Digital property needs a recognized place in the law, with protections based on fairness and clear accountability. Ultimately, the paper argues for a new kind of digital legal system—one that doesn't merely follow the latest craze, but strikes a balance between innovation and justice. The Metaverse should develop into an environment where the rule of law and digital freedom work together, and where human rights remain fundamental, no matter how virtual the context becomes.

Key words: digital, Metaverse, protections, virtual, hybrid

Introduction

The Metaverse isn't just another upgrade to the Internet—it's something else entirely. Here, people don't just browse or scroll. They step into a virtual world that feels real, where you can buy digital land, create art, own NFTs, or interact with algorithmic creations like they're physical things. With all this happening, our old ideas about ownership, creativity, and rights start to feel shaky. What does it mean to "own" a song, a building, or a piece of art that exists only in a digital universe? Can the laws that protect intellectual property in the physical world actually work in a space where everything is

code? Technology keeps racing ahead. Artificial intelligence, block chain, distributed ledger technologies—these tools are reshaping the lines between what's virtual and what's real. The result? Intellectual property law faces challenges it's never seen before. Sometimes, the rules bend. Sometimes, they break. The Metaverse pushes us to rethink not just the details, but the entire foundation of how we manage ownership and creativity online. This paper dives into these issues at the intersection of IP and the Metaverse. I examine how legal views of property are shifting as crypto tokens and digital assets become more central[795], how standard-setting organizations start to influence the rules of the game in these networked worlds[796], and what happens when AI and big data start driving resource profiling and IP management[797]. The discussion covers not just the legal and policy implications, but also the technical backbone of the Metaverse, the struggle to keep virtual environments trustworthy and secure, and where we need to go next to make sure creators are protected, innovation thrives, and fairness isn't lost along the way.

The Evolution of the Metaverse

The Metaverse used to be pure science fiction—just a wild idea in Neal Stephenson's 1992 novel Snow Crash. There, people moved through a virtual universe as avatars, living in a parallel digital society with its own rules and economy. Fast forward to today, and the Metaverse is no longer just a plot device. It's a fast-growing network of immersive, interconnected digital worlds. People blend physical and virtual life, thanks to VR, AR, block chain, AI, and high-speed 5G[798].Unlike the old Internet, where you just clicked through websites and read information, the Metaverse drops you right inside the action. Here, you build, own, and trade digital assets—sometimes for real money. You show up as an avatar, hang out with friends across the globe, shop or sell using crypto-tokens, and join concerts or classes that aren't tied to any real-world address. The whole idea flips the digital economy on its head. Creativity, identity, and ownership break free from physical limits. Three core ideas hold up the Metaverse: immersion, persistence, and interoperability. Immersion means the virtual world feels real—thanks to VR and AR, you're not just looking at a screen, you're inside it. Persistence means these spaces keep running and changing, even when you log out. Interoperability, powered by block chain and shared standards, lets you carry your digital stuff—your avatar, your NFT, your gear—from one platform to another. Together, these features push the Metaverse beyond the old Web 2.0, setting the stage for Web3, where users—not corporations—own the digital world. The Metaverse already fuels whole industries. Gaming, entertainment, education, and even real estate are shifting. Companies snap up virtual land, sell digital clothes, and trade NFT art. The virtual economy is real, with money and jobs on the line. But this new world isn't simple. Who really owns a digital asset? Who gets to set the rules, or profit? Legal and ethical questions—about property, copyright, and control—are piling up fast. So, the Metaverse isn't just a tech upgrade. It's a sweeping change in how we think about property, identity, and community. As more people invest their time, money, and creativity in these digital spaces, we have to rethink our legal and ethical playbook. The Metaverse isn't just another website. It's the next frontier, and we're all figuring out the rules as we go.

Distributed Ledger Technology, Tokens, and Digital Assets

Distributed Ledger Technology, or DLT—think block chain—forms the backbone of the Metaverse's economic and legal structures. The main draw of block chain is its ability to provide a record of ownership and transactions that is open, decentralized, and hard to alter. This is crucial in digital environments where traditional intermediaries are absent. Rather than concentrating power in one authority, block

[795] Wyczik, 2023
[796] Lemley, 2000
[797] Duin & Pedersen, 2023; Wang et al., 2022
[798] Chen et al., 2023.

chain distributes control across a network. Every participant keeps a copy of the ledger, which removes any single point of failure. This arrangement fuels the digital economy within the Metaverse, where tokens—cryptographically secured digital representations of value or rights—serve as the essential units of virtual ownership[799] .Tokens are not all alike. Some are fungible, while others are not. Fungible tokens, such as Bitcoin or Ether, are interchangeable—each one has the same value as another and is often used for trading or transactions. Non-Fungible Tokens (NFTs) are different. Every NFT is distinct, representing a particular digital asset, like a digital artwork, a piece of virtual land, or a collectible in a game. The block chain assigns each NFT a unique identifier, preserving its authenticity and provenance. As a result, digital assets can be owned and traded similarly to physical goods, expanding the concept of ownership into the digital realm. Wyczik (2023) categorizes token-based digital assets into three layers of rights. The first layer is the token itself—possessing it means you control it, and you have the ability to transfer or trade it. The second layer consists of rights linked to what the token represents—such as access to certain services, entitlement to royalties, or specific benefits. The third and most complex layer involves intellectual property tied to the underlying content—like copyright on digital creations or software. Each of these layers is governed by its own legal frameworks, making it complicated to determine exactly what ownership entails. However, the transparency and security of block chain come with certain challenges. Decentralization complicates legal matters: Which laws apply, how are contracts enforced? How is intellectual property safeguarded? Other concerns also arise—how lasting is digital ownership? What about privacy of data? And are smart contracts legally binding? In summary, Distributed Ledger Technology and tokenization[800] are foundational to the Metaverse's digital economy, introducing new forms of digital ownership. At the same time, they require us to reconsider legal and regulatory approaches to foster innovation and protect participants in this borderless [801]online environment.

AI, Augmentation Technologies, and the Enculturation of Virtual Goods

Artificial Intelligence and augmentation technologies are transforming how we create, experience, and own virtual goods in the Metaverse. These tools aren't just automating simple tasks—they're introducing smart, adaptive systems that can design, modify, and interact with digital environments in ways that sometimes match or even surpass what humans can do[802]. Duin and Pedersen (2023) note that when AI and extended reality (XR) are combined, a new partnership forms between people and machines, with both sharing agency and creativity. This ongoing exchange—referred to as "enculturation"—means that humans and technology continuously adapt to each other, opening up new forms of expression, interaction, and ownership online. With AI-powered augmentation, users are able to build virtual spaces, avatars, and digital art that actually respond to real-time events. Machine learning takes care of complex tasks, producing realistic landscapes, digital items, or even characters that move independently within the Metaverse. Augmented reality (AR) adds another layer, merging digital experiences with the physical world. The outcome is an immersive culture where creativity and ownership aren't limited to humans—machines play a role as well. Naturally, this starts to blur traditional boundaries about who the real creator or owner is, especially in terms of intellectual property law. When AI generates a new artwork or digital object, it's often unclear who holds ownership. Is it the coder, the user who provided the prompt, or the AI itself? The emergence of Decentralized Autonomous Organizations (DAOs) and smart contracts

[799] Wyczik, 2023)
[800] Koulu, 2022
[801] Reese, 2023
[802] Duin and Pedersen (2023)

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complicates things further, allowing groups to manage digital assets and creative rights through code, without direct human involvement. Duin and Pedersen (2023) argue that this challenges conventional, human-focused ideas about creativity and authority. The law will need to catch up. Introducing AI into the Metaverse also raises ethical and societal concerns. Machines that generate art, narratives, or environments can inherit biases from their training data, spreading stereotypes or excluding certain groups. Ensuring that AI-driven creation remains transparent, accountable, and inclusive is not just important—it's critical for effective policy.

The Concept of Property in Digital and Virtual Contexts

The rise of the Metaverse is forcing us to rethink old-school property law. For ages, legal thinkers drew a sharp line between things you can touch—like land or your favourite mug—and things you can't, like music files or digital art. They used to say property is just a "bundle of rights": you get to possess, use, and get rid of something, and everyone else has to respect that. If you can hold it, you can hand it over. But if it's intangible—think copyrights or digital files—it's more about value than physical control. Now, with the Metaverse, that neat split between physical and digital property is fading fast. Digital goods are everywhere. Crypto-tokens, NFTs, virtual land, avatars—you name it. These things only exist inside code and servers. You can copy them endlessly, and they zip around global networks that don't care about borders. So, what does it really mean to "own" something like that, points out that digital assets have more in common with intellectual property than with traditional property. Their value depends on creative work, code, and the community agreeing they're real—not on who physically holds them. Courts and lawmakers are scrambling to catch up. In places like England, New Zealand, and the U.S., judges have started to treat crypto-tokens as personal property. You can own them, sell them, and protect them under the law. Over in Germany and Austria, legal experts are wrestling with how to fit these digital assets into their property rules. But honestly, it's still a patchwork. There's no worldwide agreement on what digital ownership really means. This legal confusion puts Metaverse users and creators at risk. Without solid property rights[803], digital stuff mostly falls under contracts—terms set by the platforms themselves. That gives platform owners a ton of power. They can limit what users do with their assets, block transfers, or even cut people off completely. It goes against the whole decentralized spirit that Web3 promises. If we want the virtual world to be fair and trustworthy, property law has to catch up. We need to treat digital assets—data, tokens, all of it—as real property, with rights to control, use, and exclude others, just like with physical things. That shift isn't just about clearing up legal confusion. It's about making sure people have real power, security, and freedom in the new digital frontier.

Multi-Layered Property Rights in Web3 and the Metaverse

The Metaverse is changing our ideas about ownership. Built on Web3, it doesn't just repeat what traditional property law does. In the physical world, owning something usually means full control—you can use, sell, or enjoy it however you want. In the Metaverse, things get more complicated. Here, "ownership" is split between technology, contracts, and legal systems, each with its own rules about what it means to control a digital asset. Property is less about holding something and more about access, following platform policies, and understanding how these different parts fit together. Start with technology. Block chain is at the centre, using cryptography to define ownership. If you hold the private keys to an NFT or cryptocurrency, you control that asset directly, with no intermediaries. But this control only reaches as far as the block chain. If you own an NFT, you have the token—but you might not have the rights to the music or art it links to.

[803] Lemley, 2000

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Those rights can remain with someone else, leaving a gap between what's recorded on-chain and what you actually control (Reese, 2023). Next is the contractual layer. Platforms set the terms with smart contracts and user agreements. Smart contracts automate deals, but broader platform rules often restrict what you can really do with your assets. If you buy virtual land, you might just get a license to use it, not actual ownership. The platform often stays in control, able to update terms, freeze accounts, or even revoke access. So, your property rights in the Metaverse often depend on the decisions of the platform operator. The legal system is still trying to catch up, working to fit these digital assets into traditional property categories. Courts and lawmakers are starting to recognize that block chain-based assets need legal protection, but with no clear or consistent standards across jurisdictions, enforcement is uneven and uncertain. These three layers—technology, contracts, and law—combine to create a new, hybrid form of ownership. In Web3, owning something depends on code, platform rules, and changing legal structures, not on a single, clear right. Regulators have a big task ahead if they want to protect users and enable true digital autonomy. The Metaverse promises digital sovereignty, but also reveals how confusing and unsettled ownership has become in a decentralized world.

NFTs as Property: Rights, Ownership, and Legal Recognition

NFTs have rapidly emerged as the hallmark digital assets of Web3, disrupting traditional notions of property, ownership, and intellectual rights. An NFT is essentially a unique token recorded on a block chain, representing proof of ownership or authenticity over something—most often digital art, collectibles[804], or virtual land. In contrast to Bitcoin and other cryptocurrencies, which are fungible and interchangeable, each NFT carries a distinct code. This makes them more akin to owning a rare artwork than to holding currency. Yet, the legal landscape remains behind; what it actually means to "own" an NFT varies by jurisdiction. From a technical perspective, NFT ownership comes down to one thing: whoever controls the private key for the block chain address that holds the token. Possessing the key allows you to sell, transfer, or display the NFT—much like having the keys to a vehicle. However, this authority is entirely digital. It doesn't automatically grant ownership of the rights to the art or media associated with the NFT. Purchasing an NFT linked to an image does not mean you own the copyright to that image, unless a separate, explicit agreement states otherwise. This disconnect between the token and the underlying asset lies at the core of most legal disputes involving NFTs. Courts and regulators are beginning to treat NFTs as a new category of property, recognizing that they can be owned and protected just like any other asset. In 2022, the High Court of England and Wales ruled in Lavandeira v. Persons Unknown that NFTs qualify as personal property, enabling courts to restrict unauthorized transfers. The United States and Singapore are moving in a similar direction, classifying NFTs as intangible property under asset protection laws. Nevertheless, in most cases, what you actually "own" when purchasing an NFT is defined by the terms set by major marketplaces like Open Sea or Risible. These platforms typically clarify that buyers acquire only the token, not the digital file or the intellectual property rights behind it. As a result, NFT owners generally receive a license to use or display the digital content, rather than full ownership. As more courts acknowledge NFTs as legitimate property, we are witnessing the initial stages of block chain assets being incorporated into existing legal frameworks. Still, this development highlights the need for clear, standardized laws that distinguish between owning a digital token and possessing the intellectual property it references. Without such clarity, NFT "ownership" risks remaining a technical term without substantial legal significance.

[804] Lemley, M. A. (2000)

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Smart Contracts and the Legal Status of Digital Agreements in the Metaverse

Smart contracts are central to economic activity in the Metaverse and Web3. Think of them as digital agreements—self-executing programs coded in languages like Solidity—that trigger automatically when set conditions are satisfied. No banks. No notaries. No escrow services. Trust is placed directly in the code, removing intermediaries and offering efficiency, transparency, and immutability. That's the promise, at least. But the legal world is still grappling with what smart contracts mean for traditional contract law. Here's what actually happens: a smart contract uses simple "if–then" statements on a block chain. Imagine purchasing virtual land in the Metaverse. The code might specify, "If payment arrives in cryptocurrency, then transfer the digital deed to the buyer.[805]" The entire process occurs without human involvement, reducing the risk of error or fraud. However, there's a downside. Smart contracts are inflexible. Once "execute" is pressed on the block chain, the action is usually irreversible. Unlike standard contracts, you can't just cancel a smart contract or correct it if someone was coerced or misled. This creates challenges for key legal concepts—like consent, intention, and capacity—since code doesn't always reflect the complexities of real-world agreements. Different jurisdictions address this issue differently. In the US, UK, and Singapore, courts have begun to uphold smart contracts as binding agreements, provided they meet the traditional requirements: offer, acceptance, and consideration. The UK Law Commission (2022) even concluded that English law is flexible enough to accommodate smart contracts, as long as the parties' intentions are clear and the code either replaces or supplements a legal agreement. But confusion arises when the code and any written terms diverge, or when the algorithm behaves unpredictably. Within the Metaverse, smart contracts power everything from NFT transactions to digital asset exchanges and decentralized applications. They also underpin DAOs—Decentralized Autonomous Organizations—where votes are cast and the code enforces decisions automatically. Yet, these contracts face practical challenges: which nation's laws are relevant, how disputes are resolved, and how outcomes are enforced when everything is decentralized and crosses borders. So, while smart contracts enhance trust and streamline online transactions, they aren't a replacement for the law. For the system to function fairly, regulators need to close the gap—combining automated code with established legal protections. The path forward is in hybrid models that respect both technological accuracy and the realities of human intention.

Jurisdictional Challenges and Legal Accountability in the Metaverse

The Metaverse throws a real curveball at the law. Old-school legal systems draw hard lines at national borders, but the Metaverse doesn't care about borders. It's a sprawling, digital world—decentralized, always on—where people from all over jump in, trade, build things, and hang out. None of the usual rules about territory or jurisdiction really work here, so everyone's left wondering: whose laws actually apply when something goes wrong in these virtual spaces[806], traditionally, lawyers figure out jurisdiction based on where people are, what's being argued over, or where something happened. But in the Metaverse, none of that is straightforward. You're dealing with avatars, not real names or addresses. People buy and sell with block chain-based smart contracts, all scattered across different servers and networks—no central authority, no fixed location. So if you try to pin down where a contract was signed or where a wrong was committed, you're basically chasing shadows. It gets messier when you look at the platforms themselves. Each big virtual world—Decentral and, The Sandbox, Meta's Horizon Worlds—sets its own rules, outlined in their terms of service. These

[805] Reese, R. (2023)

[806] Wang, Y., Shao, Y., & Li, A. (2022)

agreements spell out which laws they want to use and how disputes should get resolved. But let's be honest, these contracts mostly protect the platforms. If they decide to change the rules or take away your access, there's not much you can do. Enforcing your rights across different countries and tech setups is a nightmare. Accountability is another headache. When something bad happens—fraud, copyright theft, harassment—who's responsible? Is it the user, the platform, or the block chain network itself? And then there are DAOs, these decentralized groups running things by collective smart contracts, but with no clear legal identity. Sure, places like Wyoming have started giving DAOs some legal recognition, but that's the exception, not the rule. People have all kinds of ideas for fixing this: maybe we need a new kind of digital law, stronger self-regulation, or even global agreements just for the Metaverse. But right now, a worldwide fix is nowhere in sight. The Metaverse forces us to rethink what jurisdiction even means, pushing for answers that fit decentralized, borderless, algorithm-driven worlds—while still holding people (and platforms) accountable, without killing off the freedom and autonomy that make Web3 so appealing.

Data Ownership, Privacy, and Control in the Metaverse

In the Metaverse, data runs the show. It shapes who you are, what you can access, and even how value gets created. Every step you take, every buy or chat or move you make in these virtual worlds—it's all tracked, generating a steady stream of personal and behavioural data. Once you dive in with avatars or wearables, the data collected goes way beyond usernames. We're talking biometrics, spatial info, even emotions. It's a tidal wave of information, and it stirs up tough questions about who really owns all this data, how private it is, and who controls it. Old-school privacy laws just can't keep up. So, who owns your data in the Metaverse? It's a messy debate, both legally and philosophically. Most laws don't treat data like regular property. You have rights over your own info, but you don't exactly "own" it in the way you own your house or your phone. Usually, platform operators call the shots. They grab, use, and sell your data, all wrapped up in those endless terms of service you probably never read. In places like Meta's Horizon Worlds, this means users create value just by being there, but the companies keep the real control—and the profits. But things are shifting. Web3 tech, like block chain and decentralized identity tools, aim to flip the script. In these decentralized spaces, users can actually own and manage their own data, locking it away in encrypted wallets and sharing it only when they want, using smart contracts. It's the idea of informational self-determination—basically, you get to decide who sees your data and when. Sounds great, right? But in reality, it's still early days. The tech is complicated, different systems don't always play nice together, and there aren't clear legal standards yet. Then there's privacy. Laws like the EU's GDPR or India's Digital Personal Data Protection Act look tough on paper, but in a borderless, decentralized Metaverse, they're hard to enforce. Who's responsible for your data? How do you know if your consent actually means anything? And what happens if you want your data erased, but it's stuck forever on a block chain? So, the way we handle data in the Metaverse needs to change. Legal rules have to catch up, blending decentralized data governance with respect for personal freedom and shared responsibility. If people don't have real control over their digital identities and info, there's just no way to build real trust or transparency in this new virtual world. And without that, the Metaverse can't really move forward.

Conclusion

Honestly, the Metaverse isn't just another shiny tech thing. It's shaking up the whole idea of what law, property, and even personhood mean. Moving from a physical world to a digital one forces us to question the old legal rules — rules built for stuff you can touch and people you can point to. What grabs me is how old concepts like ownership, consent, and

jurisdiction all start to blur here. Suddenly, we have to admit: the law can't stay stuck in the past while technology races ahead. Take digital property. I think it deserves real legal status, just like physical property, but we need to think about it in a new way. When users control their digital assets with private keys and block chain, that's real possession. The law should protect that. But it can't stop there. We need protections so platforms don't end up with all the power, and so ownership in the Metaverse actually means something—not just a label, but something you can defend in court. Smart contracts? They're exciting. They promise more transparent and efficient ways to trade and interact. Still, code isn't everything. It can't replace the messy, human side of fairness and consent. Law needs to step in when algorithms miss the mark. The best approach mixes legal standards with automation—a hybrid that keeps things fair while letting technology do its thing. Then there's data ownership. Honestly, that's the big human rights issue right now. People shouldn't just have privacy; they should have real control over their data. If they want to, they should be able to make money from it. Web3's push for users to own their own info fits right in with basic democratic values like autonomy and accountability. Bottom line: the Metaverse calls for a new kind of law—one that matches our tech reality but doesn't lose sight of ethics and justice. The legal world needs to jump in, not hold back. We need laws that protect people, encourage new ideas, and make sure justice matters even in virtual spaces. Let's not turn the Metaverse into a free-for-all. It should be a place where rights, responsibilities, and identities actually mean something—and where they all work together.

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