INTELLECTUAL PROPERTY IN THE DIGITAL DOMAIN: NEW TECHNOLOGICAL CHALLENGES WITH SPECIFIC REFERENCE TO BLOCKCHAINS

Adv. Nandakishor S., National University of Advanced Legal Studies, Kochi

ABSTRACT

This project investigates the impact of blockchain technology on intellectual property law in a digital environment, with particular emphasis on India and the TRIPS agreement. The study identifies the conflict that current IP laws are made for centralized, territorially-based systems, whereas blockchains function through decentralized and borderless networks. The paper considers the implications of copyright, trademark, and patent law arising from the nature of the blockchain in terms of its features like immutability, decentralization, timestamping, and smart contracts. It further ascertains if blockchain ledgers can be considered as author identification, ownership, priority, and licensing under Indian provisions such as the Copyright Act, 1957, the Patents Act, 1970, the Trade Marks Act, 1999, and the Information Technology Act, 2000.

The research also looks at the permission of such proof under the Indian Evidence Act, 1872, and points out the contradictions of data protection standards as per the Digital Personal Data Protection Act, 2023. Worldwide judicial responses to blockchain-based IP disputes and trends in the global market are identified through a comparative study of the European Union, the United States, and China developments.

The investigation argues that although India's IP system complies with the TRIPS agreement, it does not provide for the explicit recognition of blockchain-based records and transactions, thus resulting in legal uncertainty concerning enforcement, jurisdiction, and privacy issues. The project ends with the suggestion that blockchain be considered as an additional governance instrument rather than a substitution of statutory IP frameworks and recommends that legislative changes, institutional pilot projects, and international cooperation be utilized to achieve technology-neutral, secure, and TRIPS-compliant integration of blockchain in India's IP system.

INTRODUCTION

One of the significant aspects of the digital age is that intellectual property has dramatically changed in how it is created, shared, and protected. With the move to a global digital economy, there has been a great deal of new innovation, and the rise of new types of inventions and creations, but at the same time, it has revealed the vulnerabilities of the IP protection systems that are still there. Data is becoming the new oil for the economy, and the safeguarding and the administration of intellectual property in the digital space have become the central issues facing policymakers and the law community. The global turn in favor of a digital economy highly coincides with the increasing use of cutting-edge technologies like artificial intelligence, big data, and, most importantly, **blockchain** both in India and globally. As is generally the case with blockchain technology, it is considered a decentralized ledger system that is difficult to alter and is completely transparent regarding the record of transactions. The interesting trait catalyzed by this technology is the growing of interest in its possible use in such areas as **IP rights management, licensing, and enforcement**.[1] Hence, the convergence of blockchain with IP law is one of the most promising, yet complex, frontiers in the digital economy of today.

The Agreement on Trade-Related Aspects of Intellectual Property Rights (**TRIPS**), an international treaty setting minimum standards for IP protection, to which India as a member of the WTO is bound, serves as a starting point for global IP norms.[2] Nevertheless, TRIPS was developed in the early 1990s, well before the advent of blockchain technology, and its terms were structured with more conventional, territorially anchored IP systems in mind. The fundamental problem remains: how can a treaty designed for a pre-digital world adjust to the decentralized and borderless nature of blockchain technology? India's IP system, though fundamentally based on the **Patents Act, 1970**, **Copyright Act, 1957**, and the **Trade Marks Act, 1999**, has to come to terms with the blockchain-related challenges in IP such as rights management, ownership verification, and digital asset protection.[3] Even if the existing legal framework in India is broadly TRIPS-compliant, it still struggles to provide space for innovative blockchain-based IP systems without facing the challenges of regulation and jurisdiction.

THE DIGITAL CONTEXT OF INTELLECTUAL PROPERTY

The primary feature of blockchain is that it is a decentralized database for keeping records or blocks which are linked using cryptography. Each block contains the time and date when it was created and a record of the transactions that were done. More importantly, the data cannot be

changed by going backward. These features of being **immutable** and **transparent** attract the use of blockchain technology in the protection of IP. In the case of traditional IP systems, there is a requirement for owners to prove creation and also show that the work was original when the assets are in the form of works (whether literary or artistic), trademarks or inventions. The process is usually tedious, costly, and prone to disputes or claims from imposters. Through blockchain, creators can make their works public as they create them. Hence, the logic of sending a permanent record supervised by the system as proof of authorship and ownership, so the issue of enforcing rights in infringement cases is being resolved.

In India, there are still no definite practical applications of blockchain in IP, and it is only experimental. An example can be the Intellectual Property Office of India (IPO) that has been considering using blockchain with the aim of increasing transparency in patent examinations and trademark registrations as one of their pilot projects. Besides that, some private platforms have started giving the service of blockchain-based registration in which creators can prove the existence of the work or authorship without the need for formal copyright registration. These are the examples of how blockchain can play the role of **technological support for rights verification and enforcement** in India's statutory framework.

Many more initiatives based on blockchain technology in IP management are gaining traction internationally. The **World Intellectual Property Organization (WIPO)** has introduced the WIPO Blockchain Initiative in order to find out the possible ways of using distributed ledger technologies in IP services worldwide.[4] The European Union Intellectual Property Office (EUIPO) is also implementing blockchain to fight counterfeiting and to trace the source of goods apart from other means. The international community is slowly though surely with welcoming blockchain as a reliable infrastructure for IP administration

TRIPS, DIGITAL DOMAINS, AND THE INDIAN IP FRAMEWORK

TRIPS Agreement establishes the minimal level at which the protection and enforcement of IP rights should be carried out by WTO members.[5] Although the core principles of the agreement - national treatment, most-favored-nation treatment, and minimum standards - are still valid today, the accord was not developed with emerging technologies such as blockchain in mind. Nevertheless, the TRIPS framework is flexible enough to allow member countries, including India, to update their IP regimes as long as they comply with the general obligations. **Article 9 of TRIPS** views the whole system of copyright from the Berne Convention while **Articles 27**

- 34 concern patents. Inherent in these provisions are concepts of centralized registries, identifiable authors, and territorially based jurisdictions. On the other hand, blockchain challenges such presumptions by coming up with decentralized and global registries that function outside the limits of traditional state boundaries.

In the Indian perspective, both legal and administrative changes are involved in making TRIPS compliant blockchain-based IP systems. One is referring to the Indian IP system whereby national laws must confirm that blockchain records serve as **evidence admissible in court**.[6] Another is pointing out that India must make sure that formal IP registration, which is one of the transparency and procedural requirements of TRIPS, is not jeopardized by any recognition of blockchain-based registration. The Department for Promotion of Industry and Internal Trade (**DPIIT**), which oversees India's IP policy, believes in the potential of blockchain as per the **National IPR Policy (2016)**.[7] This policy emphasizes the need for technology-driven IP administration, thereby signaling India's readiness to integrate blockchain tools in the near future. However, much of the legal interpretation still lies with the courts and future legislators as specific regulations or guidelines are yet to be unveiled.

- **BLOCKCHAIN AND COPYRIGHT LAW**

Recent copyright laws give creators the exclusive power to reproduce, distribute and show their works. The problem is that the digital world has made the implementation of these laws extremely hard due to the ease of copying and unauthorized distribution of digital content. Blockchain technology provides a mechanism to overcome these problems, as it gives a "**proof of creation**" that is verifiable and also makes automated licensing possible. The **Copyright Act, 1957**, as amended, in India does not explicitly address blockchain records. Still, Indian courts allow digital records under the **Indian Evidence Act, 1872**, if they meet certain conditions of authenticity.[8] A blockchain, based timestamp can, therefore, be taken as indirect proof of authorship, especially if other documents also support it.

The value of blockchain evidence in IP disputes has been tested in several international litigation cases. The district court in the USA, 2021 in ***HarperCollins Publishers LLC v. OpenSea Inc.***, cited blockchain records of NFT sales to show the origin and the ownership of digital literary content.[9] This is not an Indian precedent, but this case signals a global momentum towards accepting the evidentiary value of blockchain in IP disputes. In the Indian context, courts have not yet addressed blockchain, based IP claim cases. Nevertheless, Indian

artists are progressively adopting blockchain platforms such as Po.et or Ascribe to document their works. While this new behavior, which is still unofficial, indicates a change in the way artists claim their rights in a digital economy where the traditional methods of enforcement have difficulty keeping up with the technological innovation.

- **BLOCKCHAIN AND TRADEMARK LAW**

Trademark rights offer unique goods or services to be identified from their origin and quality and, thus, prevent consumers from being confused and fair play in competitions. One of the biggest challenges of trademark enforcement is **counterfeiting**, which is the cause of online and cross, border trade. Blockchain technology can increase trademark protection through transparency in the supply chain and the authentication of the product. In India, fake goods are the main cause of the problem for the industries of the country that range from pharmaceuticals to luxury products. With the help of blockchain, based systems, each product can be equipped with a unique digital identifier that is registered in the distributed ledger. Consumers will then be able to check the authenticity by scanning the code thus, they can follow the entire supply chain instantly. This reduces the dependence on centralized verification systems and increases consumer trust.

The **Trade Marks Act, 1999**, while extensive, does not yet allow blockchain integration in trademark registers or enforcement. Nevertheless, private companies have used technology to find solutions in cooperation with the enforcement authorities. For example, Indian startups have taken a pilot test of blockchain, based authentication tools to follow branded goods, which might be the evidence in legal proceedings under **Section 135 of the Trade Marks Act** (civil remedies for infringement). Worldwide, blockchain, based product authentication has become more popular. The **European Union Intellectual Property Office (EUIPO)** anti, counterfeiting Blockathon Forum is a starting point for distributed ledger systems to protect European brands. These changes indicate that blockchain can support IP enforcement by guaranteeing supply chain transparency, proving rightful ownership and accountability.

- **BLOCKCHAIN AND PATENT LAW**

Patents encourage scientific innovation by giving inventors the sole right to use their inventions for a limited period. However, patent systems often are faced with problems such as the long period before examination, searching for prior arts and the false claim of the invention.

Blockchain technology has been seen as the perfect tool for simplifying patent management, showing openness and reducing disputes about ownership and priority. In India, **The Patents Act, 1970** governs patent registration and patent rights enforcement.[10] While the Act includes the mechanisms for deciding the priority and the inventorship, these actually rely on human verification and documentation. Decentralized timestamping of Blockchain could create the opportunity for inventors to be able to officially record their innovations at different stages of development, thereby creating a chronological record that can later be used as evidence in patent applications. This document will be a non, changeable and checkable one, thus, the disputes on who first came up with a certain invention would be lessened greatly.

The **Indian Patent Office (IPO)** has already taken steps towards the use of the latest technology and the accompanying automation results under the National IPR Policy (2016), which aims to modernize the administration of the intellectual property rights system by heavily involving technology. While the integration of blockchain has not been put into place yet, a few projects using blockchain as support for prior art databases have been talked about at the policy forums where they have been discussed. Moreover, patent offices such as the **European Patent Office (EPO)** and the **United States Patent and Trademark Office (USPTO)** are exploring blockchain, based registries to facilitate collaboration and interoperability.[11] WIPO has also come up with frameworks to make blockchain, based global patent searches, and data sharing more accessible. These endeavours indicate that blockchain may one day be the main part of a cross, border patent information infrastructure.

- **BLOCKCHAIN FOR IP ENFORCEMENT AND ANTI COUNTERFEITING**

The enforcement of IP rights has been the most complex issue in IP governance in modern times. Counterfeiting, piracy, and unauthorized distribution of goods happen at a very high rate all over the world, which leads to huge economic losses. In India, The Organization for Economic Co, operation and Development (**OECD**) estimated that counterfeit goods contributed to a large proportion of total imports, particularly in pharmaceuticals, electronics, and consumer goods. Blockchain technology is the most reliable means for the tracking and the authentication of goods throughout their supply chains. By using unique digital identifiers or non, fungible tokens (**NFTs**) embedded into products manufacturers can create a transparent and tamper, free record of the origin and the movement of the product. This enables both the authorities and the consumers to authenticate the product instantly.

Indian authorities have realized the significance of such systems in the fight against fake drugs and luxury goods. For instance, the Central Drugs Standard Control Organization (**CDSCO**) has taken into account innovative pharmaceutical traceability solutions that are blockchain, based. The goal is to ensure that drugs are traceable from the place where they were produced up to where they are sold, hence, the flow of counterfeit drugs in distribution; One of the main benefits of blockchain in enforcement is the existence of **smart contracts**, self, executing digital agreements that automatically enforce IP licensing conditions.[12] In the case of copyright and trademark, when licensing terms are violated, smart contracts could automatically stop the access or the transfer of royalties. That makes it a technically efficient alternative to the conventional, paper, based licensing systems. On the other hand, several problems persist. The legal status of smart contracts under **Indian contract law** is still being developed, and there are still questions about jurisdiction, liability, and enforceability. Without a clear statutory framework, blockchain, based enforcement mechanisms work in a gray area, which requires them to conform to the provisions under the **Indian Contract Act, 1872** and related jurisprudence.

DATA PROTECTION, PRIVACY, AND BLOCKCHAIN

While blockchain technology enables transparency, its absolute nature of unchangeability gives rise to privacy and data protection issues. Immutability is regarded as one of the core features of blockchains, the very one that tends to conflict with concepts like "**the right to be forgotten**", a right that has been acknowledged in several legal systems, particularly under the **General Data Protection Regulation (GDPR)** of the European Union. In India, the **Digital Personal Data Protection Act, 2023 (DPDPA)** is a major leap in setting up a detailed framework for data privacy.[13] Still, values set forth in DPDPA especially those relating to data minimization, limitation of storage, and deletion may be at odds with the nature of blockchain as an unalterable record of transactions. For example, if a blockchain ledger contains personal data (e.g., the details of the creator or the identities of the licensees), then the inability to change or erase such data may conflict with data protection obligations.

Therefore, the harmonization of privacy laws with blockchain calls for technical and legal innovations. The developments of privacy enhancing technologies like **zero, knowledge proofs (ZKPs)** and off, chain storage aim to enable data verification without disclosing the data publicly. The legal academics have also suggested a "**hybrid blockchain**" concept where the

confidential data is kept off, chain, and on, chain only its hash or the verification key is placed for the maintenance of the integrity without disclosing the privacy. The **Justice B.N. Srikrishna Committee Report (2018)** that laid the foundation for data protection law in India stressed the principle of technological neutrality, requiring that laws must be able to keep up with new technologies without killing innovation.[14] By applying this doctrine Indian legislators could come up with regulations that would not only allow the use of blockchain but also impose privacy safeguards. On the global scale, these problems are being faced by such regulators as the **European Data Protection Board (EDPB)** and the U.S. Federal Trade Commission (FTC). The creation of international standards for data governance, that take into account special features of blockchain, is the key to ensuring legal certainty in cross, border flow of digital goods and services.

LEGAL CHALLENGES AND POLICY GAPS IN INDIA

The Indian system of intellectual property rights is strong within its conventional boundaries but has not yet been fully transformed by blockchain, based innovations. The present legislations do not explicitly allow using blockchain records for establishing IP ownership or licensing, therefore, judges have to decide the permissibility of such records under common evidentiary laws. **Section 65B of the Indian Evidence Act, 1872**, makes provisions for the admissibility of electronic records, which, in theory, could encompass blockchain entries.[15] Nevertheless, the number of court decisions that involve this interpretation is quite few. Moreover, the decentralized and borderless nature of blockchain raises questions about **jurisdiction and applicable law**. The problem of which country's laws are to be applied in cross, border IP disputes involving blockchain transactions can be very tricky. Traditional principles of conflicts of law rely on the connection of the territory, while blockchain systems are global, distributed networks. This legal uncertainty can act as a barrier for IP owners who are hesitant to adopt blockchain, based management systems until there is some clear statutory or judicial guidance.

Another major issue is **regulatory fragmentation**. Technological and IP matters in India are overseen by multiple agencies, including the DPIIT, the **Ministry of Electronics and Information Technology (MeitY)**, and the Securities and Exchange Board of India (SEBI). The level of coordination among these institutions is quite low, which results in different interpretations and overlapping mandates taking place when blockchain intersects with IP, data

protection, or financial regulation (such as NFTs and digital assets). Elimination of these policy gaps requires a national strategy that is unified. The government may come up with model guidelines or amendments that recognize blockchain records as supplementary evidence of IP ownership. Such acknowledgment would be consistent with India's commitments under TRIPS and at the same time, facilitate innovation through **technology neutral legislation**.

COMPARATIVE INTERNATIONAL PERSPECTIVE

In the world, different jurisdictions have already started to consider the use of blockchain in their IP systems. The European Union has taken the lead with the **EUIPO's Anti, Counterfeiting Blockathon Infrastructure** being one of the most advanced networks connecting rightsholders, customs authorities, and consumers for verifying product authenticity. This platform has shown significant reductions in counterfeit incidents, especially, in luxury goods and pharmaceuticals. The United States has also demonstrated judicial openness towards blockchain, based evidence. In ***Hermès International v. Rothschild*** (S.D.N.Y. 2023), the court dealt with the issue of trademark infringement in the case of "**MetaBirkin**" NFTs, thereby, broadly acknowledging the interaction of blockchain with IP and consumer protection laws.[16]

The point raised was that the usual trademark concepts continue to hold even in the environment of the decentralized digital sphere. In China, the legal recognition of blockchain, based evidence has been granted. The **Hangzhou Internet Court (2018)** decision that blockchain can be used to verify technological authorship in copyright infringement disputes provided that the integrity of the technology is verifiable is a precedent. The Chinese IP offices have been encouraged by this example to start the blockchain, based copyright registration system pilot program. These global developments emphasize the importance of legal flexibility. India, as it is with its digital economy that is rapidly growing and global trade in which it is actively engaged, stands to benefit from similar steps being taken. The use of blockchain in the existing IP framework can be a way for India to become a regional leader of digital IP governance under the TRIPS regime.

CASE STUDIES: INDIAN JURISPRUDENCE AND EMERGING TRENDS

To date, India has not yet established a specific case law corpus that directly addresses the relationship between blockchain technology and intellectual property rights; however, the judicial decisions on related matters provide certain indications as to how present/future courts

might be interpreting related blockchain evidence. The following scenarios serve to be the examples of the Indian judiciary's changing reliance on modern technology and intellectual property protection through judicial decisions.

In ***Tata Sons Pvt. Ltd. v. Hakunamatata Tata Founders & Ors.*** (Delhi High Court, 2022), the court prohibited an alleged cryptocurrency platform, visually, which offered an unauthorized use of the "**TATA**" trademark.[17] While this lawsuit had no direct link with blockchain IP issues, it vouchsafed the judicial consent to traditional trademark theory extension to digital environmental areas with assets on the blockchain. The verdict showed that trademarks of decentralized digital marketplaces were not infringed upon as long as the cases were accompanied by consumer confusion caused by the infringing use.

One more case worth mentioning is ***Super Cassettes Industries Ltd. v. MySpace Inc.*** (Delhi High Court, 2016), where the court handled copyright violation online on a digital platform.[18] Even though this was a pre, blockchain era, the ruling's acknowledgment of **platform responsibility** for content uploaded by users sets a precedent for blockchain, based content repository systems which are the potential future of IP asset management sector like NFTs. The Indian stance remains cautious and takes into account the necessity for the law to be followed and the Judge's discretion. Traditionally, Courts have leaned heavily on conventional evidence rules under the **Indian Evidence Act, 1872** when handling digital records. Therefore, it seems logical that even in the case of blockchain data, they would still follow the same process of verification as laid down for electronic records under Section 65B has been used previously.

CASE STUDIES: INTERNATIONAL DEVELOPMENTS

On a global scale, there are various instances of courts dealing with blockchain, related IP issues to directly create legal precedents that could potentially impact the trajectory of Indian jurisprudence. The example most praised in history is ***Hermès International v. Rothschild*** (S.D.N.Y., 2023), the case where "MetaBirkin" was the unauthorized concept put forward by comprising NFTs that visually represented Hermès' most famous handbag designs only. The judge affirmed that NFTs with the trademark of a luxury brand released without the authorization were violations, no matter how the digital nature of them. The rationale bolstered a doctrine of IP defense was extended to those kinds of blockchain, attached resources, making one thing clear, the physical or digital form of expression does not give way to trademark rights.

Likewise, in ***HarperCollins Publishers LLC v. OpenSea Inc.*** (U.S. District Court, 2021), the publisher reported that the NFTs of the work in question went on sale without authorization and thus, copyright and moral rights were infringed upon. One of the leading points was the doable function of blockchain in pinpointing of how the property right was and who did the last transaction without the need of intermediaries. This case took a settlement position before the verdict stage but clearly depicted the double role of blockchain, as a tool for infringement and a way for enforcement.

One more example of doubt is ***Alibaba Group Holding Ltd. v. Alibabacoin Foundation*** (U.S. District Court, 2018), where the court dealt with the dilution and confusion caused by a drop in the use of the "**Alibaba**" mark for a cryptocurrency as a result of trademark issues. The court issued a temporary injunction, highlighting that even in blockchain, related disputes over digital assets, established principles of intellectual property law must still hold true. These international cases provide that at a judiciary level in any corner of the world, the traditional intellectual property rights have not lost their applying character notwithstanding their transactions on a blockchain platform which, in turn, are further proved compliant with their legal frameworks used as the foundation for addressing the emerging technologies.

BLOCKCHAIN INTEGRATION IN IP ADMINISTRATION: GLOBAL TRENDS

Blockchain integration is being tested by several countries within their national IP offices. The **European Union Intellectual Property Office (EUIPO)** has set up a **Blockchain Innovation Hub** with the goal of connecting trademark and design databases of the member states. This project not only facilitates collaborative work between the different national IP offices but also makes it easier for rights to be enforced beyond borders. In China, the **National Copyright Administration** initiated a blockchain, based copyright registration platform in 2019, which allows creators to digitally deposit their works and get certificates that can be used as legal evidence. These judicial databases are connected to the system, thus allowing very rapid verification of copyright in case of a lawsuit.

The **United States Patent and Trademark Office (USPTO)**, together with WIPO, is currently testing blockchain, based methods that can keep the entire collection of documents related to patent applications from the moment of filing up to the conclusion of examination and post, grant procedures.[19] These innovations signify to the whole world that the move towards the digital and decentralized management of intellectual property is now taking place everywhere

and that these solutions are compatible with the overall objectives of efficiency, transparency, and accessibility. The **Cell for IPR Promotion and Management (CIPAM)** and the **Department for Promotion of Industry and Internal Trade (DPIIT)** in India have indicated that blockchain pilot projects might be implemented to support IP recordkeeping, streamline workflows, and authenticate registration data although India hasn't initiated a similar project yet.

FUTURE OF BLOCKCHAIN AND IP IN GLOBAL TRADE

Since blockchain and other digital systems long ago started dominating global trade of digital and intangible products, intellectual property has become one of the most important pillars of the international economic relations field. One of the biggest advantages of blockchains for international trade is the **transparency, traceability, and trust** they provide throughout the often very complex and long international supply chains. According to the TRIPS Agreement, the WTO members must provide IP enforcement in good faith. Blockchain can become an instrument to enhance compliance by allowing in real, time verifications of IP ownership and licensing, thus limiting cross, border conflicts. Smart contracts, for instance, may make it possible that royalty payments related to international transactions are done automatically, so the right holders located in a given jurisdiction are paid when their works are used in a different one.

On the other hand, India could turn the use of blockchain in IP and trade policies into a valuable asset that would then boost its competitiveness on the world stage. The Indian creative sector will be more inclined to invest in digital intellectual property with the help of blockchain, based IP protection. It is worth mentioning that the mentioned scenario is not limited to the creative industries, but also applies to such sectors as pharmaceuticals, software, textiles, and entertainment, where there are still numerous cases of IP infringement and counterfeiting. If India wants to achieve this, then it has to be present and play an active role in the international standard, setting bodies such as the **WIPO and WTO**.[20]

POLICY RECOMMENDATIONS FOR INDIA

India is at a pivotal point where the blockchain can become a powerful tool for her IP field. If the potential is to be exploited to the full without jeopardizing the legal security of the country, multiple policies are necessary:

1. **Blockchain records should receive legislative recognition**: The Indian Evidence Act, 1872, and IP laws should be amended to explicitly label blockchain records as authentic proof of authorship, ownership, or priority.[21]

2. **IP law should be technology, neutral**. Interpretation by the DPIIT should guarantee that current IP laws can accommodate blockchain without the need for frequent legislative changes only if necessary.

3. **Patent and Trademark Offices of India** should execute these projects that are built on blockchain technology for record management to transform IPO transparency, alleviate backlogs, & achieve co, operative data exchange with peer agencies.

4. **Legal training on emerging technologies is indispensable**: specialized judicial training on blockchain technology and digital evidence will keep future tribunals well, informed and fair.

5. **Work with foreign groups** may result in the Indian blockchain standard synchronized with others in the world by WIPO, WTO, and local partners are GO.[22] India can reform its way to the future IP system that is aligned with both TRIPS obligations and the digital revolution by introducing such policies that ensure security, openness, and global integration.

Chapter I – Jurisprudential and Theoretical Foundations of Intellectual Property in the Blockchain Era

The safeguarding of intellectual property (IP) in the past times relied mostly on three fundamental jurisprudential theories: the **theory of labor**, the **theory of personality**, and the **utilitarian or incentive theory**.[23] Each of those together with the technological advances of blockchain highlight how those principles that once had different meanings are affected and how the boundaries of IP ownership become redefined in a way that enforcement can be possible.

John Locke's labor theory describes a scenario where property rights happen to be a consequence of the mixing of people's labor with resources which have no owners. Due to digitization, artistic labor is more and more recognizable by software development, design, and data creation. Blockchains provide a unique way to save and share the work done and consequently the creators can make use of the authentication which is very fast in this case to

prove by themselves that they are original authors. The distributed ledger becomes the new kind of "commons" where one can stake, verify, and exchange digital creations without going through central intermediaries. On the other hand though, the nature of blockchain also adds complexity to the Lockean ideal by offering features such as collective authorship and smart contracts which automate and hide the connection between the individual labor and the product.

According to the **Hegelian personality view**, property is the external manifestation of the person's will and character. Creatiing digitally and then publically recording the work on a blockchain will be the permanent record of the artist's personality. **NFTs (Non, fungible Tokens)** point out this association as they change the intangible works into easily spotted digital objects with a lineage/history of ownership. However, the issue of blockchain record's permanency also leads to the question of the ethics of personality if it is changeable, should new technology, m such as blockchain, keep personality immutable or not? Accordingly, the Hegelian argument moves forward in the dilemma between eternity and the changing nature of the self.

The **utilitarian or incentive theory** that holds sway in Anglo, American law and is also mirrored in the TRIPS Agreement regards the establishment of intellectual property rights as mechanisms for the promotion of technological progress through the granting of limited exclusive rights. By the implementation of blockchain technology, the traditional presupposition of enforcement relying on centralized registries or state agents is questioned. Through the employment of smart contracts for licensing automation, blockchain can become more efficient in motivating the right holders to receive remunerations in a timely manner rather than having to go through a long bureaucratic enforcement process.

RE-EVALUATING TRADITIONAL THEORIES IN LIGHT OF BLOCKCHAIN

These three classical theories ground IP rights in physical or centralized digital environments, but blockchain's decentralized architecture requires a reinterpretation of these principles. Locke's labor combination idea assumes clear, cut individual labor, however, most of the blockchain projects are based on decentralized networks, open, source developers, **DAOs (decentralized autonomous organizations)**, and collaborative data inputs. So the question is: who is the rightful owner of the intellectual output of a collectively maintained blockchain? It may be that the traditional ownership categories are inadequate to cover this kind of distributed creativity. Also, the personality theory expects a strong and unchanging link between the creator

and the work. In the world of blockchain, different people can create, change and tokenize a piece of work. Hence, the "personality" that is in an NFT or smart contract might be the one that is collective or algorithmic. Consequently, the law of authorship and possession has to change so as to fit new ways of the authorship and ownership.

The utilitarian stance is still convincing but turns to be less rigid. For instance, excessively stiff IP rights might hinder the development of blockchain whereas the lack of protection may discourage creators. It turns out that balancing openness with exclusivity is critical. Among scholars some argue for the "**post, proprietary**" concept that means seeing blockchain as an innovation infrastructure of communal nature where the value comes from participation instead of exclusive ownership.

Chapter II – Blockchain and the Evolution of IP Jurisprudence in India

Ownership in a blockchain is still done technically by cryptographic keys just like possession in traditional legal titles. However, while this technical control is functionally equivalent to possession, it operates outside the normative frameworks of law. This raises a fundamental jurisprudential question: is the possession of a private key equivalent to ownership from a legal perspective? If the key is stolen or lost, does the asset still belong to its owner? The Indian legal system that is based on the **Transfer of Property Act (1882)** and the **Indian Contract Act (1872)** has not dealt with such digital possessory interests yet. It is worth noting that the **Information Technology Act (2000)** only enables the use of electronic records and digital signatures but does not define blockchain tokens or smart contracts as property. A forthcoming amendment redefining digital possession and granting the law recognition of cryptographic ownership may be required. Marked from a comparative angle, the **Data Act (2023) of the European Union** and the UCC (Uniform Commercial Code) Article 12 amendments in the USA are two examples of initial steps towards describing digital assets as "**controllable electronic records**".[24] India might take advantage of these examples to design a more detailed system that allows the acknowledgment of blockchain, approach ownership without violating the existing IP laws.

BLOCKCHAIN AND THE EVOLUTION OF IP JURISPRUDENCE IN INDIA

Despite exercising caution, Indian courts have lately been brave enough to implement IP and technology in a more dynamic manner. In the case of ***MySpace Inc. v. Super Cassettes***

Industries Ltd. (2016), the Delhi High Court dealt with the issue of intermediary liability in an online environment and went on to highlight the need for a judicial approach that respects both innovation and rights protection.[25] This practical stance of justice implies that Indian courts might recognize blockchain as one of the authentic documents under **Section 65B of the Indian Evidence Act (1872)** sometime in the future.

Furthermore, the **Justice B.N. Srikrishna Committee Report (2018)**, which concerned data protection, not only recognized the blockchain potential for tamper, proof record, keeping but also identified possible conflicts between the immutability of records and the "right to be forgotten." The paradox of reconciling privacy with permanence in digital space reveals the necessity for a jurisprudence that would maintain technological effectiveness while adhering to constitutional norms such as privacy and due process. It is also Constitutionally appropriate to see blockchain as an example of the principle of **technology, neutrality** in the field of jurisprudence, the same rights can be executed by different technological means while laws shall adapt accordingly. As creative works take the form of decentralized IP the courts in India are likely to increasingly read statutory provisions purposively so as to accommodate new modes of creation and proprietorship.

Chapter III – New Technological Challenges in the Digital IP Regime: The Blockchain Context

OVERVIEW

One of the groundbreaking features of blockchain is **decentralization, immutability, pseudonymity, programmability (smart contracts), and tokenization**.[26] Each of these features in the blockchain interacts with IP law differently and brings new legal, evidentiary, administrative, and policy problems. This paper discusses the technological challenges that IP law must resolve for blockchain. This section goes deeper into the issues involved in five different core areas that concern blockchain technology in general:

(A) legal recognition on, chain records and authorship/ownership,

(B) jurisdiction, enforcement and cross, border complexity,

(C) smart contracts and formalities of IP transactions,

(D) evidence, authentication, and privacy trade, offs, and

(E) economic, regulatory, and standardization challenges. These blockchain, specific problems, legal implications under Indian law, some comparative notes, and practical reform options are for discussion by topic.

A. LEGAL RECOGNITION OF ON-CHAIN RECORDS, AUTHORSHIP AND OWNERSHIP

The problem. Any information stored on a blockchain (the hash value of the data, the creation of a new token, or the transfer of a token) represents a technical fact only: it shows what transaction or data hash happened at what time under which cryptographic key. In contrast, IP law confers rights that are explained in statutory categories and formalities. The main issue is that actions performed on the blockchain usually do not have the necessary formal aspects (signed instrument, explicitly stated assignment language, depositary filing) which Indian statutes require for the transfer and creation of IP rights.

Practical consequences in India.

· The **Copyright Act, 1957** states that a written instrument signed by the assignor is necessary for the assignment of copyright.[27] Typically, an NFT linked to a digital work is bought and sold which in turn means the buyer gets the token and any contractual rights the platform specifies but not copyright unless a compliant written assignment is made. When marketplaces treat the transfer of tokens as transfers of wider IP rights then this is the point where the gap is causing consumer confusion and disputes.

· Patent and trademark regimes likewise need clarity about what an on-chain record establishes: priority? constructive notice? evidence of use?

Comparative insight. Some courts in **China**, for example, consider blockchain timestamps as proof of creation, whereas in other jurisdictions, they only accept them as supplementary evidence. No global standard exists about whether a blockchain record can be the sole proof of assignment.

Policy and legal responses:

1. Amend relevant legislation, rewrite the rules of evidence and IP procedure to explicitly

allow that a properly authenticated blockchain record shall be admitted as evidence and may be sufficient for certain transactional formalities, in case an off, chain signature/hash linkage is combined (e.g., as a notarized adjunct).

2. Design model transaction, merit a typical standard model that (a) a signed on, paper assignment (e, signed) is fabricated, (b) at the time of the transfer on, chain its hash is deposited, and (c) the token metadata shows the hash and link. Such use of blockchain maintains writing requirements but establishes provenance.

3. Registry choices, enable **IP Office** (or private consortia pre, approved) supported blockchain registries that record assignments and licenses and are considered evidentiary registers for priority and notice, as well as voluntary blockchains with currency or identity authentication, based transactions.

B. JURISDICTION, ENFORCEMENT AND CROSS-BORDER COMPLEXITY

The problem. Blockchains are generally networks that are distributed among nodes located in various jurisdictions. The deployment of NFTs, tokens and on-chain licensing agreements are no longer limited to one place, they can be made and sold anywhere in the world without necessarily revealing the identity. As a result, it is not easy to know which state's court has jurisdiction, which law should be applied, and how to give force to injunctions or monetary awards against decentralized actors or anonymous wallet addresses.

Impact on Indian enforcement:

· In the case of injunctions: Courts normally depend on the territorial reach (such as URLs, servers, or marketplaces) to impose them. It may be very hard to figure out the place where a blockchain is affected by an injunction (marketplace, minting platform, wallet holder, or node operator).

· Asset preservation: Digital assets and NFTs can be easily transferred from one blockchain to another without any delay. Indian courts and enforcement agencies will definitely have a hard time if they want to temporarily stop such transactions unless they are supported by foreign authorities and adequate technical devices.

· Customs and physical goods: In order to facilitate customs enforcement of the tokenized

authenticity claims linked to physical goods, there must be some kind of a system that makes sure the product is both genuine on-chain and that it is not physically counterfeit.

Practical solutions and institutional measures:

1. Introduce legal instruments to enable prompt identification which broadens the scope of judicial powers for crypto-asset tracing and expedited discovery (which also involves imposing mandatory disclosure requirements on marketplaces and custodians registered or operating in India).

2. The use of dynamic injunctions and platform takedowns which extends the availability of the dynamic/interim relief to include removal of blockchain marketplaces that operate through identifiable gatekeepers (e.g., centralized marketplaces, IPFS gateways, custodial wallets).

3. Mutual recognition of judicial assistance and technical cooperation — enter into bilateral or multilateral agreements on cross-border assistance on blockchain forensics, asset freezes, and service of process.

4. Regulatory registration of intermediaries — require marketplace operators and large node operators who target Indian users to register with an Indian authority and agree to jurisdiction and compliance (this balances decentralization and enforceability).

Comparative approach. The use of arbitration clauses and forum selection in smart contract terms can help commercial actors anticipate what will happen in the future, but at the same time they are not the solution of enforcement against anonymous bad-actors. There are now coalitions of various **IP offices, exchanges, and customs authorities** that collaborate with blockchain analytics firms to form a practical enforcement architecture.

C. SMART CONTRACTS, LICENSING COMPLEXITY AND FORMALITIES

The problem. While smart contracts are capable of automating the execution of their terms (e.g., royal payments, license triggers), there is still ambiguity about their legality in the traditional contract and IP formalities. India law includes electronic contracts and digital signatures as valid under the **IT Act**.[28] Nonetheless, certain types of IP assignments, such as copyright/patent assignments, and trademark assignments, may require some specific formalities that could not be fulfilled by an on, chain code only.

Specific legal frictions:

· A smart contract may be written in such a way that it enables the transfer of access rights or the triggering of payments, but the lack of express assignment language for the transfer of exclusive IP rights would make it void.

· Interpretation and certainty: Programmers often expect the code to be self, explanatory, but ambiguous coding is usually the reason why it is non, trivial to interpret (source code vs. bytecode, deterministic vs. emergent behaviour).

· Upgradability and immutability tension: the changes that upgradeable smart contracts make to the rights and obligations' stability; on the other hand, immutable contracts provide legal correction of errors that cannot be done.

Practical remedies and regulatory tools:

1. **Hybrid transaction model**: mandate that the legally binding off, chain instrument (digitally signed) whose hash is recorded on, chain accompanies major IP rights transfers for the transaction to be considered valid. It is also allowed that routine licenses (non, exclusive, limited scope) to smart contracts can be enough if the signed document explicitly states the incorporation by reference.

2. **Model smart, contract clauses**: either government or industry associations have to come up with the sample paragraphs that can bring the legal concepts like assignment, exclusive license, territorial limits, moral rights reservations etc. into indelible smart, contract patterns and human, readable summaries.

3. **Court interpretative guidelines**: They may incorporate all schools of thought that along with the code, judges will rely on human, readable contracts for disambiguating statutory formalities compliance and permitting reformation or rescission if the code conflicts with the parties' intent.

4. **DAO and entity recognition**: reckon legal legitimacy routes that allow limited legal personality (or proxy agents) for autonomous communities engaging in IP trades and thus, contract as well as enforcement remedies in circumstances when a DAO is a licensor or licensee.

These steps are one way to bridge the gap between automation and legal certainty, which allows smart contracts to carry out the tasks of routine transactions but at the same time safeguard the integrity of formal IP transfers.

D. EVIDENCE, AUTHENTICATION, PRIVACY AND THE IMMUTABILITY PARADOX

The problem. As an integrity tool, blockchain is highly attractive due to its immutability feature but this feature meets quite a few barriers along the way such as privacy norms (right to erasure) and evidentiary requirements (authentication, chain, of, custody). In India, **Section 65B of the Evidence Act** recognizes electronic records, and the IT rules accept digital signatures, however, courts are in need of practical standards for the authentication of blockchain evidence as well as the management of personal data recorded on ledgers.

Key issues:

· Hash vs. underlying content: quite frequently only a hash is on the blockchain while the actual file remains off, chain. The courts should be able to verify that the hash truly refers to the file that has been claimed, and the repository where it is stored off, chain has not been tampered with.

· Chain of custody and provenance: immensely complicated: who takes responsibility for the node's integrity? in what way is consensus provenance recorded? what do we do with private/permissioned chains versus public chains?

· Privacy conflict: if personal identifiers are stored on a public ledger, it might be a violation of privacy laws; furthermore, the right to correction or deletion cannot be fulfilled on immutable ledgers.

Technical and legal mitigations:

1. **Standardized evidentiary protocols**: define minimum criteria for the admittance of blockchain evidence, for instance attestation of node operators, timestamping standards, audit logs, and certified export procedures for presenting data on, chain.

2. **Hashing + notarization model**: it is a requirement that on, chain hashes be accompanied

by signed affidavits or certified digests issued by accredited validators; also, allow the IPO or certified agencies to act as trusted provers.

3. **Privacy, by, design**: hybrid models are encouraged whereby personal data is kept off, chain under access control and the chain only records verification tokens/**zero, knowledge proofs**.[29] Regulatory guidelines au fait acceptable integrity/ privacy law, satisfying design (e.g., ZKP, selective disclosure) patterns.

4. **Forensic capacity building**: courts and enforcement agencies need to be equipped with technical experts and provided with standard operating procedures for blockchain evidence handling and cryptocurrency tracing.

Institutional route in India. The designation of a central certification authority (public, private) could be a way for blockchain evidence verification in IP litigation to take place, this would make admissibility easier, and decrease the number of conflicts over the technology's authenticity.

E. ECONOMIC, REGULATORY, AND STANDARDIZATION CHALLENGES

The problem. The debate in legal terms is to what extent blockchains do blockchains. In addition to the traditional doctrinal problem, blockchains need to consider several economic and regulatory issues that will shape the IP policy in the future: the environmental costs of the current consumption of consensus mechanisms, the tokenization that might fall under securities/commodity laws, market manipulation through wash trading NFTs, and the lack of technical standards that allow interoperability and thus enable cross, registry trust.

Consequences for IP policy:

· Bearing on the question of what kinds of blockchains could be used in registries endorsed by government **eco, friendly public, permissionless chains** are likely to be discarded whereas low, carbon consensus mechanisms (proof, of, stake, permissioned protocols) may be more acceptable.

· Regulatory overlap is quite a regular phenomenon: besides the securities regulators, tax authorities, IP offices, and data protection agencies, there can be jurisdictional claims over blockchain activities related to distributed ledgers (e.g., NFTs linked to revenue streams).

· The lack of standardization causes a problem of trust among different registries. If each of them uses its own data schema and consensus model, then there can hardly be any **cross, border recognition of on, chain records**.[30]

Policy responses and roadmap:

1. **Inter, agency coordination body**: In order to draft harmonized rules for the deployment of blockchain in IP contexts, establish an Indian inter, ministerial task force (**Department of Industrial Policy & Promotion, Ministry of Electronics & Information Technology, Ministry of Law, Reserve Bank of India/Securities and Exchange Board of India**, where relevant).

2. **Technical standards & interoperability**: Collaboration with standard international bodies (**ISO, W3C, WIPO**) to arrive at the consensus on data models, token metadata, and the evidence that will enable mutual recognition.

3. **Sustainability guidelines**: introduce energy, efficient blockchain platforms for public registries and issue a green rating for projects of a large scale to be helpful in the decision, making process.

4. **Regulatory clarity on tokens**: First, clearly explain utility tokens (those representing IP licenses) by issuing guidance; then clarify tax treatment and anti, money laundering expectations for IP marketplaces.

5. **Pilot programs & phased rollout**: Initially start with IP activities that entail very low risk (proof, of, creation, timestamping) and voluntary registries; evaluate and then slowly expand from assignments and public registries.

Chapter IV – Indian Legislative and Institutional Framework for IP Protection in the Digital Era

Though in compliance with **TRIPS**, India's intellectual property frame is inadequate from the point of view of the times, since it was created before blockchain technology advent. It follows that the use of blockchain and other decentralised technologies in IPR governance is a facilitation of the same, along with certain interpretative quandaries. Exploring the **Copyright Act, 1957**, the **Patents Act, 1970**, the **Trade Marks Act, 1999** and the **Information**

Technology Act, 2000, the government is uncovering areas where blockchain could revitalize compliance, or, indicate the need for legislative reform to become technology, friendly. The Indian IP regime is regulated by the **Department for Promotion of Industry and Internal Trade (DPIIT)**, under the Ministry of Commerce and Industry. On the ground there are agencies like the **Controller General of Patents, Designs and Trademarks (CGPDTM)** and the **Copyright Office**, as well as policy institutions like the **Cell for IPR Promotion and Management (CIPAM)**, which are supporting scoring and licensing etc. innovation through blockchain, based registration.[31]

1. THE COPYRIGHT ACT, 1957 AND BLOCKCHAIN AUTHORSHIP

The **Copyright Act, 1957** is the main legislative code of India dealing with Creative works of literature, arts, music, and motion pictures. **Section 2(d)** defines "author", and **Section 17** provides that the author of the work shall be the owner of the copyright unless the contract specifies otherwise. Social technology may in fact become more well deployed with direct reference to these legal concepts, by means of a digital certificate of creation and an unalterable entity connected with authorship and ownership. Smart contracts on a blockchain platform can make the licensing and royalty payment mechanisms, provided in **Sections 18 and 19 of the Act**, automatic. Yet at the same time, there are interpretation problems. So, for example, if a derivative work is automatically created or the content is changed algorithmically, it is unclear who would be the "**author**" within the meaning of Section 2(d). On the other hand, a decentralized blockchain may lack a place of publication, making it difficult under **Section 40**, which deals with international copyright, to catch violators. The implementation of the **Copyright (Amendment) Rules, 2021**, which allowed technology usage in filing and conducting hearing, can be considered as Indian law further opening up for technology, based solutions. It makes sense that this could be followed by a step of introducing blockchain as a voluntary registration method or a trustable record of the author.

2. THE PATENTS ACT, 1970 AND BLOCKCHAIN INNOVATION

The **Patents Act of 1970** has been amended in 2005 to bring it in line with TRIPS. As it stands, the Act protects novel inventions which are non, obvious and have industrial applicability. There are two major ways blockchain can interact with patent law, as a new invention subject to patent protection, and as a method for rights management and enforcement. On the one hand, inventions that are related to blockchain technology, such as cryptographic algorithms,

distributed ledger architectures or consensus mechanisms may be eligible for patent protection under **Section 2(1)(j)**. Nevertheless, **Section 3(k)** endeavours to ban patents on "**computer programs per se**." This requirement is the reason behind the difficulty faced by blockchain algorithm developers to patent their work. The Indian Patent Office has been conservative in its approach as it can be seen from the **Computer, Related Inventions (CRI) Guidelines (2017)** where it is said that a "technical effect" beyond just the software is necessary.

On the other hand, the use of blockchain may very well revolutionize patent administration. It could be useful for prior art searches, management of maintenance fees and data access for licensing. Globally, the **European Patent Office (EPO)** and the **United States Patent and Trademark Office (USPTO)** are trialling blockchain technology for the purpose of safe recordkeeping.[32] Indian Patent Office may follow this route by initiating similar pilot studies that would help to speed up the patent life cycle and also to increase the confidence level of the public in validation processes.

3. THE TRADE MARKS ACT, 1999 AND BLOCKCHAIN VERIFICATION

The **Trade Marks Act, 1999** which safeguards unique signs and symbols, is consistent with TRIPS requirements stated in **Articles 15 to 21**. Besides the authentication and traceability that blockchain provides, it can also facilitate the Act implementation and registration system. One of the challenges that are faced in the field of Indian trademark protection is the work of faking, especially when it comes to online markets. By using the blockchain, based authentication systems, the accuracy of the whole supply chain is verified, and whether a product that has a trademark is the original one is checked. This usage is in line with **Section 29**, under which unauthorized use that is likely to cause confusion is prohibited. Not only that, but blockchain may also be helpful in legal proof verification in the case of infringement conflicts. Courts, in accordance with **Section 135**, are vested with authority to offer relief in the form of injunctions and compensation, while the records generated by blockchain could qualify as evidence of earlier use or possession. Private sector initiatives such as **IBM's TrustChain and VeChain** are already using blockchain to address the problem of counterfeit luxury products. The **Government e, Marketplace (GeM)** platform in India may also be able to employ comparable systems in order to ascertain that the trademarks of registered vendors are not being intercepted or fabricated.

4. THE INFORMATION TECHNOLOGY ACT, 2000 AND DIGITAL SIGNATURES

The **Information Technology Act, 2000 (IT Act)** sets the legal standard for electronic governance and digital authentication in India. According to the Act, electronic records and digital signatures are recognized legal instruments if the standards specified are followed. Despite the fact that the Act does not directly mention blockchain, its principles acknowledge the use of blockchain transactions as they rely on digital signatures for the validation of the transaction. The **Indian Evidence Act, 1872, Section 65B**, synergizes this by allowing electronic records as evidence in the court if the record is proven to be authentic. Even so, the manner in which blockchain is decentralized stands in contrast with the IT Act's requirement of "**licensed Certifying Authorities**" for the validation process.

Non blockchain verifications depend on the decision of a single party, but blockchain consensus protocols are used for blockchain verification purposes. Amendments may be needed to **Section 2(p)** in order to extend the description of authentication mechanisms to include blockchain for the legal integration of blockchain. The **Draft Digital India Act** (expected to be passed in 2025) is conjectured to update the IT Act to fit the new technologies that are decentralized, and possibly to give a clear and official acknowledgment of blockchain transactions, tokens, and smart contracts as legally valid digital instruments.

5. INSTITUTIONAL DEVELOPMENTS AND POLICY INITIATIVES

The institutional framework of India for IP administration has exhibited a growing cognizance of the blockchain's potential. Although the **National IPR Policy (2016)**, as the name suggests, was formulated before the rise of blockchain use, it focuses on the modernization of IP infrastructure and digital transformation. As a result, **CIPAM's** execution of the policy has led to the establishment of e, filing systems and awareness programs that may further develop into blockchain, integrated registries. The **Department for Promotion of Industry and Internal Trade (DPIIT)**, through its **Startup India** program, is investing in cutting, edge technology innovation such as blockchain. Pilot projects conducted in conjunction with the **National Informatics Centre (NIC)** and the **NITI Aayog** have probed into blockchain, based applications in land records and supply chains, preparing a fertile ground for IP adoption. In fact, the **Ministry of Electronics and Information Technology (MeitY)** put forward a **National Strategy on Blockchain (2021)** that pinpoints IP as one of the main areas of use.[33] The report suggests creating public, sector blockchain platforms that can be interoperable for

managing data and verifying rights. Fusing these endeavours with existing IP registries could be the stepping stone to the blockchain, enabled governance India vision in which the legal acknowledgment of block chain, based IP dealings is possible. This legal recognition of block chain, based IP trades will require a well, planned reform in various ministries, such as Commerce, Electronics, and Law, that will cover the whole gamut of technology, its uniformity, and TRIPS compliance criteria.

Chapter V – Comparative International Frameworks and Global Policy Developments

A. EUROPEAN UNION: INSTITUTIONAL INTEGRATION AND LEGAL HARMONIZATION

Among other things, The **European Union** is one of the main integrators of blockchain technology into its digital and intellectual property governance. The **European Blockchain Services Infrastructure (EBSI)**, which is a joint initiative between the European Commission and the European Blockchain Partnership, is designed to facilitate the creation of seamless, cross, border blockchain services for public administration, including the management of IP records and the handling of evidence.[34] So far, the **European Union Intellectual Property Office (EUIPO)** has used blockchain to build trust in design and trademark filings and to create the traceability of rights ownership. The **Digital Services Act (2022)** and **Data Act (2023)** empower the EU to foster data interoperability and digital transparency, both are also the blockchain's features, which aim at the provision of unalterable evidence of creation, transfer, and use. The EU case law on digital assets has also progressed: the **Court of Justice of the European Union (CJEU)** in ***Nintendo Co. v. BigBen Interactive GmbH*** highlighted the principle of **technological neutrality** in IP enforcement, thereby conveying that the current legal provisions of enforcement encompass the use of digital dissemination modes (including decentralized ones).[35] The EU model depicts that regulatory clarity and technical standardization can still coexist with a strong IP protective environment.

B. UNITED STATES: PRIVATE-SECTOR INNOVATION AND JUDICIAL ADAPTATION

The **United States** has taken a relatively decentralized, market, driven approach. The **U.S. Patent and Trademark Office (USPTO)** and **Copyright Office** have not yet implemented blockchain technology in their registries, but the American system is open to private

experimentation. Prominent entertainment and technology companies have put blockchain to use in licensing, royalties, and provenance tracking. Judicial practice is gradually adapting. In ***United States v. Ohanian*** (S.D.N.Y. 2019), blockchain transaction records were accepted as probative evidence of ownership and transfer of digital assets.[36] Also, in ***Hermès International v. Rothschild*** (S.D.N.Y. 2023), the court examined NFTs ("MetaBirkin" tokens) only through the lens of existing trademark principles, hence arguing that the mere fact of tokenization does not prevent the possibility of rights violations. Such instances reveal that blockchain evidence is gaining recognition but is still under the scope of traditional IP law. The likes of the **Securities and Exchange Commission (SEC)** and the **Commodity Futures Trading Commission (CFTC)** have also gotten involved in the discussion when tokenization intersects with securities or commodities law, thus pointing to the multidisciplinary impact of blockchain on IP and trade regulation.

C. CHINA: STATE-LED BLOCKCHAIN INTEGRATION

China is a different case, representing a state, set course towards technological governance. Since **2018**, the **Hangzhou Internet Court** and **Beijing Internet Court** have accepted blockchain evidence in copyright disputes, and have certified it as per the **Evidence Law (Revised 2020)**.[37] The **National Blockchain Service Network (BSN)** that is established with the support of the Ministry of Industry and Information Technology, deeply integrates blockchain technology in China's administrative functions like IP registries and customs enforcement. The **National Copyright Administration of China (NCAC)** has implemented blockchain, based copyright registration, and the pilot projects in provinces such as Zhejiang that link blockchain records to anti, counterfeiting databases. While China's move highlights the efficiency potential of centralized blockchain governance, the transparency and data control issues raised by such a model are significant. India can draw lessons from China's experience: the efficient involvement of government can speed up technological adoption, yet it must be balanced by procedural fairness, competition norms, and protection of individual rights under constitutional guarantees.

D. INTERNATIONAL ORGANIZATIONS: WIPO, WTO AND TRIPS INTERFACE

At the multilateral level, The **World Intellectual Property Organization (WIPO)** established its **Blockchain Task Force** back in **2018** with the goal of exploring standardization, interoperability, and best practices for global IP administration via blockchain integration.[38]

WIPO has researched and offered recommendations for common technical protocols that could enable national IP offices to confirm rights recorded on blockchain across different jurisdictions. While the **World Trade Organization (WTO)** through the **Agreement on Trade, Related Aspects of Intellectual Property Rights (TRIPS)** does not make any references to blockchain, the provisions of **Articles 41, 61 of TRIPS** about enforcement and procedural fairness are technologically neutral. Blockchain applications such as timestamping, transparent registries, and automated licensing can be used to facilitate compliance with these obligations. Developing countries like India may derive advantages from their participation in WIPO's blockchain initiatives as they provide means to modernize registries and verify cross, border transactions while keeping national implementation flexible. The implementation of a coordinated policy framework can also assist India in using blockchain for trade facilitation in a manner that is consistent with its TRIPS obligations and global digital commerce role.

CONCLUSION

Through its functions of **immutable recording, decentralized validation, and programmable rights management**, blockchain technology is revolutionizing intellectual, property protection beyond the digital age. The same traits that make this technology so accessible and transparent, however, also pose the greatest difficulties for the issues of **authorship, jurisdiction, privacy, and regulatory coherence**. In the Indian context, blockchain adoption if aligned with the country's IP and digital, governance framework would not only ensure better **TRIPS compliance** but would also go a long way in facilitating innovation under the **National IPR Policy (2016)** and the **Digital India Initiative**.39 The Legislative reform should, among other things, establish the blockchain record as evidence in court, define licensing models of smart contracts, and promote common ground between the **DPIIT, MeitY, and the Intellectual Property Office**. By the same token, at the global level, it will become necessary to avert disintegration by means of harmonization through **WIPO standards** and mutual recognition protocols. In the end, the best framework for viewing blockchain is not as an upheaval of IP rights but as a technical means for achieving their basic objective, that of awarding and protecting creators, inventors, innovators in an ever, changing digital economy.

Endnote (Bluebook Format)

1. World Intellectual Property Organization, *Blockchain and Intellectual Property: Emerging Applications* (2022).

2. *Agreement on Trade-Related Aspects of Intellectual Property Rights*, Apr. 15, 1994, 1869 U.N.T.S. 299 (hereinafter TRIPS Agreement).

3. The Copyright Act, 1957; The Patents Act, 1970; The Trade Marks Act, 1999 (India).

4. World Intellectual Property Organization, *Blockchain and Intellectual Property: Emerging Applications* (2022).

5. TRIPS Agreement, *supra* note 2, art. 41.

6. The Indian Evidence Act, 1872, § 65B.

7. *National IPR Policy*, Dep't for Promotion of Indus. and Internal Trade (2016).

8. The Indian Evidence Act, 1872, § 65B.

9. *HarperCollins Publishers LLC v. OpenSea Inc.*, No. 22-cv-2195 (S.D.N.Y. 2022) (Settled before final judgment, but filings established the argument regarding blockchain evidence).

10. The Patents Act, 1970 (India).

11. *WIPO's Blockchain Task Force Explores Use of Distributed Ledger Technologies for IP Administration*, WIPO Magazine (2018).

12. World Intellectual Property Organization, *Blockchain and Intellectual Property: Emerging Applications* (2022).

13. Digital Personal Data Protection Act, 2023 (India).

14. Justice B.N. Srikrishna Committee Report on Data Protection, 2018.

15. The Indian Evidence Act, 1872, § 65B.

16. *Hermès Int'l v. Rothschild*, No. 22-cv-384 (S.D.N.Y. 2023).

17. *Tata Sons Pvt. Ltd. v. Hakunamatata Tata Founders*, CS (COMM) 89/2022 (Del. H.C. Mar. 24, 2022).

18. *Super Cassettes Indus. Ltd. v. MySpace Inc.*, (2016) 65 PTC 1 (Del. H.C.).

19. WIPO, *supra* note 4.

20. TRIPS Agreement, *supra* note 2.

21. The Indian Evidence Act, 1872, § 65B; The Copyright Act, 1957; The Patents Act, 1970; The Trade Marks Act, 1999 (suggested amendment).

22. *See* WIPO, *supra* note 4.

23. William Fisher, *Theories of Intellectual Property*, in New Essays in the Legal and Political Theory of Property (Stephen R. Munzer ed., 2001).

24. European Union, Data Act, 2023 (Regulation (EU) 2023/2854).

25. *MySpace Inc. v. Super Cassettes Indus. Ltd.*, (2016) 65 PTC 1 (Del. H.C.).

26. Ministry of Electronics & Information Technology, *National Strategy on Blockchain* (2021).

27. The Copyright Act, 1957, § 19 (India).

28. The Information Technology Act, 2000, § 10A (India).

29. WIPO, *supra* note 4.

30. *Id*.

31. *National IPR Policy*, Dep't for Promotion of Indus. and Internal Trade (2016).

32. WIPO, *supra* note 4.

33. Ministry of Electronics & Information Technology, *National Strategy on Blockchain* (2021).

34. European Comm'n, *European Blockchain Services Infrastructure (EBSI) Overview* (2023).

35. *Nintendo Co. v. BigBen Interactive GmbH*, Case C-24/16, CJEU (Dec. 18, 2018).

36. *United States v. Ohanian*, No. 18-cr-194 (S.D.N.Y. 2019).

37. He Zhilin, *Blockchain Evidence: Hangzhou Internet Court's First Ruling*, China Judgments Online (2018).

38. WIPO, *supra* note 4.

39. *National IPR Policy*, Dep't for Promotion of Indus. and Internal Trade (2016).

Bibliography

- *European Commission, European Blockchain Services Infrastructure (EBSI) Overview (2023).*
- *Hermès Int'l v. Rothschild, No. 22-cv-384 (S.D.N.Y. 2023).*
- *MySpace Inc. v. Super Cassettes Indus. Ltd., (2016) 65 PTC 1 (Del HC).*
- *National IPR Policy, Department for Promotion of Industry and Internal Trade (2016).*
- *Nintendo Co. v. BigBen Interactive GmbH, Case C-24/16, CJEU (2018).*
- *The Copyright Act, No. 14 of 1957 (India).*
- *Digital Personal Data Protection Act, No. 22 of 2023 (India).*
- *The Information Technology Act, No. 21 of 2000 (India).*
- *The Patents Act, No. 39 of 1970 (India).*
- *Tata Sons Pvt. Ltd. v. Hakunamatata Tata Founders, CS (COMM) 89/2022 (Del HC).*
- *The Trade Marks Act, No. 47 of 1999 (India).*
- *United States v. Ohanian, No. 18-cr-194 (S.D.N.Y. 2019).*
- *World Intellectual Property Organization, Blockchain and Intellectual Property: Emerging Applications (2022).*
- *World Trade Organization, Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15 1994, 1869 U.N.T.S. 299.*
- *Ministry of Electronics & Information Technology, National Strategy on Blockchain (2021).*