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Blockchain and Intellectual Property Registration: Between Technological Innovation and Limits of Access to the Brazilian Legal System

Blockchain e o Registro de Propriedade Intelectual: Entre a Inovação Tecnológica e os Limites de Acesso ao Sistema Jurídico Brasileiro

Blockchain y el Registro de la Propiedad Intelectual: Entre la Innovación Tecnológica y los Límites de Acceso al Sistema Jurídico Brasileño

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Abstract:
Given the datafication of the contemporary economy and the exponential growth of the production of intangible assets in a digital environment, the challenge arises of ensuring the protection, integrity, and legal validity of these creations in a swift and accessible manner. Based on this, the general objective of this article is to investigate whether blockchain technology, due to its properties of immutability, traceability, and timestamp , has the potential to be recognized as a suitable means of proof for the protection of copyright and industrial property rights in Brazil. Using a deductive approach, through qualitative research and documentary-normative analysis, the study examines the compatibility of this technology with the national legal system. It investigated not only its potential for democratizing evidence but also the normative, technical, and social obstacles that limit its widespread implementation. In conclusion, it is understood that although blockchain is relevant for mitigating legal uncertainty and reducing barriers to access, its effectiveness is strictly complementary, not replacing formal state registration regimes, and its full integration depends on overcoming regulatory gaps and digital asymmetries.

Keywords:
Document Authenticity; Blockchain; Intellectual Property; Proof of Prior Art.

Resumo:
Diante da datificação da economia contemporânea e do crescimento exponencial da produção de ativos imateriais em ambiente digital, surge o desafio de garantir a proteção, integridade e validade jurídica dessas criações de forma célere e acessível. A partir disso, o objetivo geral deste artigo é investigar se a tecnologia blockchain, em razão de suas propriedades de imutabilidade, rastreabilidade e marcação temporal (timestamp), possui potencial para ser reconhecida como meio de prova idôneo para a tutela de direitos autorais e propriedade industrial no Brasil. Sob o método de abordagem dedutivo, mediante pesquisa qualitativa e análise documental-normativa, o estudo examina a compatibilidade dessa tecnologia com o ordenamento jurídico nacional. Investigou-se não apenas seu potencial de democratização da prova, mas também os obstáculos normativos, técnicos e sociais que limitam sua implementação ampla. Como considerações finais, compreende-se que embora a blockchain apresente relevância para mitigar a insegurança jurídica e reduzir barreiras de acesso, sua eficácia é estritamente complementar, não substituindo os regimes formais de registro estatal, dependendo sua integração plena da superação de lacunas regulatórias e assimetrias digitais.

Palavras-chave: Autenticidade Documental; Blockchain; Propriedade Intelectual; Prova de Anterioridade.

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Resumen: Ante la datificación de la economía contemporánea y el crecimiento exponencial de la producción de activos inmateriales en entornos digitales, surge el desafío de garantizar la protección, la integridad y la validez jurídica de estas creaciones de manera ágil y accesible. A partir de ello, el objetivo general de este artículo es investigar si la tecnología blockchain, debido a sus propiedades de inmutabilidad, trazabilidad y marcación temporal (timestamp), tiene potencial para ser reconocida como un medio de prueba idóneo para la tutela de los derechos de autor y de la propiedad industrial en Brasil. Bajo un enfoque deductivo, mediante investigación cualitativa y análisis documental-normativo, el estudio examina la compatibilidad de esta tecnología con el ordenamiento jurídico nacional. Se investigó no solo su potencial para democratizar la prueba, sino también los obstáculos normativos, técnicos y sociales que limitan su implementación amplia. Como consideraciones finales, se concluye que, aunque la blockchain presenta relevancia para mitigar la inseguridad jurídica y reducir las barreras de acceso, su eficacia es estrictamente complementaria, no sustituyendo los regímenes formales de registro estatal, y su integración plena depende de la superación de vacíos regulatorios y asimetrías digitales.

Palabras clave: Autenticidad Documental; Blockchain; Propiedad Intelectual; Prueba de Anterioridad.Introduction

Introduction

The exponential growth of digital technologies has profoundly transformed the ways in which intangible goods are created, circulated, and economically exploited. The so-called datafication of contemporary society has turned information into one of the main assets of the global economy, significantly expanding the production of intellectual content in digital environments.

In this scenario, the legal protection of intellectual property faces new challenges related to the authenticity, integrity, and proof of authorship of intellectual creations. The ease of reproduction, sharing, and modification of digital content increases the potential for conflicts involving plagiarism, misappropriation, and copyright infringement, requiring increasingly efficient mechanisms for the establishment and preservation of evidence.

Although the Brazilian legal system has traditional instruments for protecting intellectual property, such as registrations with the National Library and the National Institute of Industrial Property (INPI), these mechanisms are frequently criticized due to bureaucracy, costs, and the time required to complete the procedures.

blockchain technology emerges as a possible alternative for the creation of digital evidence endowed with integrity, traceability, and time stamping. Based on distributed systems of cryptographic registration and validation, *blockchain* enables the creation of immutable records capable of demonstrating the existence of certain content at a specific moment, offering potential relevance for the protection of intellectual property rights.

Given this scenario, the research problem guiding this study is to verify to what extent *blockchain technology* can be recognized as a legally valid means of proving authorship, priority, and authenticity within the scope of Brazilian intellectual property.

The hypothesis is that *blockchain* has the legal capacity to act as a complementary instrument for proving authorship and prior art, especially in the context of copyright, due to its characteristics of immutability, traceability, and time stamping.

However, it is assumed that this technology does not have the legal capacity to replace the formal state registration regimes required for certain industrial property rights, remaining limited by normative, technical, and social obstacles.

The overall objective of this research is to analyze the potential of this technology as an instrument for proving authorship, authenticity, and prior art in the protection of intellectual property in Brazil.

As specific objectives, this study seeks to: a) examine the legal foundations of Brazilian intellectual property; b) analyze the technical characteristics of *blockchain* relevant to evidentiary law; c) verify the compatibility of the technology with the national legal system; d) identify the legal limits to the replacement of formal registration regimes; and e) evaluate the regulatory, technical, and social obstacles that hinder its widespread implementation.

Methodologically, this is a qualitative research, of an exploratory and descriptive nature, developed using the deductive method, with a bibliographic-documentary procedure. The documentary corpus is composed of the 1988 Federal Constitution, Law No. 9.610/1998, Law No. 9.279/1996, the Code of Civil Procedure, Provisional Measure No. 2.200-2/2001, Law No. 14.478/2022, the Paris Convention, the Berne Convention, the Stockholm Convention/WIPO, as well as technical and institutional documents from WIPO, OECD and EUIPO on intellectual property, *blockchain* , digital assets and emerging technologies.

The bibliographic selection considered classic and contemporary national doctrinal works, specialized international literature, and scientific articles published between 2023 and 2026 in indexed databases, especially *Scopus* and *Web of Science* , using the descriptors " *blockchain* " and " *intellectual". property* ”, “ *copyright* ”, “ *patents* ”, “ *timestamp* ”, “ *digital evidence* ” and “ *distributed ledger " technology* ". The temporal delimitation of recent literature encompasses the period from 2023 to 2026, without prejudice to the use of classic works indispensable to the conceptual foundation.

1.Fundamentals of Intellectual Property and the Brazilian Legal System

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In the mid-20th century, the world was undergoing an intense process of economic globalization, increased international trade, and technological advancements. With this acceleration, the age-old methods of protecting inventions and artistic works—based on the Paris Convention (1883) and the Berne Convention (1886)—demanded updating. In this context, the creation of the World Intellectual Property Organization (WIPO), through the Stockholm Convention in 1967, represented a milestone in the modernization and harmonization of intellectual property protection standards at a global level. The WIPO Convention established a comprehensive definition for the concept: Article 2, VIII: [...] intellectual property comprises rights relating to literary, artistic and scientific works, to the performances of performing artists, to phonograms and broadcasts, to inventions in all fields of human activity, to scientific discoveries, to industrial designs, to trademarks, commercial and service marks, as well as to trade names and commercial designations, to protection against unfair competition and all other rights inherent in intellectual activity in the industrial, scientific, literary and artistic fields. Fundamentally, it concerns the legal control over intangible economic assets that possess significant social value. In the Brazilian legal system, the subject is linked to the branches of Civil and Business Law, being centralized in the discipline of Intellectual Property Law. This aims to regulate and protect creations emanating from the human spirit, provided they are capable of being externalized and commercialized (DAS CHAGAS, 2021). From this perspective, legal doctrine has consolidated the understanding that Intellectual Property (IP) constitutes a genre that is subdivided into two main species: Copyright and Industrial Property. However, as Barbosa (2010) teaches, this protection is dynamic and should not be seen as an absolute or static property right; it is an instrumental monopoly granted by the State to correct the natural tendency of knowledge to disperse. This exclusive right assumes various forms to adapt to the new complexities of the market and technology, materializing in so-called *sui generis protections* .

1.1 Copyright and Industrial Property

Regulated by Law No. 9.610/1998, copyright constitutes a set of rules that ensure moral and patrimonial protection for the creator of a work. These precepts aim to safeguard intellectual creations—such as texts, images, music, and videos—simultaneously encompassing the related rights of performers and related entities.

By guaranteeing the authorship and integrity of works, these rights extend to both nationals and foreigners, establishing as a fundamental premise the need for prior authorization for the use of

any protected intellectual creation. Under this regime, the declaratory principle is adopted: legal protection arises with the externalization of the work, with public registration being a merely optional act of evidentiary safeguarding. [1]

In contrast, Industrial Property focuses on the productive and commercial environment. According to the framework established by the Paris Convention of 1883 (Article 1, § 2), this institution encompasses a diverse range of assets, such as patents for inventions, utility models, industrial designs, and trademarks (for products, services, or commerce). It also includes the protection of trade names, geographical indications—such as designations of origin—and the necessary repression of acts of unfair competition. It is worth noting that, although the terminology carries the adjective "industrial," the scope of this branch of law is not limited to factory manufacturing. On the contrary, as Barbosa's classic doctrine (2010) recovers, it should be interpreted in its most latent meaning, extending to agricultural and extractive activities.

In this sense, legal protection extends from natural products and minerals to specific manufactured items, historically exemplified by wines, grains, flowers, and mineral waters. Thus, Industrial Property acts as a cross-cutting protection mechanism, guaranteeing the exclusivity and integrity of assets circulating in the most varied sectors of the global economy.

In the national context, Law No. 9.279/1996 (Industrial Property Law - LPI) consolidates guidelines by establishing, in its Article 2, that the protection of these rights is effected through the granting of patents, registration of industrial designs and trademarks, in addition to the repression of false geographical indications and unfair competition.

Brazilian law closely aligns with the parameters established by the International Convention, but adds a fundamental axiological vector dictated by the 1988 Federal Constitution (Article 5, XXIX): the granting of these rights must necessarily observe the social interest and the technological and economic development of the country. Unlike copyright, this branch is governed by the constitutive principle, depending on the legal exclusivity of the state's administrative act of granting such rights. Therefore, the effectiveness of intellectual property protection in the digital environment faces a paradox: while copyright arises with creation and industrial property depends on a state administrative procedure, both face the factual difficulty of producing timely and low-cost proof of prior art.

In a scenario where data volatility and the speed of violations surpass the agility of traditional records, there is an urgent need for technological mechanisms that confer authenticity and

[1] BRAZIL. Federal Senate. **Copyright Guide** . In: Federal Senate Communication Manual. Brasília: Federal Senate, [2026]. Available at: https://www12.senado.leg.br/manualdecomunicacao/guia-de-direitos-autorais . Accessed on: March 2, 2026.

integrity without the barriers of conventional bureaucracy. It is from this perspective that *blockchain technology* ceases to be a mere financial instrument and positions itself as a paradigm of trust and proof in Brazilian Intellectual Property Law.

1.2 Registration, ownership and proof of authorship

First, it is imperative to distinguish between the concepts of authorship and ownership. While authorship is linked to the individual responsible for creating the work, granting them inalienable and non-waivable moral rights, ownership refers to the holding of patrimonial rights.

In practical terms, the author is the creative genius, while the owner is the subject (physical or legal) legitimized to the economic exploitation of the intangible asset. From the perspective of Civil Law, this creation process is linked to the institute of specification, in which human work and intelligence mold intangible elements to give rise to a new species, whose economic relevance transcends the physical or digital environment in which it is inserted (BARBOSA, 2010).

Unlike Industrial Property, copyright protection is declaratory and immediate. As stipulated in Article 18 of Law No. 9.610/1998, the protection of intellectual creations is independent of registration, a premise aimed at reducing bureaucracy in cultural production. However, this legal exemption creates a paradoxical situation regarding evidence: although the right exists from the moment the idea is expressed, the absence of an official record makes it difficult to prove prior ownership in cases of plagiarism or misuse.

The legislation itself, by providing in Article 19 of the same law the option of registering the work with bodies such as the National Library or the School of Fine Arts, recognizes that material protection requires instrumental support to be enforceable against third parties.

In this scenario, traditional registration bodies, although endowed with public faith, operate through processes that often prove anachronistic in the face of the speed of the computer network. The bureaucratic delays and costs involved end up discouraging the digital creator, leaving them vulnerable in an ecosystem of infinite technical reproducibility.

It is in this gap that the technology that is the subject of this study is inserted; not with the aim of replacing secular institutions, but to act as a complementary instrument of evidentiary effectiveness, guaranteeing speed and legal security through immutable *timestamps* .

2.*Blockchain* and technological trust

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2.1 Concept, operation and relevant legal characteristics

At the height of the 2008 global financial crisis, a disruptive proposal emerged in October of that year, conceived under the pseudonym Satoshi Nakamoto . This was achieved through a computer protocol presented in an article titled *"Bitcoin: A peer-to-peer" In his book "electronic cash system* [2]," the author introduced a technology capable of transforming the course of electronic transactions, as it presented a definitive mathematical solution to the double-spending problem without the need for central intermediaries or a trusted authority [3].

Thus, paraphrasing Antoine Yeretzian (co-founder of *Blockchain Partner), blockchain* is understood as "a large ledger that tracks events - a record - anonymous and unfalsifiable" (FAVREAU, 2018, p. 2). In this system, information is structured in the form of chained blocks, each with a unique electronic identity called *a hash* [4].

hash- protected blockchains has existed since the late 20th century, it was Nakamoto (2008) who materialized the project and created the first decentralized *blockchain* database . This was achieved through distributed software based on DLT (*Distributed Ledger Technology*), characterized by being immutable, possessing very high cryptographic security, and storing information in interconnected blocks that operate through a decentralized computer network.

Although the computer protocol deals essentially with a type of cryptocurrency, Nakamoto (2008) refers to the *" timestamp server"* as the basis of this technology. This server provides not only cryptographically secure and accurate dates and times for digital signatures—proving that the data existed at a specific moment—but also records all these movements in chained blocks, generating a unique digital fingerprint: the *hashes* .

Blockchain , therefore, emerges in a context of global economic crisis with the aim of benefiting society by saving it from costly expenses. Thus, with the use of DLT (Direct-to-Led Technology), it means that the copy of the software registry *does not* reside in a single location;

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[2]NAKAMOTO, Satoshi. **Bitcoin** : A peer-to-peer Electronic cash system. 2008. Available at: https://bitcoin.org/bitcoin.pdf . Accessed on: February 2, 2026.

[3] The *subprime* crisis was a severe international financial crisis triggered by the collapse of a housing bubble in the United States, resulting from the massive granting of high-risk mortgage loans (classified as *subprime*) to borrowers with low repayment capacity. The collapse highlighted the fragility of traditional and centralized financial institutions, serving as a catalyst for the emergence of decentralized models of value validation.

[4]A *hash* is an algorithmic mathematical function that transforms any volume of digital data into a unique sequence of characters of fixed size. It is a one-way and irreversible cryptographic method; any minimal alteration to the original file results in a completely different *hash* , a technical property that ensures the informational integrity and non- falsifiability of the electronic document.

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on the contrary, it is replicated across thousands of computers. This arrangement ensures that the technological advancement in question is not subject to intervention by any body, not even the state, being entirely governed by consensus among its participants.[5]

Since the information in this "ledger" is recorded in block format, its structure is divided into two main parts: the header (*block header*) and the transaction data (body). The first part comprises the *hash* of the preceding block, the timestamp , the *nonce* (an arbitrary number used in the mining process for algorithmic validation), and the Merkle *root (* which consists of a consolidated *hash* of all transactions included in that block).

This space encompasses the list of transactions (containing the addresses of the sender's and recipient's public keys, the transferred value, and the digital signatures that validate authenticity), the *smart contracts* (self-executing smart contracts, common in networks like *Ethereum* [6]where blocks can contain self-executing contract code) and, finally, validation data that proves the consensus reached by the network participants.

Given this entire technological structure, the properties of *blockchain* —cryptographic immutability, the authenticity conferred by the *timestamp* , and decentralization—begin to play a crucial role in the field of Evidence Law. According to Gonçalves (2015), judicial evidence consists of the means used to convince the judge of disputed facts that are relevant to the case. From this procedural perspective, this digital mechanism emerges as a suitable means of establishing factual truth. The network's distributive architecture acts as a vector for the democratization of evidence by eliminating intermediaries and reducing costs, allowing the integrity of an electronic document and the priority of an intellectual creation to generate a presumption of authenticity, providing the necessary security to support the judge's conviction.

2.2 *Timestamp* , immutability, traceability, and informational integrity

Understanding *blockchain* as a mechanism of interest to the Judiciary requires transposing its technological characteristics into the dogmatic principles of Brazilian civil procedure. It is from the inseparable convergence of *timestamping* , immutability, traceability, and informational

[5] This distributed network dynamic implies that if a malicious agent attempts to retroactively modify the information in a block of the chain, the alteration will corrupt its corresponding *hash* . Since the system operates by consensus, the other computers (nodes in the network) will identify the mathematical incompatibility and automatically reject the fraudulent block, guaranteeing the inviolability of the recorded data.

[6] It is a decentralized, open-source blockchain platform that enables the creation of smart contracts and decentralized applications (dApps). Unlike Bitcoin, which focuses on money, Ethereum functions as a global computer, using its native cryptocurrency, Ether (ETH), to power transactions and applications.

integrity that the technology consolidates itself as a means of electronic documentary evidence with high probative force, capable of fulfilling the validity requirements demanded by the Brazilian legal system.

The first element to highlight is the *timestamp* , which directly establishes the chronological order of events. In the digital environment, altering file metadata (such as changing the creation date of a document in the operating system) is easily done, weakening the proof of prior existence.

Blockchain timestamping resolves this evidentiary vulnerability by recording the exact moment (second, minute, hour, and day *) when* the *hash* of that creation was inserted into the block. From the perspective of evidentiary law, the timestamp confers on the document an indisputable presumption of prior existence, generating in the mind of the judge the certainty that the intangible asset existed in that exact state and time period, essential for resolving authorship disputes.

This temporal precision is complemented by immutability, a property resulting from decentralized consensus and cryptographic chaining. Once the data is validated and integrated into the chain, any subsequent attempt to modify it would require altering all subsequent blocks and simultaneously controlling most of the computers on the network, which is mathematically unfeasible. From the perspective of Article 369 of the Code of Civil Procedure, which admits all legal and morally legitimate means to prove the truth of the facts, immutability gives the *blockchain* a probative value superior to that of many physical documents, shielding the evidence against risks of fraud or unilateral alterations during the course of the process.

In turn, traceability operates as a logical and uninterrupted timeline of events. Since each block carries the *hash* of the previous block, a perfect digital chain of custody is created. In the context of intellectual property, this allows tracking the entire history of an asset, from its original registration to any transfers of ownership via *smart devices. contracts* .

According to the judge, traceability eliminates any factual uncertainties about the chain of events, allowing for auditing the origin and path of information with absolute transparency, fulfilling the scope of historical reconstruction of the facts that governs the investigative phase. Furthermore, informational integrity is embodied in the guarantee that the document presented in court has not undergone any corruption or alteration since the moment it was inserted into the network. The verification of integrity is done mathematically: if the file presented in *hash format* perfectly matches the code registered in the *blockchain* , it is conclusively demonstrated that the document remains intact.

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In the national legal system, the validity and acceptance of this digital evidentiary system are directly supported by Article 10, § 2, of Provisional Measure No. 2,200-2/2001, which confers functional equivalence and legal validity to means of proving authorship and integrity of electronic documents that differ from the ICP-Brasil standard, provided that it is accepted by the parties or legally validated by the magistrate.

As Pinheiro (2021) teaches, the security of legal acts in the virtual environment depends on the creation of reliable audit trails. Therefore, by bringing together these four properties, *blockchain* ceases to be a mere technical innovation and becomes a technological trust ecosystem that materializes, with scientific certainty, the procedural truth required by Brazilian law.

3. *Blockchain* and intellectual property

The intersection between decentralized technological arrangements and the protection of intangible assets challenges the traditional boundaries of Intellectual Property Law. Beyond its original application in the financial sector, the structural properties of *blockchain* find perfect resonance within the protective institutions of Intellectual Property.

The purpose of this chapter is to analyze the dogmatic adequacy and operational limitations of this tool in relation to the current copyright and industrial legal regimes in Brazil, investigating to what extent algorithmic trust can act as a vector for complementarity and democratization of access to justice.

3.1. Potential for proof of prior art and authenticity

The potential of *blockchain technology* in the Intellectual Property landscape lies in its ability to solve the challenge of establishing evidence in a virtual environment. As analyzed, both the declaratory protection of copyright and the safeguards of precedence in industrial property demand the unequivocal demonstration of a fundamental element: priority.

In a digital ecosystem governed by instant reproducibility, *blockchain* emerges as a highly relevant tool, acting as a decentralized mathematical witness capable of permanently recording the exact moment of the creation or use of an intangible asset.

This evidentiary capability is directly manifested in the guarantee of the work's authenticity and the identity of its creator. By submitting a digital file to the network protocol, an inseparable

link is generated between the author's cryptographic signature, the asset's content, and the indelible *timestamp* .

From a procedural and civil law perspective, the strength of this evidentiary title finds direct support in Article 10, § 2, of Provisional Measure No. 2.200-2/2001. Since copyright is governed by the declaratory principle (Article 18 of Law No. 9.610/1998), the exemption from mandatory state registration grants the creator the freedom to use *blockchain* as a suitable means of establishing authorship and priority.

The potential of this technology, therefore, transcends mere technical innovation; it decentralizes the power to produce evidence, allowing the independent creator to immediately establish robust evidence against fraud and plagiarism, mitigating economic asymmetries in access to legal protection.

3.2 Limits for replacing formal registration regimes

Despite the recognized efficiency of *blockchain* in consolidating evidence of prior art and integrity, it is imperative to establish the legal limits of its application, lest we fall into a misguided technological reductionism.

The mathematical security offered by the distribution network is neither the same as, nor a substitute for, the legal security provided by formal public registration systems managed by the State. Therefore, technology should be understood as a complementary mechanism for safeguarding evidence, and not as a replacement for official intellectual property authorities.

The first major limitation lies in the absence of merit-based review by the technological protocol. *Blockchain* functions as a blind repository of information: it attests, with absolute precision, that a given digital file existed on a specific date and under the ownership of a cryptographic key, but it is incapable of assessing the legality, originality, or novelty of the recorded material.

In the realm of Industrial Property, for example, the granting of a patent or the registration of a trademark requires a complex technical analysis carried out by the National Institute of Industrial Property (INPI), which verifies strict legal requirements, such as inventive step and non-conflict with third-party trademarks. Technology, by itself, does not possess the police power or administrative discretion necessary to perform this scrutiny.

The second crucial limitation concerns the legal nature of registration acts. In the Brazilian legal system, the classic distinction between copyright and industrial property rights prevails. While copyright arises with the creation of the work, with registration at the National Library being

merely declaratory and optional, industrial property is governed by the principle of constitutive registration.

This means that the exclusive right to a trademark or patent only legally exists after the administrative act of granting it by the State. A *blockchain registration* , therefore, will never grant its holder a monopoly on the economic exploitation of a trademark, serving strictly as initial material evidence or for purposes of priority rights due to prior use, as dictated by Article 129, §1, of Law No. 9.279/1996 (Industrial Property Law).

Furthermore, a third factual and technical limitation is imposed, known in the Digital Law literature as the "oracle problem" or fraud at the origin (PINHEIRO, 2021). The distributed network guarantees the immutability of the data from the moment it enters the blockchain, but it is unable to attest to the veracity of the information before its registration.

Thus, if a malicious third party stamps a work authored by another on the *blockchain* , the technology indelibly records a fundamental ideological falsehood. The tool, therefore, certifies the existence of the file on a given date, but it does not have the power to validate the original causal link between the genius of the creative spirit and the real ownership of the intangible asset, an essential distinction pointed out by Barbosa (2010) when discussing the limits of purely instrumental evidence.

4.Obstacles to integration into the Brazilian legal system

Despite the evidentiary virtues and functional equivalence that technology confers on the preservation of digital memory, the effective integration of *blockchain* into the daily routine of Brazilian forensics faces complex barriers that transcend the realm of data engineering. The definitive inclusion of this tool in the instruments for protecting Intellectual Property requires overcoming limitations of a political-regulatory and structural nature.

This chapter aims to map these obstacles, investigating how gaps in the legal framework and the country's profound socioeconomic asymmetries limit the democratizing potential of this technological innovation.

4.1 Regulatory gaps

The first major obstacle to the widespread use of *blockchain* in the national legal landscape stems from the absence of a specific regulatory framework and clear guidelines from the Legislative Branch.

Although the Code of Civil Procedure adopts the principle of atypical means of proof (Art. 369) and Provisional Measure No. 2,200-2/2001 confers legal validity to electronic documents, the national legal system still lacks rules that specifically regulate the standards for auditing, custody, and reception of data recorded on decentralized networks.

Furthermore, even with the advent of Law No. 14,478/2022 (Legal Framework for Virtual Assets), the Brazilian legislator chose to restrict regulation to the economic and criminal aspects of financial service providers, omitting any mention of the standardization of distributed networks for civil and evidentiary purposes.

This legislative omission creates a scenario of legal uncertainty for both those subject to the law and for judges. Without objective standardization criteria, the acceptance of *blockchain - based evidence* is subject to the subjective interpretation of each judge and the discretion of state courts.

This fragmented decision-making weakens the predictability of the procedural system, since the intellectual creator does not have the prior guarantee that their cryptographic record will be uniformly admitted as valid evidence in any eventual legal dispute, transforming the pursuit of judicial protection into a scenario of interpretative uncertainties.

4.2 Technical and social barriers to the use of technology

Beyond the regulatory vacuum, the integration of this technology faces technical, cultural, and social obstacles. From a technical standpoint, the Brazilian Judiciary operates under electronic process systems (such as PJe and Projudi) that do not have native interoperability with *blockchain* networks .

Thus, the integrity check of a *hash* or the validation of a *smart device... Contracts* require computer forensics knowledge that goes beyond traditional legal training, demanding complex and costly technical expertise, which inevitably slows down the procedural process.

On a cultural level, the barrier of institutional distrust and lack of dogmatic knowledge manifests itself. There is a natural resistance on the part of legal professionals to admitting the mitigation of the traditional public trust in extrajudicial registries by abstract cryptographic keys.

In this way, the lack of digital literacy regarding the functioning of distributed consensus means that the technology is often mistakenly associated with environments of mere financial speculation or illicit activities, delaying its legitimization as a tool for legal security. Still on the socio-legal level, the most severe limitation lies in the reproduction of socioeconomic

asymmetries and digital exclusion. Although *blockchain* is theoretically projected as a vector for the democratization of evidence, its practical application presupposes a high degree of technological literacy and mastery of complex digital infrastructures.

Thus, for low-income independent creators or those in socially vulnerable contexts, mechanisms such as custody of private keys and payment of network transaction fees (*gas) are essential. (fees*) act as invisible barriers. Thus, without public policies for digital inclusion and empowerment, technology risks deepening the inequality gap in access to justice, becoming a privilege restricted to economically dominant sectors.

4.3 Access to the legal system and technological inequality

Therefore, the analysis of obstacles cannot ignore the profound technological inequality that characterizes Brazilian society. The proposal to democratize proof through *blockchain technology* runs up against the structural digital exclusion that affects millions of citizens, especially in peripheral regions and in the states of the North and Northeast of the country.

To demand that a small artisan, an independent musician, or a riverside dweller use *web network interfaces* to safeguard their intellectual creations ignores the reality of the lack of access to quality internet and the absence of basic digital inclusion.

From the perspective of the constitutional principle of broad access to justice (Article 5, item XXXV, of the Brazilian Federal Constitution of 1988), the unassisted preference for advanced technological means risks institutionalizing what legal sociology classifies as a "procedural digital apartheid," creating a new layer of exclusion in the course of the legal process.

Furthermore, this asymmetry compromises the very social function of intellectual property, safeguarded in Article 5, item XXIX, of the Constitution, since incentives for innovation and cultural development fail to reach vulnerable creators.

That is, if the State and Institutions do not promote public policies of inclusion, technological literacy, and accessible institutional tools for registration and mediation, *blockchain* — which was born under the aegis of decentralization and democratization — will paradoxically begin to act as a filter of privilege.

Ultimately, the cryptographic ecosystem will restrict the protection of intangible assets only to those who possess the financial and cognitive capital to navigate its structure, converting a potential instrument of emancipation into a vector for the elitization of legal protection.

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Final considerations

This research aimed to analyze the possibility of using *blockchain technology* as a complementary instrument for the protection of intellectual property in Brazil, especially regarding the proof of authorship, authenticity, and prior existence of intellectual creations. Starting from the hypothesis that the technology possesses relevant evidentiary capacity but does not replace formal state registration mechanisms, the study sought to investigate its compatibility with the Brazilian legal system and the limits imposed by normative, technical, and social factors.

Given the investigated scenario, it is clear that the convergence between the mathematical properties of the distributed network confers robust evidentiary aptitude to the system, finding direct legal support in the functional equivalence guaranteed by Article 10, § 2, of Provisional Measure No. 2.200-2/2001.

Within the scope of copyright law, governed by the declaratory principle, this tool establishes itself as a suitable, swift, and secure means for establishing proof of prior creation and authenticity.

However, the study showed that algorithmic efficiency does not operate in isolation and does not replace the legal security provided by the State. In the Industrial Property regime, governed by the principle of constitutive registration, *blockchain* acts strictly as initial material evidence or safeguard of a right of precedence, being incapable of replacing the essential substantive examination carried out by the INPI (Brazilian National Institute of Industrial Property).

Furthermore, factual limitations such as the "oracle problem" demonstrate that cryptographic immutability protects data entered into the network, but does not eliminate potential fraud or ideological falsehoods perpetrated at the origin of the record, thus maintaining the inseparable need for traditional judicial and administrative protection.

Finally, from a socio-legal perspective, a profound institutional paradox emerges. While *blockchain technology* was born under the aegis of decentralization and the potential to democratize access to justice, its practical application is hampered by digital exclusion and the cognitive and financial asymmetries that characterize Brazilian society.

This means that without the development of public policies focused on technological literacy and the creation of accessible institutional mechanisms for mediation, the cryptographic ecosystem risks becoming a filter of privileges for economically dominant sectors, excluding vulnerable and independent creators.

It can therefore be inferred that *blockchain* figures as a valuable complementary technological trust ecosystem, whose emancipatory and democratizing effectiveness remains strictly conditioned on overcoming the regulatory and structural barriers to digital inclusion in the country.

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