The Legal Nature of Digital Collectibles and the Adaptive Challenges of the Civil Law Property System

Zefan Jiang[1]*

[1] Hefei University, China
* Correspondence: jiangjiangzf@163.com

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Abstract: This paper explores the evolving legal nature of digital collectibles, particularly non-fungible tokens (NFTs), and the systemic challenges they pose to civil law property regimes. Within civil law traditions, the concept of property is bound by codified categories and the principle of *numerus clausus*, which restricts recognition to a limited set of property forms. Digital collectibles, by contrast, are decentralized, programmable, and technologically mediated, defying conventional classifications such as tangible movables or intangible rights. This disconnect generates uncertainty regarding their ownership, transferability, inheritance, and enforceability under traditional legal frameworks. The analysis addresses how digital assets undermine the foundational assumptions of possession, registration, and state-backed enforcement. Particular attention is given to the problems of inheritance continuity, token fragmentation, cross-border legal conflicts, and the role of private key control in lieu of legal title. Drawing from emerging theoretical debates and comparative jurisprudence, the paper proposes a trajectory of adaptive legal reform that includes doctrinal reinterpretation, statutory innovation, and the development of interoperable legal-technical standards. The study concludes that civil law systems must reconceptualize the legal object and embrace a pluralistic approach to digital property to ensure institutional relevance in the era of algorithmic ownership.

Keywords: digital collectibles; NFTs; civil law property; numerus clausus; legal object; smart contracts

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1. Introduction

Digital collectibles, especially non-fungible tokens (NFTs), signal a transformative shift in the conceptual infrastructure of property law. This transformation is not merely a question of integrating new technologies into existing legal frameworks; it necessitates the recalibration of legal concepts that have been relatively stable for centuries. The civil law tradition—grounded in the primacy of codification, the rigidity of the *numerus clausus*, and the ontological clarity of things (*res*)—is particularly strained by the emergence of assets that are neither tangible nor reducible to traditional legal categories.

Civil law systems have historically relied on the physicality of property to define possession and

ownership. The traditional civil notion of possession as factual control of a tangible item breaks down in the face of blockchain technologies. A private cryptographic key grants access and transferability, but not through spatial control or factual custody in the Roman-law sense. NFTs exist as unique entries on a distributed ledger, verifiable through cryptographic hashing and consensus protocols, but fundamentally detached from material referents. Unlike a deed to land, which points to a registrable asset in the real world, an NFT might merely represent a metadata pointer to a digital file stored on an external server, with no guarantee of permanent linkage or legal stability (Hutson et al., 2023).

This detachment produces friction within legal systems where "property" is bound to physical or at least well-defined intangible forms such as intellectual property rights or debt instruments. A core ambiguity lies in whether NFTs themselves constitute the object of property rights, or whether they merely serve as a digital representation of something else—such as a license, a contractual right, or a pointer to an off-chain resource. The question is not merely theoretical; it determines whether NFTs fall within the scope of proprietary protection or must be adjudicated through adjacent legal frameworks such as contract law or intellectual property law. If NFTs are to be treated as legal objects (*corpora*), they pose a challenge to the numerus clausus principle that restricts recognized property forms in civil law. If, instead, they are treated merely as technical instruments or tokens signifying access or usage rights, then the enforceability of associated claims must be anchored in auxiliary legal regimes, and not in the proprietary framework itself.

Blockchain as a technological substrate further complicates the matter. Its decentralized, immutable, and pseudonymous nature introduces new challenges for legal enforcement and regulatory design. The legal order traditionally identifies ownership through registration, contracts, or physical control. But with NFTs, ownership is entirely mediated through a blockchain wallet address—control is code-based, not contract-based. Wyczik notes that while common law systems have begun to recognize digital assets as personal property through judicial interpretation, civil law systems struggle due to the lack of legislative and conceptual infrastructure for recognizing programmable ownership as legally operative property rights (Wyczik, 2025).

Another dimension of difficulty lies in the multi-jurisdictional and platform-dependent reality of NFTs. Smart contracts can be coded with complex transfer restrictions, royalty mechanisms, or usage conditions. These may be enforceable in code, but not necessarily aligned with legal enforceability in civil courts. Roman observes that this divergence between code-based logic and law-based logic threatens the coherence of civil law systems built on predictability and transparency. In practice, the enforcement of property rights over NFTs may depend more on platform governance and digital infrastructure than on judicial or statutory authority.

Intellectual property law introduces additional ambiguity. Many NFTs purport to transfer "ownership" of digital artworks or content, but without any actual assignment of copyright or moral rights. This leads to a bifurcation of ownership: one party owns the NFT (the token), another retains IP over the referenced content. Blandino explores how French private law struggles with this dualism, as the principle of unity in ownership is destabilized when control over access is divorced from legal authorship (Blandino, 2025).

The legal implications deepen when NFTs intersect with fractional ownership, securitization, or derivative financial products. Jiménez & Jiménez document how decentralized platforms have begun offering tokens that represent fractions of a larger NFT or pooled assets. This blurs the line between property and securities law. The traditional concept of indivisibility in unique property is technologically undermined by smart contracts that allow near-infinite divisibility, altering the economic and legal nature of the asset (Jiménez & Jiménez, 2023).

Even where civil law systems acknowledge these assets, regulatory regimes often fall back on analogies that fail to grasp the distinctiveness of blockchain-based ownership. The analogy to traditional chattels

or titles remains inadequate. Soares and Kauffman show how legal challenges in Europe and Latin America highlight the failure of analogical reasoning to fully capture the logic of decentralized digital property (Soares & Kauffman, 2024).

Judicial systems in civil law jurisdictions are beginning to tentatively engage with these questions, but mostly through fragmented, issue-specific rulings. A broader theoretical response demands a re-imagining of the ontology of legal objects, the decoupling of ownership from physical possession, and a reconstruction of property doctrines to accommodate assets whose persistence, transferability, and identity are governed by code rather than legal fiat.

The deeper question remains whether civil law property systems can adapt incrementally, or whether they require foundational rearticulation. Moringiello and Odinet argue that civil law systems have historically redefined property categories during periods of major technological and economic change—printing presses, industrial assets, dematerialized securities—suggesting a latent capacity for transformation (Moringiello & Odinet, 2022). Whether NFTs will catalyze such a transformation depends on whether legislators and scholars can forge new taxonomies of property that reflect the ontological shift from things to data.

2. Conceptualizing Digital Collectibles as Legal Objects

Civil law property theory is predicated on the notion of the "thing" (*res*) as a precondition for ownership. Ownership in this context is not an abstract claim but a structured legal relationship rooted in the nature of a legally recognized object. Traditionally, these objects are categorized either as corporeal (tangible) or incorporeal (intangible), with legal recognition contingent upon their capacity to be bounded, possessed, transferred, and subjected to exclusive control. In this framework, the "thingness" of property is both a metaphysical and legal prerequisite. Digital collectibles, particularly non-fungible tokens (NFTs), challenge the foundations of this classification, presenting new forms of existence that resist assimilation into conventional categories.

Digital collectibles are fundamentally informational constructs. They are encoded representations of uniqueness, embedded on decentralized ledgers, and operationalized through smart contracts. Unlike intangible rights such as debts or intellectual property, which are historically recognized as rights in personam or rights in rem derived from statutory frameworks, digital collectibles exist natively on technological platforms. Their existence and functionality are defined not by law but by code. This technological ontology defies the object-subject division that underlies classical property law. As Michael Madison argues, digital objects are not "things" in the traditional sense, but functional constructs whose design is determined by code, infrastructure, and institutional interpretation (Madison, 2005).

The classical civil law system begins with the assumption that legal things exist independently of the law itself. The law merely recognizes and assigns legal consequences to things that are materially real. Civil codes often define things in terms of spatial occupation and tangibility. For instance, the German Civil Code (BGB) defines "thing" (*Sache*) under §90 as a corporeal object, excluding digital entities entirely. This excludes digital collectibles from the outset, barring any attempt at their legal classification unless new legislative or doctrinal mechanisms are introduced. The French Code Civil similarly roots ownership in physical possession or material representations of rights, leaving no space for natively digital constructs whose function and persistence are technologically rather than legally determined (Blandino, 2025).

The categorization problem is exacerbated by the semiotic nature of digital collectibles. An NFT is not the digital artwork or media it references; it is a ledger entry that points, usually via a metadata hash, to a location where the media is stored. This separation between token and referent introduces ontological instability into the legal classification. Is the object of ownership the token, the metadata, the referenced file,

or the conceptual package they form together? None of these layers is sufficient to constitute a legal object under traditional property definitions. The token cannot be possessed in a physical sense; the file is usually not stored on-chain; the reference may decay as servers go offline; the linkage between token and asset is frequently governed only by informal norms or platform-level agreements.

This instability demands a reassessment of what constitutes a "thing" in law. Contemporary legal theory has proposed several pathways. One is the functionalist redefinition of things based on exclusionary control. Thomas Merrill and Henry Smith's theory of the numerus clausus posits that legal property must enable standardized exclusionary rights to ensure clarity and transactional efficiency. In their framework, a property right is legally sustainable if it allows a defined subject to exclude others from a resource. Applying this to digital collectibles, one could argue that control over the private key associated with an NFT wallet constitutes exclusionary control over the token. However, this analogy is strained. Control in blockchain systems is a function of cryptography and consensus protocols, not legal enforcement. Possession is not a factual state but a mathematical condition governed by access credentials. The law plays no active role in maintaining or validating that possession.

The legal ambiguity is compounded by the lack of uniformity in what NFTs represent. Some NFTs are used as tickets, others as keys to exclusive digital communities, and still others as financial instruments or identity markers in metaverse platforms. The variability of function undermines the possibility of defining NFTs as a coherent class of legal objects. If the legal system treats all NFTs identically, it ignores the substantive differences in their use. If it distinguishes among them by function, it risks fracturing the legal concept of digital property into incompatible micro-categories. This tension has led some scholars to propose that digital objects should be classified not by ontology but by affordance—what they allow users to do and how they are used within a broader technological and social context.

Ownership in civil law is tied to concepts of control, benefit, and risk. In digital systems, control is operationalized via smart contracts and platforms. Benefit is frequently realized through monetization, resale, or access to gated services. Risk is borne not through natural degradation or theft in the traditional sense but through loss of access credentials, platform deprecation, or regulatory interventions. These shifts in how control and risk manifest call into question whether legal ownership in the classical sense can be meaningfully applied. If losing a password results in irreversible loss of access, does this constitute legal alienation? If a platform discontinues support for an NFT standard, does that constitute destruction of the object? Legal definitions lack the vocabulary to engage with such questions because they assume a world in which property is stable, persistent, and enforceable by courts and institutions.

There is also a distinction between metaphysical and institutional recognition of objects. Something may exist ontologically as an object but lack institutional recognition as a legal thing. Digital collectibles exist and are traded, assigned value, and used in complex financial and cultural transactions. They are ontologically robust but legally invisible or only partially visible. Law's failure to classify them is not an indication of their insignificance but of its epistemic lag. As Peter Goodrich has written, the law often functions through "juridical signs" that trail the objects and practices they attempt to order. The legal system's inability to name or classify digital collectibles renders them formally ambiguous even as they are economically and socially significant.

Attempts to resolve this through analogy—by treating digital collectibles like dematerialized securities, intellectual property licenses, or contractual rights—inevitably run into conceptual limits. Securities are backed by legal entities and subject to disclosure regimes. Licenses depend on intellectual property statutes and entail limited-use rights. Contractual rights are enforceable against named counterparties. NFTs often lack identifiable issuers, rely on open access, and involve platforms that disclaim responsibility for governance. Their legal status is

therefore decentered, existing in a liminal zone between property, code, and community norms.

The application of private law principles to digital assets is emerging as a contested site of doctrinal innovation. Some courts have begun to treat cryptocurrencies as property capable of being held in trust, seized, or subjected to restitution. The Singapore International Commercial Court in *B2C2 Ltd v Quoine Pte Ltd* recognized that contractual obligations involving digital tokens could be enforced under common law principles. However, this approach has not been widely replicated in civil law jurisdictions, where the recognition of property hinges on codified definitions. The German Federal Court of Justice (BGH) has not yet ruled definitively on whether NFTs qualify as things or rights. Legal uncertainty persists, leaving users and institutions in a state of interpretive flux.

One possible doctrinal avenue lies in the concept of *immaterialgüterrecht*, or the law of intangible goods. Swiss and German law have developed limited frameworks for recognizing data and digital signals as potential legal interests, particularly in the context of data protection or software licensing. These could be extended to accommodate digital collectibles, not as things per se but as rights encoded in a new technological form. This would require substantial legislative reform, but it is theoretically plausible. A less ambitious path would be to create a sui generis category for blockchain-based tokens, similar to how some jurisdictions have carved out special rules for electronic money or digital signatures.

Any comprehensive reclassification must also grapple with the normative consequences of treating digital collectibles as legal objects. Doing so would vest owners with enforceable rights and impose correlative duties on third parties. It would require the state to recognize blockchain-based transactions as constitutive of legal transfer. It would invite the courts to adjudicate disputes over smart contract execution, digital theft, and token fraud. These changes are not merely technical; they implicate deep questions about the scope of state authority, the legitimacy of code as law, and the autonomy of decentralized systems.

The political economy of digital collectibles further complicates their legal recognition. These tokens often function within platform ecosystems where control is exercised by corporations or decentralized autonomous organizations (DAOs). Legal recognition of the tokens might empower platform users but also expose them to regulatory burdens. Legislators must weigh the risks of legitimizing speculative instruments against the need to provide legal certainty. Some jurisdictions, such as the United Kingdom, have begun to explore the idea of recognizing digital tokens as a new form of personal property, building on the 2019 UK Jurisdiction Taskforce Legal Statement on Cryptoassets and Smart Contracts. Yet these statements remain advisory, lacking the force of codified law.

Conceptualizing digital collectibles as legal objects demands a paradigm shift. It is not enough to force new technologies into old conceptual boxes. The law must develop new categories that reflect the realities of digital existence: modularity, programmability, conditionality, and platform dependence. This will require sustained theoretical engagement and legislative creativity. As law has adapted in the past to encompass railroads, telegraphs, and dematerialized shares, so too must it evolve to accommodate assets that exist entirely in the space of code, networks, and user interaction.

3. Property Law and Numerus Clausus Constraints

The civil law tradition is underpinned by structural coherence, doctrinal rigidity, and formal certainty. Among its defining features is the principle of *numerus clausus*, which limits the forms of property rights that individuals can create and transfer. This principle operates as a safeguard for third-party expectations and market efficiency, by ensuring that legal systems only recognize a fixed number of property rights that are publicly knowable and predictable in content. While this rigidity promotes legal security and transactional clarity in traditional economies, it becomes a constraint in the digital age, where new forms of value, particularly digital collectibles such as non-fungible tokens (NFTs), emerge beyond the established taxonomy of property.

The principle of *numerus clausus* is a doctrinal commitment that not only defines which property interests are valid but also prohibits the private creation of novel property forms outside those recognized by law. In civil law systems such as those of France, Germany, and many East Asian jurisdictions, this doctrine is entrenched in both statute and jurisprudence. The justification for this constraint is twofold: to prevent fragmentation of property rights that could impair marketability, and to maintain a legal order that facilitates efficient dispute resolution. The assumption underlying this justification is that legal certainty requires limitation. By constraining legal innovation in property relations to the legislature, civil law systems discourage ad hoc contractual invention of hybrid or sui generis property interests.

Digital collectibles expose the limitations of this constraint. NFTs are inherently multifaceted; they can represent digital artworks, identity credentials, gaming assets, virtual real estate, or access rights. Their use cases transcend the fixed forms of property traditionally recognized by civil codes. Yet under the principle of *numerus clausus*, legal systems cannot easily accommodate assets that do not fit into predefined categories such as movables (*res mobilis*), immovables (*res immobilis*), or intangible rights like claims, shares, or intellectual property. This creates a legal void. NFTs exist in an ambiguous zone between data and property, between technological function and legal form. Civil law frameworks, designed around clear typologies of things and rights, are often ill-equipped to classify or govern such hybrid entities without significant conceptual and legislative adaptation.

The classification problem arises not merely from conceptual unfamiliarity but from doctrinal design. NFTs, as tokens recorded on a blockchain ledger, do not occupy space, cannot be possessed in the traditional sense, and lack inherent economic function. Their value derives from social consensus and platform infrastructure. Civil law typically requires that property objects be clearly defined, rivalrous, and susceptible to exclusion or appropriation. NFTs fail on multiple counts under this definition. Their existence is predicated on technological conditions, and their utility and identity are often governed by smart contracts, which are autonomous and self-executing, not traditional legal instruments.

Attempts to analogize NFTs to recognized property forms have been unsatisfactory. One approach is to treat them as dematerialized movable goods, akin to digital files or electronically transferable instruments. Another is to frame them as bearer instruments, where control of the cryptographic key is equated with legal possession. A third is to associate them with intellectual property licenses. Each analogy captures a facet of NFTs but fails to reflect their composite nature. Unlike digital files, NFTs do not store content; they reference it. Unlike bearer instruments, NFTs cannot be destroyed or physically transferred; their existence is inscribed on a public ledger that is immutable. Unlike licenses, NFTs often lack express legal terms defining scope, duration, and enforceability. None of these analogies provides a fully satisfactory doctrinal foundation for treating NFTs as legal property under a *numerus clausus* system.

The risk of overextension also looms large. If civil law jurisdictions begin to treat NFTs as property without a clear framework, they risk destabilizing the coherence of property doctrine. Doctrines such as transfer formalities, publicity of rights, and succession mechanisms are designed for well-defined property forms. Applying them to NFTs without adaptation could generate inconsistencies and legal uncertainty. At the same time, refusal to recognize NFTs as property at all leaves their holders without recourse to fundamental legal protections, such as enforcement of ownership, restitution of unjust enrichment, or liability for wrongful interference. This limbo is both doctrinally problematic and economically destabilizing in markets where NFTs are traded with significant monetary and symbolic value.

Some jurisdictions have sought to mitigate these tensions through legislative experimentation. Liechtenstein's 2019 Blockchain Act (Token and TT Service Provider Act) is a notable example. It introduced the legal concept of the "token container

model," whereby tokens can represent rights or claims linked to assets, enabling their recognition as property-like entities. While not a civil law jurisdiction in the strict sense, Liechtenstein's approach is influential because it demonstrates a pathway for reconciling digital innovation with structured legal categories. The Act does not expand the *numerus clausus* per se, but it creates a legislative wrapper that permits tokens to function within the existing taxonomy.

Other scholars have argued for a rethinking of the *numerus clausus* principle itself. Alexandra Braun notes that *numerus clausus* is often justified on grounds that assume static and paper-based property regimes, and that its rigidity is increasingly at odds with the modular and programmable nature of digital assets (Braun, 2020). The digital economy, she argues, operates through a different logic—where value is created through interoperability, composability, and networked utility—none of which aligns with the closed and hierarchical structure of classical property law.

The adaptability of *numerus clausus* also differs across legal systems. In common law jurisdictions, while property forms are also limited, courts have greater latitude to recognize new categories through case law. Civil law systems, by contrast, rely on legislative enumeration. This structural difference explains why common law courts have been quicker to recognize cryptocurrencies and NFTs as species of personal property, as seen in cases like *AA v Persons Unknown* in England. Civil law systems, such as those in Germany or Japan, face more substantial doctrinal barriers. The legislative process is slow, and the required revisions implicate foundational concepts like *Besitz* (possession) and *Eigentum* (ownership).

Civil law systems may need to reconsider whether *numerus clausus* should remain a gatekeeping mechanism in an era of algorithmic governance and platform-based economies. The practical realities of digital ownership have already overtaken legal doctrine. NFTs are bought, sold, inherited, and used as collateral. Platforms implement quasi-legal mechanisms such as dispute resolution and revocation policies. These practices amount to a kind of de facto property regime that operates outside formal law. Ignoring this regime risks alienating law from the economic and social practices it is meant to regulate.

One way forward is to introduce statutory recognition of NFTs as legal objects without necessarily labeling them as full property rights. They could be recognized as *digital tokens with enforceable use claims* or *platform-native quasi-things*, akin to how financial derivatives or electronic money are regulated under bespoke regimes. This would preserve the integrity of *numerus clausus* while providing a legal hook for enforcement, taxation, and inheritance. Such a move would echo earlier legal evolutions, such as the treatment of dematerialized securities in the 20th century or the emergence of *immaterialgüterrecht* in the realm of intellectual property.

Property law has historically evolved by absorbing innovations into its conceptual framework when economic necessity and social practice demanded it. The recognition of corporate shares, patents, and digital money all required departures from strict interpretations of legal objects. Digital collectibles represent a new frontier in this tradition. They call for a recalibration of the relationship between formal constraints and functional utility. The *numerus clausus* principle has served an important role in limiting complexity, protecting third-party interests, and preserving legal order. But its preservation must not come at the cost of excluding entire classes of socially and economically significant assets from legal recognition.

4. Ownership and Transferability in a Decentralized Digital Context

The foundational concepts of ownership and transferability in civil law property systems have historically been defined through materiality, possession, and state-backed registries. Ownership has traditionally relied on visible, physical control over an object and the possibility of asserting one's rights through legally recognized mechanisms of possession, transfer, or inheritance. The digitalization

of assets presents a radical shift in this structure, particularly with the introduction of blockchain-based tokens such as cryptocurrencies and non-fungible tokens (NFTs). These assets displace the center of gravity of ownership away from tangible control and legal title toward access credentials and cryptographic authority.

Aksoy has argued that the legal nature of crypto assets challenges classical property regimes because these assets are not "objects" in the traditional legal sense (Aksoy, 2023). They are not physical, cannot be perceived through sensory experience, and lack a centralized registry. Ownership over such assets is determined by control over private cryptographic keys and is executed through code rather than institutional intermediation. This creates a divergence between de facto control and legal recognition. Someone may hold exclusive control over a digital collectible, but that control is not equivalent to legally protected ownership unless the law recognizes the asset as an object of property and the form of transfer as valid under the legal regime.

In civil law systems, possession and ownership are conceptually distinct but deeply interrelated. Possession is typically defined as factual control with intent to possess, and it often serves as the basis for the presumption of ownership. The concept of possession is rooted in tangible reality and assumes that a person can physically exclude others from the use of an object. In a decentralized blockchain context, the absence of tangibility and the presence of global, immutable ledgers upend this conceptual apparatus. Control is not a physical condition but a mathematical one, verified by consensus algorithms and dependent on key management. If the private key is lost, control is irretrievable. There is no central authority to reset ownership or resolve disputes. As a result, the civil law concept of possession lacks traction in this environment.

The act of transfer within a blockchain network is similarly decoupled from traditional legal paradigms. Transfer of an NFT or cryptocurrency token is executed through the signing of a transaction using a private key, which then gets validated and recorded on a public ledger. This process bears resemblance to delivery in classical property law, but it is devoid of legal formalities such as notarization or registration. In many civil law systems, especially with regard to immovables or valuable movables, transfer of ownership requires compliance with specific procedural and evidentiary requirements. These are designed to provide legal certainty, prevent fraud, and ensure public visibility of transactions. Blockchain transactions bypass these mechanisms entirely, raising the question of whether such a transfer can have proprietary effects under the law.

A related complication arises in cases of disputed ownership or wrongful dispossession. In traditional civil law systems, mechanisms such as rei vindicatio enable the recovery of property by the rightful owner. These mechanisms assume a centralized judiciary and a legal framework that can enforce rights against specific persons. On the blockchain, the system is both anonymous and autonomous. The platform does not recognize legal ownership; it only recognizes control of the key. If a token is transferred fraudulently, the transaction is usually irreversible. There is no legal backstop embedded into the technology. Aksoy notes that while some common law jurisdictions have begun treating digital tokens as property interests capable of supporting proprietary remedies, civil law jurisdictions have yet to develop equivalent doctrines (Aksoy, 2023).

Another area of conceptual friction is the absence of a central registry. Traditional property systems rely on public registers—of land, securities, or intellectual property—to identify ownership and resolve conflicts. Blockchain replaces the registry with a distributed ledger, which is theoretically more secure and transparent, but lacks a mechanism for recognizing legal status or rectifying errors. The ledger records what the code executes, not what the law commands. This disjuncture creates complications for legal institutions attempting to interface with decentralized systems. Courts cannot easily enforce orders to revert transactions. Legislators cannot require compliance from platforms that operate without geographic jurisdiction. Property law, which evolved in tandem with the territorial authority of the state, faces an

unprecedented challenge in the form of borderless, stateless digital assets.

The tension between code and law also manifests in the concept of intent. Civil law attaches importance to the subjective intention behind a legal act. Ownership and transfer are not only factual but volitional: they must reflect the will of the owner. Smart contracts, by contrast, are self-executing scripts that operate without reference to subjective intention. Once triggered, they complete transactions automatically. If an error occurs in the code, the law may not recognize that the parties intended something different. The gap between what the code does and what the law would have done in a comparable situation leads to uncertainty and potential injustice. Some scholars have described this as a shift from "law in action" to "code as law," where formalism replaces discretion and automation supplants interpretation.

This automation has implications for transferability. In traditional property systems, transferability is a function of the nature of the object, the will of the parties, and compliance with formal requirements. In blockchain-based systems, tokens are, by design, easily transferable. This high fluidity resembles fungible commodities or bearer instruments. Yet, in the case of NFTs, which are unique and sometimes linked to valuable content or functionality, transferability raises questions of legal consequences, such as taxation, consumer protection, and regulatory compliance. The simplicity of code-based transfer masks the complexity of real-world legal obligations.

The problem of interoperability adds another layer. NFTs and other digital collectibles often operate within specific platforms or ecosystems. Ownership may grant access to services, communities, or content that is platform-dependent. If the platform ceases to operate, or changes its terms, the utility of the NFT may disappear, despite continued control over the token itself. In classical property theory, ownership confers stable and independent rights. Here, ownership is contingent on the persistence of external technological structures. Legal systems are not yet equipped to handle this conditional and modular nature of digital ownership.

Cross-border issues further complicate the picture. Blockchain networks are global, but property law is national. Determining the applicable law in a dispute involving a digital asset is difficult. Conflict of laws rules are based on the location of the object or the parties, both of which may be indeterminate in blockchain contexts. Some jurisdictions may view a token as property, others as a contractual right, and others as data. The same asset may be treated differently depending on where the dispute arises, who is involved, and what legal theories are advanced. The absence of harmonized rules leads to legal arbitrage and forum shopping, undermining coherence and predictability.

Attempts to address these problems have included judicial recognition of digital assets as property, the creation of legal categories such as "digital things," and legislative proposals to regulate blockchain assets within national frameworks. Some proposals suggest adapting the concept of *control* to serve as a proxy for possession. Others recommend creating statutory registers for digital assets or embedding legal terms into smart contracts to ensure enforceability. These efforts reflect a recognition that traditional doctrines need modification, not abandonment. The goal is not to discard the concept of ownership but to reimagine it in a context where control, identity, and transactionality are redefined by code.

Ownership in a decentralized digital context is best understood as a hybrid construct. It consists of cryptographic control, platform governance, and social recognition, none of which maps neatly onto classical legal categories. Legal systems must grapple with the reality that ownership can exist without state recognition, transfer can occur without legal formality, and value can be created and destroyed without physical movement or human intention. Civil law traditions, with their emphasis on codification and formalism, face significant hurdles in adapting to this paradigm. But they also possess conceptual resources—such as abstraction, doctrinal systematization, and legislative precision—that can be mobilized to meet the challenge.

Ownership in the digital age requires a reconceptualization that integrates technological architecture with legal principle. It demands a theory of transferability that accounts for self-executing systems, irreversible operations, and jurisdictional indeterminacy. It calls for legal tools that recognize control not as a physical fact but as a digital function. The challenge is to maintain the integrity of property law while acknowledging the transformations brought about by decentralized technology. The opportunity is to build a legal framework that is both grounded in tradition and responsive to innovation.

5. Inheritance and Continuity of Digital Ownership

The law of succession is traditionally rooted in the assumption that property, whether tangible or intangible, can be clearly identified, classified, and transferred through mechanisms embedded in the legal apparatus of the state. Wills, intestacy rules, probate proceedings, and civil registries have historically enabled the orderly transmission of rights and obligations from one generation to the next. The emergence of digital property, particularly in the form of blockchain-based collectibles and assets such as non-fungible tokens (NFTs), disrupts this system in foundational ways. These assets are not only novel in their technical structure but also in the manner in which they are controlled, accessed, and valued. Their decentralization, programmability, and dependence on private keys generate tensions with traditional legal expectations around death, succession, and continuity of ownership.

The core issue lies in the disjunction between control and legal title. Ownership of a digital collectible is determined by control of a private cryptographic key, not by registry entries, probate orders, or testamentary documents. If the key is lost, access to the asset is irretrievably gone. If the key is held by someone else, legal remedies may be unavailable or ineffective. This presents a challenge for heirs, courts, and legal professionals. In the traditional model, executors or administrators are empowered to collect, manage, and distribute the estate, relying on public registries, financial institutions, or court mandates. With digital collectibles, there is often no institution to contact, no court-enforceable record, and no practical way to recover the asset without prior access to the relevant keys or wallets.

Anyama et al. identify the failure of conventional inheritance mechanisms to adequately accommodate blockchain-based assets as a source of significant legal risk (Anyama et al., 2024). They suggest that AI-driven estate planning tools and smart contracts may offer solutions, but these require a rethinking of inheritance frameworks at the legislative level. The key insight from their analysis is that intent and access must be simultaneously preserved. The law must ensure that an individual's wishes regarding digital property can be fulfilled, while also providing heirs with the technological and legal means to exercise control over inherited assets.

The principle of transferability on death, deeply embedded in civil law systems, presumes that property does not extinguish upon the death of the owner. Instead, it vests in the heirs or beneficiaries, subject to formalities. This presumption collapses in the case of digital assets where access cannot be forcibly transferred. The asset may persist on the blockchain, but in the absence of access credentials, it becomes a stranded value—existing but unusable. The traditional remedies of inheritance law, such as substitution, seizure, or liquidation, are inapplicable. Legal recognition of the heir's right is irrelevant if the asset is inaccessible.

Daulay and Cahyono argue that legal systems must provide for statutory recognition of digital tokens as part of the estate and require asset holders to disclose or escrow access credentials in a legally binding manner (Daulay & Cahyono, 2025). Their proposal rests on two pillars: legal classification and procedural enforcement. First, digital collectibles must be classified as heritable property under civil law, regardless of their technological origin. Second, procedural rules must be reformed to include obligations to register, disclose, or safeguard access mechanisms in anticipation of death. Without such reforms, succession law fails to achieve its purpose in the digital domain.

The question of classification is particularly complex. NFTs and other blockchain assets do not neatly fall into existing property categories. They are neither corporeal things nor traditional rights such as debts or shares. Their value lies in their uniqueness, traceability, and association with digital communities or functionalities. Some are used as symbols of status, others as tools of governance in decentralized platforms. Inheritance law struggles to treat such multifaceted, mutable assets as static elements of an estate. Their volatility, coupled with their technological dependence, renders them resistant to traditional valuation, registration, or management.

Compounding this is the problem of formal requirements. Many civil law systems impose strict requirements for the creation of valid wills and the transfer of certain assets. These include notarization, signatures, and official registration. In the context of digital collectibles, such formalities may be unworkable. The assets may reside on decentralized platforms with no legal entity, may be accessible only through multi-signature wallets, or may be governed by smart contracts that preclude external interference. In some cases, a testator may intend to pass an NFT to an heir, but without appropriate access arrangements, the asset remains out of reach. Even a valid will cannot override the logic of a smart contract that requires specific cryptographic authorization.

The rise of "dead wallets" illustrates the urgency of the issue. These are blockchain addresses that hold assets but are no longer accessible because the private keys have been lost or destroyed. The assets cannot be moved, sold, or transferred. They continue to exist, but they are functionally inert. From a legal perspective, they represent a kind of lost property, but without the possibility of recovery through possession or adverse claims. The law has no current tools to address this phenomenon, which is likely to become more widespread as digital assets become a more common part of personal estates.

Solutions proposed in the legal literature include custodial inheritance services, where trusted third parties hold backup access credentials in escrow, to be released upon proof of death. Other models propose the use of smart contracts that automatically transfer access rights upon receipt of a death certificate or after a period of inactivity. These technological solutions are promising, but they raise concerns about privacy, security, and regulatory compliance. If not carefully designed, they may expose assets to theft or misuse. They may also conflict with legal prohibitions against conditional transfers or self-executing inheritance devices in some jurisdictions.

Public law considerations also enter the picture. Taxation of digital assets on death requires accurate valuation and legal recognition. Many jurisdictions tax estates or inheritances based on fair market value at the time of death. In the case of NFTs, which may fluctuate wildly in value and may lack a transparent market, this requirement becomes nearly impossible to fulfill. Moreover, if the asset cannot be transferred or accessed, the imposition of tax may be both unfair and legally dubious. Legislatures must develop new guidelines for the valuation, reporting, and taxation of digital collectibles in the context of succession.

The rights of co-heirs and legatees are similarly complicated. Where multiple heirs are entitled to a share of an estate that includes indivisible or platform-bound assets, traditional mechanisms of partition or liquidation may not apply. A single NFT cannot be divided physically or legally. Its transfer may require consensus on valuation, platform rules, and potential tax liabilities. If one heir holds the key, others may be excluded. If the key is shared, issues of trust, coordination, and platform functionality arise. Succession law must develop new doctrines for managing digital co-ownership and fiduciary responsibilities over blockchain assets.

Jurisdictional conflicts are inevitable. A person may die domiciled in one country, with assets located on decentralized platforms accessible globally. Conflict of laws rules must determine which jurisdiction's inheritance law applies, and whether that law can be enforced in relation to assets that are not physically located or legally registered anywhere. The traditional reliance on situs—location of the asset—is inapplicable. Some have suggested using the location of the controller or the platform, but this too raises

difficulties, particularly when platforms are governed by decentralized autonomous organizations with no legal domicile.

Some legal systems have begun to grapple with these issues. The United States Internal Revenue Service has issued preliminary guidance on the taxation of digital assets in estates. Switzerland and Liechtenstein have moved to recognize crypto-assets as part of the estate for inheritance purposes. Singaporean courts have addressed ownership disputes over blockchain assets and have hinted at the need to integrate them into estate planning. These developments are tentative and fragmented. They represent early efforts to respond to a problem that is global, urgent, and growing in scale.

The overarching challenge is that inheritance law is premised on state authority, legal formalism, and centralized enforcement. Digital ownership is premised on individual control, technical rules, and decentralized execution. Bridging the gap between these systems requires more than doctrinal adjustment; it demands a reconceptualization of what it means to own, transfer, and inherit in a digital age.

6. Adaptive Legal Reforms and Path Forward

The evolution of digital collectibles and blockchain-based property has exposed deep structural tensions in civil law systems that rely on stable, closed categories of property. These tensions manifest across doctrinal, institutional, and procedural dimensions. They require not only reactive responses to new asset types but also proactive structural adaptations in lawmaking, adjudication, legal theory, and international cooperation. As digital assets become increasingly normalized in economic and social life, a fragmented or hesitant legal response risks disenfranchising holders of such assets, undermining the coherence of the civil law property system, and widening the gap between legal form and technological substance.

The principle of codification in civil law systems traditionally provides clarity and uniformity. Yet the pace of technological change renders static legislative structures inadequate to meet new realities. Yang identifies the need to create standardized legal categories for digital property in civil law codes, emphasizing that unclassified or ambiguously defined property leads to legal uncertainty and risks creating informal legal hierarchies (Yang, 2025). Legal systems must first acknowledge that digital collectibles represent a distinct and autonomous category of property. This category is neither traditional movable property nor a subset of intellectual property but rather a digitally-native, technologically-mediated asset whose existence and value are determined by decentralized infrastructures.

Recognition is not sufficient without tailored legislative frameworks. The codification of digital property must define ownership, transferability, inheritance, and loss in terms that reflect the technical nature of blockchain architecture. A critical element of this codification is the concept of control. In civil law, ownership is supported by the twin pillars of title and possession. In digital systems, control is exercised through private keys and validated by blockchain consensus mechanisms. Civil law must revise its definition of possession to include technological control mechanisms that do not require physical proximity or material substance. The law must treat the secure and exclusive control of a private key as a legally cognizable act of possession with proprietary consequences.

Transfer of digital assets poses another challenge. The traditional requirement of legal formalities—often designed to protect third-party interests or signal legal intent—collides with the technical design of blockchain systems. A transfer on a blockchain is executed through the submission of a transaction signed with a private key. No external witnesses, notaries, or declarations of intent are involved. Legal reform must bridge this divide by accepting blockchain-validated transactions as legally effective, provided they meet specific evidentiary standards. These standards might involve the verification of metadata, timestamps, digital signatures, and blockchain immutability.

Judicial systems in civil law countries must also adapt. Courts traditionally resolve property disputes by analyzing documents, examining witnesses, and

referencing registries. These tools are less effective in digital environments where ownership is recorded on public blockchains and access is determined by cryptographic key control. Judges need technical literacy and doctrinal flexibility to interpret smart contracts, analyze wallet activity, and differentiate between technological and legal indicators of ownership. Comparative law shows that common law jurisdictions have moved faster in this domain. Courts in Singapore and the United Kingdom have issued opinions recognizing crypto-assets as property and allowing injunctions over wallets. Civil law courts must develop similar jurisprudence, either through interpretive analogies or guided legislative mandates.

One of the more promising models of flexible civil law adaptation comes from Brazil, where courts have demonstrated interpretive openness in applying existing property law concepts to digital contexts (Soares & Kauffman, 2024). This interpretive strategy avoids the paralysis of waiting for legislative reform while maintaining fidelity to core civil law doctrines. Brazilian judges have emphasized the functional attributes of digital tokens—excludability, assignability, and valuation—rather than their formal ontological status. This approach provides a template for other civil law jurisdictions to follow, using doctrinal tools such as analogical reasoning, general clauses, and open-ended definitions of patrimonial assets.

Another area requiring reform is inheritance law. As digital assets increasingly become components of personal wealth, legal systems must ensure their effective transmission after death. Traditional inheritance models rely on institutional intermediaries—such as probate courts and asset custodians—to facilitate the orderly transfer of rights. In decentralized systems, there is no institution to compel the release of a digital asset or reassign access. Yang proposes a typological reform model that distinguishes digital assets by their underlying rights—personality-based, property-based, or composite (Yang, 2025). This model supports the creation of tailored inheritance protocols that reflect the diverse nature of digital property. In practice, this could involve default smart contract templates for testamentary transfers or legal mandates for custodians to support inheritance access mechanisms.

Procedurally, reform must address evidentiary burdens. Courts and notaries currently lack tools to authenticate digital asset ownership, validate the content of smart contracts, or determine the last known control of a wallet. Legal reform should mandate the integration of blockchain analytics tools into judicial processes and notarial systems. These tools can trace ownership histories, verify the authenticity of token standards, and establish the transactional integrity of digital assets. Such mechanisms would allow courts to determine ownership without depending solely on testimony or subjective declarations.

Cross-border legal coherence is essential. Digital collectibles operate across jurisdictions, but property law is deeply territorial. Conflicts of law arise over which jurisdiction's property law applies, especially in cases of inheritance, insolvency, or contractual disputes. Existing private international law frameworks are ill-suited to address stateless, decentralized assets. Harmonization initiatives must include provisions specifically targeting digital assets. This may require conventions that define a default applicable law based on the domicile of the wallet controller, the legal seat of the issuing platform, or the jurisdiction of primary economic activity. Absent such clarity, legal uncertainty will persist, particularly in multi-jurisdictional disputes.

The infrastructure of digital ownership must also be integrated into legal frameworks. Platforms that facilitate digital asset trading, storage, and access must be subjected to legal obligations regarding identity verification, asset custodianship, and dispute resolution. These obligations are especially important when dealing with asset freezes, fraud claims, or ownership transfers due to incapacity or death. Regulatory approaches can mandate compliance with access protocols, custodial standards, or judicial intervention orders. In parallel, user rights must be protected against arbitrary platform actions such as deletions, bans, or token delisting, all of which can

erode the value and functionality of digital collectibles.

Public legal education is critical. Users must understand that digital ownership is not equivalent to legal title unless supported by legal infrastructure. Platforms must disclose the limitations of their token systems and the legal risks involved. Legislatures can require warnings or legal disclosures in digital wallets, platforms, and marketplaces. This transparency will mitigate legal disputes and help align public expectations with legal realities.

The role of administrative agencies should be expanded to include supervision of digital asset ecosystems. Just as financial authorities regulate securities, banking, and payment systems, specialized agencies can oversee NFT platforms, token issuers, and decentralized applications. These agencies can monitor compliance with legal standards, investigate abuses, and provide guidance on best practices. Their actions can supplement judicial enforcement and legislative reform by acting quickly and flexibly in response to technological developments.

International cooperation is indispensable. The borderless nature of blockchain assets requires coordinated action among states. Bilateral treaties, international guidelines, and multilateral organizations must develop shared standards for digital asset classification, recognition, and enforcement. The current fragmentation of regulatory approaches hampers legal certainty and enables jurisdictional arbitrage. Global convergence around principles—such as the recognition of digital tokens as assets, the enforceability of smart contracts, and the legal significance of blockchain transactions—will create a coherent global digital property regime.

Adaptive reform is not only a matter of legal technique. It reflects a broader philosophical shift in how property is conceptualized in the digital age. Traditional property law assumes scarcity, tangibility, and static value. Digital collectibles defy these assumptions. They are abundant in format but scarce by design. They are intangible yet possess unique identity. Their value is dynamic, network-dependent, and context-driven. Legal systems must adopt a dynamic theory of property that incorporates modularity, programmability, and interoperability as core legal features.

The future of civil law property doctrine depends on its ability to absorb, translate, and govern new forms of ownership. This requires abandoning the binary between legal and non-legal property and recognizing that property exists wherever control, value, and exclusion intersect—regardless of material form. The challenge is not to preserve tradition for its own sake but to evolve doctrine to meet the needs of a society transformed by digital technology.

7. Conclusion

The rise of digital collectibles has introduced a structural fracture in classical property law, particularly within civil law systems where conceptual clarity and codified categories have historically served as the bedrock of legal certainty. Unlike prior innovations that were eventually absorbed into established frameworks through analogy or incremental reform, digital assets demand a deeper reconsideration of foundational principles. The separation between control and ownership, the abstraction of property from physical form, and the autonomy of code from legal institutions together erode the assumptions that have governed property regimes for centuries.

Digital property challenges not only classification but authority. In a traditional property system, the state certifies ownership, enforces rights, and resolves disputes. In decentralized environments, ownership is validated by consensus protocols, access is enforced by encryption, and disputes are resolved—or left unresolved—by immutable code. The absence of a centralized arbiter of property claims introduces a new legal topology where power is distributed, authority is fragmented, and legal remedies are limited by design. This inversion of control disorients legal systems structured around vertical authority and hierarchical validation of title.

Civil law systems must confront the inadequacy of their current vocabulary. Legal concepts such as possession, registration, alienation, and restitution

were forged in material contexts where objects had location, form, and observable presence. Digital collectibles resist these predicates. They are borderless, incorporeal, and non-rivalrous, yet carry economic weight and social significance. Legal systems that insist on material referents for property risk obsolescence in a world where value circulates without mass and ownership is asserted through lines of code. The challenge is not to redefine property in abstract terms but to rebuild its architecture around the realities of digital existence.

This transformation is not merely technical. It marks a shift in the social contract of ownership. Classical property was grounded in exclusion and permanence. Digital property is grounded in access and mutability. What can be owned can also be reprogrammed, deplatformed, or deprecated. Legal rights must evolve to recognize this volatility without surrendering the protections that property traditionally affords. The law must secure digital ownership against technological failure, contractual overreach, and institutional neglect.

The digital turn in property also reconfigures relationships between private parties. Smart contracts automate transactions without recourse to courts or traditional dispute resolution. Tokenized governance enables collective decisions without legislatures. Platforms become de facto legislators, adjudicators, and enforcers. In this ecosystem, legal systems risk becoming reactive observers unless they assert normative principles that govern how digital property is created, exchanged, and defended. The authority of law must be re-established not by overriding technology but by shaping the terms under which technology operates.

A recalibrated civil law system will need to acknowledge technological control as a legally significant fact. It will need to formalize the evidentiary value of blockchain records, recognize token-based rights as objects of patrimony, and impose obligations on platforms that facilitate digital ownership. These reforms will not dilute legal certainty. They will anchor it in a new ontological context. Law must move from a world of paper, possession, and physicality to one of networks, cryptography, and data.

The path forward is neither conservative preservation nor wholesale abandonment of doctrine. It is a methodical reconstruction of legal categories, procedures, and institutions to accommodate new modes of owning and transferring value. This reconstruction must begin with intellectual clarity, proceed through legislative innovation, and culminate in judicial practice. Only through such a process can the civil law system maintain its legitimacy and efficacy in the age of digital property.

The transformation of property law in response to digital collectibles is not a peripheral adjustment but a core task of contemporary legal theory and practice. It compels a recognition that property is not a fixed concept but a dynamic relationship between persons and objects, mediated by institutions and shaped by technology. The legal future of digital ownership will depend on how effectively this relationship is redefined, not in opposition to the past, but as an extension of it into a new terrain.

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