

# A New Panorama for Intellectual Property: The Benefits and Challenges of Blockchain

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**Abstract:** Intellectual property (IP) plays an essential role in protecting the output of human creativity and is a tool for transforming intangible assets into innovation. The increased use of digital technologies and the transition to a knowledge-based economy have brought unexpected challenges to the IP system, which needs more robust tools. Blockchain presents itself as a technology with disruptive potential because of its revolutionary nature and potential to break several paradigms imposed by the regulation of the IP system. This article aims to introduce to readers of both areas which challenges blockchain can solve within the IP ecosystem, as well as to understand how these proposals are understood and worked on an international scale, primarily through the actions of global organizations, performing a diagnosis of how it is possible to make blockchain bring tangible benefits to the IP system.

**Keywords:** intellectual property, blockchain, intellectual property rights, innovation, intellectual property ecosystem

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## 1. Introduction

Intellectual property (IP), according to the World Intellectual Property Organization (WIPO), refers to the creations of the mind, such as inventions, literary and artistic works, designs, symbols, names, and images used in commerce, as well as other forms of expression [1].

Legal instruments protect IP in a way that allows people to be recognized for their creations and obtain financial benefits. Thus, the IP system aims to create an environment where creativity and innovation can flourish by continuously supporting the creation of new intellectual works [2].

Each country has different ways of protecting these intellectual assets, which find a common point in legislation and international agreements. These protection tools include patents, copyrights, trademarks, industrial designs, and geographical indications [3].

There are fundamental concepts in how IP is understood and applied in each country. The Paris Convention first signed in 1883, is the first document to serve as a basis for creating the IP system [4], defining some fundamental concepts about IP, which are of great importance to understanding the particularities of how the protection of these assets is carried out:

- **National Treatment** states that all citizens of any nation are entitled to have their creations protected in any other country as long as they observe and follow their legislation.
- **Unionist Priority** states that the first filing of a patent or design in any member country counts as the priority for future filings in other countries, i.e., it serves as the temporal reference for these future filings.
- **Independence of rights** affirms that each country has the right to have its intellectual property protection system and that its decisions are sovereign and independent within its territory.
- **Territoriality** determines that the protection is valid only in the country or group of countries in which the protection right was granted. Thus, there is no international, universal protection of IP.

With the expansion of the adoption of digital technologies, the challenge to protect or even prove the origin of an invention is increasing since this creation can be efficiently accessed and distributed in an unauthorized way by third parties [2]. Still, concerning protection, there is also the challenge of searching for information about IP assets because they are stored in different databases without connection, making the processing time-consuming and complex [5, 6]. The use of blockchain technology for creating a distributed IP database has been proposed because it is a technology that guarantees the tracking of IP assets, each transaction performed on these assets, its authenticity, and transparency, besides providing a lower cost and more efficient process [2, 5].

Thus, this paper aims to elucidate the potential applications of blockchain technology throughout the spectrum of the intellectual property system, evaluating which areas are more prominent for adopting this technology and what actions are being taken in this direction internationally. This article is directed to all who know one of the areas and would like to understand better and have more contact with this scenario.

## **2. Potential Applications of Blockchain in IP**

Blockchain technology can bring technological advances in different fields of Intellectual Property Rights (IPR) protection, as well as presenting itself with disruptive potential in the way society will deal with the form of protection *per se*, in addition to the conditions of access to these IPRs [5–8]. Thus, we list some of the main areas in which blockchain stands out within the field of IP.

### **2.1. Blockchain for Authorship Determination: Proof-of-Ownership**

Because of its characteristics, it is possible to use blockchain technology to determine the authorship of intellectual creation, especially creations made in the digital world [9]. One way is to make a digital certificate, creating proof of evidence of an asset at a particular time, done with blockchain as a timestamping tool. With this, a hashed digital certificate of the IP to be protected is created, which is done so that the record is immutable and cannot be hacked or accessed by other parties, creating one that must be held by the creator of that work that effectively serves as proof of authorship [10].

The blockchain can also be used as a validation tool for these digital certificates and the work itself, validating the integrity of any intellectual property asset previously entered that blockchain. Thus, it is possible to perform infringement checks on any previous IP product since the blockchain does not allow duplicate information to be recorded on its network [10].

Finally, blockchain can also be used to prevent the misuse of an IPR, preventing piracy. Blockchain technology can distinguish counterfeit goods from genuine products by using the ledgers created on the network to have real-time tracking of the ownership of these products, especially in digital intellectual property products, where the ownership of a creation is quite fluid, as the holder of its rights and the ownership policies applied to it [11]. Thus, by allowing a more straightforward correlation between these issues, blockchain presents itself as a promising tool to prevent IPR piracy [10].

### **2.2. Blockchain for Maintaining Version Control of Digital Assets**

Some types of digital assets have the characteristic of having multiple versions during their lifespan and need some technology that can identify and protect these IPR assets during their entire lifecycle. Blockchain technology is up-and-coming in this field, having the ability to provide end-to-end lifecycle maintenance of IP assets [12].

The main application in this sense is in the defensive publication of creation as a way to avoid the erroneous protection of an asset or even the possibility of others taking ownership of the final product while a product is under development [2]. For example, it is possible to register a highly complex IPR, such as computer software or a videogame, at varied times during its creation process without this characterizing the registration of different products: it is just the registration of the same product at several stages of development.

Such registration is possible since the blockchain can provide a unique identifier to each asset, also called a fingerprint. Since duplicates are removed and are not subject to double registration, it is possible to perform updates and register the different versions of the same asset on the network [2]. Furthermore, this database is indexed and searchable, showing all the other versions, when the records were made, and what modifications were made, making it a complete tracking tool for an IPR [10].

### **2.3. Blockchain for Maintaining Version Control of Digital Assets Blockchain for Enabling Marketplace**

The market for IP assets is growing at a fast pace. However, the challenges facing the system that supports the transactions of these properties.

As these assets are fluid, their ownership must be maintained through dynamic, secure, and agile tools, and blockchain technology stands out among the possibilities. By using blockchains, it is possible to create a global IP registry so that the records of different types of IP assets can be stored in a ledger distributed by an IP office, which is responsible for the administration and authentication of these assets, as well as for maintaining the immutable record of events throughout the asset's lifecycle [10], which is known as a smart IP registry. This way, IP asset offices and beneficiaries can accelerate their processes, ensuring they are auditable and maintaining due diligence on all transactions [12].

Once the record is appropriately stored on the blockchain, it can assist in the digital transfer of IP assets, exchanging or transferring them between two entities [11]. Thus, it is possible to benefit from the blockchain's smart contract technology. With it, through the Distributed Ledger, you can use it as an authentication and validation system for transferring intellectual assets.

Finally, it is also possible to transact IP assets through secure payments directly on the blockchain using cryptocurrencies. Payments made this way add an extra layer of security to the transaction, as they remove the vulnerabilities of using paper money or traditional banking, such as issuing a valid proof of transaction to release the asset transfer [10].

### **2.4. Innovation Chronogram with Public Blockchains and Cryptographed Repositories**

Innovation projects require different iterations, creating difficulties in recording IP assets that are static in time. There is also the issue of maintaining a repository in which all versions of all intellectual assets are stored. As mentioned, using a decentralized ledger, a central feature of a blockchain, allows the registration of these IP assets. However, it can go further: creating a low-cost, globally validated IP asset schedule is possible.

This way, it is possible to prove the existence, integrity, and ownership of different IPRs, such as documents, artistic compositions, research data, computer programs, business plans, and others [10]. Moreover, this kind of registration also solves the problem of the fragility of property certificates issued by IP authorities and offices: they need to be used in combination with the original files to which the certifications refer. However, even minor changes to the originals invalidate the certificate since it is no longer the exact intellectual asset that is protected. With versioning enabled on the blockchain, assets can be dynamically registered, and their development timeline can be integrated into the IPR registry [11].

### **2.5. Blockchain-based Smart Contracts**

The built-in technology of smart contracts in blockchains may be one of the main assets for commercializing IP assets; however, the possibilities of smart contracts to manage IPRs go beyond this [13]. Smart contracts are a very convenient form of enforcement and guarantee legal security for establishing IPRs. They ensure that a given protected content has its registration or copyrights implemented more readily since access to these records becomes easily accessible and with guaranteed security [14].

The licensing of IPR uses also benefited from smart contracts, reducing the transaction course and creating a direct link between the content creators and their users. It also allowed a continuous follow-up of the capture and payment of royalties between the licensor and the licensee [14].

The reward system benefits from the application of smart contracts since they can be tied to specific milestones and automatically release the payment to the creator when a particular goal is reached. In this way, creators and owners of IPRs get their due recognition and gratification in a simplified manner [10]. Thus, it is possible to accelerate innovation by encouraging inventors, researchers, and content creators to be assured that their creations will be recognized and receive the correct remuneration for their intellectual effort [10].

As the blockchain connects the contracts established by the parties and the remuneration system, there is the facilitation of the release of secure payments, which can be legally made to IPR holders by real-time payments, bringing greater transparency to the processes involving IPR [11].

For example, the application of this tool allows creators of content for social networks to use content from other creators who have the registration and for payment to be automated according to the number of views

of the derivative work and the percentage of use of the original work, which could be administered directly through the platform where the intellectual asset has been deposited, which, through the unique identifier of that work, would be able to monitor its use and remunerate the author while charging a small administration fee for the monitoring.

### **3. Blockchain for Unifying the Global IP System**

A long-standing desire of many users of the IP system is to establish a global IP system in which users can move and register their assets globally easily in a unified manner [15]. As it stands now, following the principle of territoriality, each country has its IP laws and offices. Many still have difficulties accepting assets registered on blockchains as “admissible evidence” for proof of anteriority of registration [6].

Some jurisdictions, however, already accept blockchain records as proof of evidence, notably some states in the United States of America, China, and India, although this understanding is only broadly valid for some IP assets [12]. Still, blockchain’s potential to revolutionize how intellectual assets are registered will force governments to update their legislation to accept blockchain and its adjacent technologies [10]. Otherwise, they will be out of step with other national offices.

When such acceptance of technology occurs, the possibility of unification of the intellectual property system will be on the horizon. However, many challenges to harmonizing all parties involved will be necessary to achieve such a scenario.

#### **3.1. International Initiatives for Applying Blockchain in IP**

The intellectual property system is strongly linked to treaties, conventions, and agreements signed by several countries to establish a common understanding of the scope and procedures related to IPR. Adopting new technologies, procedures, and applications of these rights requires consensus or support from most of the system’s users [11]. Discussions between the parties become even more critical for adopting disruptive technologies in the area, among which blockchain stands out.

The global forum for these discussions is WIPO. An agency of the United Nations, WIPO was established in 1967 and currently has 193 member states. Its main functions focus on discussing services, policies, information, and cooperation on intellectual property [16]. WIPO stands out for its mission to lead a balanced and effective development agenda for the international IP system to enable innovations and products of human creativity to benefit all societies [16].

The organization is not blind to the rise of the transformation in IPR management enabled by blockchain technology and has been organizing events and meetings in increasing numbers to discuss the topic. Three forums have received prominence: in 2019, the WIPO Standards Workshop on Blockchain; in 2020, the Webinar on Blockchain White Paper; and in 2021, the Blockchain Whitepaper for IP Ecosystems [17].

These events culminated in the publication of the manual Blockchain Technologies and IP Ecosystems: A WIPO white paper, prepared in partnership with member state IP offices and other stakeholders [18]. Notable among them was financial support from Funds-In-Trust Korea, a government organization in South Korea. This paper provides guidelines for the future application of blockchain in the IP sector. The White Paper highlights some priority areas for the development and application of blockchain technology in the IP system and what discussions are relevant for this development to be aligned with national and international interests managed by the organization.

Initially, WIPO indicates the importance of gathering information on how blockchain is understood in general and by the IP community to understand better the potential and main bottlenecks in developing the technology. From this, it will be possible to identify what opportunities and challenges are imposed by using blockchain technologies for IP and to analyze the implications of the applications in the IP ecosystem.

The WIPO document also indicates the importance of mapping and identifying the leading agents and stakeholders of blockchain applications in the IP system to bring them closer to the activities developed by WIPO and that they participate in the construction of these systems with the organization. Also highlighted is the institution of the Blockchain Task Force, which will be the institutional body responsible for coordinating activities related to blockchain implementation in the IP space and will suggest recommendations for consideration by the WIPO plenary, which has members from all member countries [18, 19].

In this sense, the role of the Blockchain Task Force within WIPO stands out. Established within the Committee on WIPO Standards (CWS) through CWS Task No. 59, its primary assignment is the drafting of a standard with international strength to support the applications of technologies that use blockchains in the

IP ecosystem, ensuring that these applications observe, at the international level, interoperability, governance, and compliance with national and transnational regulations on the subject [19].

As for the practical initiatives taken by WIPO regarding the management of IPRs, although none of them directly involve the use of blockchains, there is one that is heavily inspired by the possibilities of the technology and is considered a replacement for blockchain until the organization fully adopts it: the WIPO Proof [20].

This tool works as an online time stamping solution for unregistered IP assets, acting as proof of possession of digital content at a given time as long as it has stayed the same since then. If there are any changes, a new registration must be made. Thus, this tool ensures trusted digital evidence by an international organization. WIPO Proof complements current IP systems by being a safeguard tool for intellectual assets, even if they are not registrable in the formal IPR system. Thus, different intangible assets can be registered with the device, such as trade secrets, creative works, designs, software source code, AI algorithms, scientific data, and even digitally signed business documents.

Although the premise of WIPO Proof is reasonably coherent with the potential offered by blockchain, it differs in one crucial aspect: centralization. In this tool, the generation and verification of the proof of existence for a PI and its related assets are managed only by WIPO, which holds the database of the records made. This topic is susceptible in the IP community since the blockchain assumes that the ledger must be shared by all nodes in the network so that all perform the validation of a record [5].

The understanding is that the support and certification of digital evidence by a neutral and central authority body maximizes the trust in that record, ensuring greater validity as evidence compared to records that do not have this support, such as most already held on blockchains [5]. This understanding led WIPO to discontinue the tool in its token generation service by 2022 [21], standing by the argument that the rapid evolution of the market and a re-evaluation of the business case of the tool led to the decision of service interruption by the WIPO General Assembly.

Although creating new tokens is impossible, those already generated can be validated, and certificates for the owners can be made. WIPO ensures the continuity of the service until at least 2027. Until the moment of the preparation of this manuscript, a new tool to substitute the services provided by WIPO Proof was not announced by the organization.

Regardless, WIPO Proof presents the main advantage of the registration in an international organization of a broad recognition of a digital asset in an anonymous way, besides providing a record that is recognized as evidence in several jurisdictions in case of litigation [20]. However, the platform is less secure than the blockchain due to its centralized characteristics. Besides not having a versioning tool, innovation projects that seek this alternative and go through several iterations may register only one final product or register the versions separately [5].

#### **4. Discussion**

Adopting blockchain technologies for IP asset management will require standards and regulations to be discussed and approved internationally, preferably through multilateral organizations that can mediate and bring the technologies into practice, such as WIPO.

Although welcome and with the potential to bring significant advances, private initiatives in the area will come up against the solidity of the IPR system as it is constituted based on the principles dictated by the Paris Convention, especially territoriality. Thus, local initiatives will first have to find repercussions and acceptance in national IPR offices to have an echo on a global scale.

However, isolated private and national initiatives rule out the possibility of building a unified IP asset management system, something blockchain can do. This problem is why the different stakeholders should actively participate in the discussions held in international forums to adapt their technologies according to the agreed recommendations.

Blockchain can assist and replace the current IPR protection and management model. Despite this, it has yet to find full support within the IP community, mainly because it does not provide sufficient legal certainty for the actors involved.

Therefore, IP authorities, lawmakers, and experts must collaborate to develop blockchain implementation for IPRs. WIPO is moving in the right direction by providing a global forum for these discussions. Notably, WIPO's mediation can promote the international adoption of these technologies, including countries that still need a stable system for managing IPRs. In this way, they can actively participate in the global market without further increasing their gap with countries with a higher level of development and use of IPRs.

Another need is for IP experts, including law firms that provide direct support to creators and experts in



blockchain technologies, to work together to educate creators and give the best tools for their needs, broadening the understanding and adoption of these innovative technologies for the IP landscape.

## 5. Conclusion

The adoption of blockchain technologies for IPR management must be understood with great potential for transformation and disruption. However, it is necessary to comprehend that those conventions and norms within the IP system must be respected. To undergo the required changes to keep up with the evolution of society, they must also be updated and allow the adoption of new technologies.

Authors, inventors, and creators can currently complement the protection already guaranteed by the IP system with blockchain-based registrations. Such solutions are a considerable step towards adopting new technologies in the system, promoting awareness, and creating a minimum degree of legal certainty necessary for such solutions to solidify themselves as viable alternatives.

With discussion among the different stakeholders of the IP system at a national and international level and the gradual adoption of these technologies in a harmonic way, it will be possible to establish the best practices and the new contractual frameworks necessary to leverage the proposed solutions to the current problems of the IP system, as well as allowing these solutions to be accessible to all.

## Conflicts of Interest

The authors declare no conflict of interest.

## Author Contributions

Both T.N.C. and GSP contributed equally to this work. Both authors have read and agreed to the published version of the manuscript.

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