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Blockchain: An Efficient Intelligent Agreement for Patents and Trademarks

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Abstract: Intellectual property security faces problems in the digital era, with growing piracy, AI-generated works, and global compliance problems, Creations, designs, trademarks, and trade secrets are all protected by Intellectual Property (IP) rights; yet, there are several issues with IP rights management and enforcement around the world. The benefits of blockchain technology include decentralization, transparency, and immutability. Therefore, blockchain offers to provide a solution for IP issues. Example: Patient records. Important medical information is contained in patient records, and protecting these records requires a combination of ethical considerations, data privacy regulations, and Intellectual Property Rights (IPR). The Intellectual property transfer would indicate the necessary legal frameworks rather than needing to be explicitly laid out separately if the platform became legally binding. The dynamic nature of the ledger also removes the ambiguous and imprecise matters related to contract voiding and mooting. IPRs, or intellectual property rights, have always been important and complicated issues because they protect intangible works' property and the possibility of financial gain from them. A trademark is any term, fragrance, design, or combination that identifies and sets one company's or individual's products apart from those of competitors. The Results discussed the creation of smart contracts for patient health records for data privacy. The proposed article describes intellectual property like Intangible assets including things like copyrights, trademarks, and patents. Tangible assets include things like vehicles and houses. The blockchain keeps a permanent record of transactions in a series of groupings called blocks connected cryptographically. Every block has a copy of the preceding block's hash as well as a hash of the transactions in that block.

Keywords: Intellectual Property Rights, Blockchain, Cryptography, Tangible, Intangible

Introduction

A blockchain is an expanding collection of data blocks connected via cryptography. A timestamp, all pertinent transaction data, and the previous block are usually included in each block that makes up the chain. Blockchains are resistant to alterations made in the past because of their mathematical nature. The blockchain's data immutability is crucial for maintaining security and establishing the reliability of the information contained therein. The most Open access is also available to widely used blockchain ledgers. Both their appearance and upkeep are open to the public. Additionally, this is required to ensure the security of the blockchain. Bitcoin is the most notorious association of blockchain technology. Nakamoto (2008) supports the fundamental features of the Bitcoin network and acts as its backbone. However, blockchain technology is more broadly applicable even with this relationship. Its salient features, which necessitate precise and secure record-keeping and administrative tasks, are particularly appealing. For this very reason, banks have proven to be highly useful. One obvious use of blockchain technology is to log transaction details. In general, blockchain has developed into a cutting-edge method for approaching the resolution of traditional computer issues from a fresh and enhanced perspective. Our project intends to create a platform for digital intellectual property transfers that is supported by a public blockchain ledger. The actual property transfer would indicate the necessary legal frameworks, rather

than needing to be explicitly laid out separately if the platform were to become legally binding. The dynamic nature of the ledger also removes the ambiguous and imprecise matters related to contract voiding and mooting. (SEC *et al*., n.d.) IPRs, or intellectual property rights, have always been important and complicated issues because they protect intangible works' property and the possibility of financial gain from them (World, 2004). Several issues are associated with legal complexity, which includes the cohabitation and co-existence of international and national laws commercial complexity, encompassing the complementarity and diversity of stakeholders, and technological complexity, which encompasses the absence of global repositories and appropriate metadata standards. Digital media can be easily copied or altered, which makes managing Intellectual Property Rights (IPR) more (Tewari and Panjwani, 2023) difficult even as media asset management advances thanks to digitalization. There's a growing consensus regarding the potential of blockchain technology to address these kinds of problems (Adjovu and Fabian, 2020) by making it possible to quickly register and track intellectual property related to media and by automating tasks with Smart Contracts (SCs) tasks associated with contracts. Smart contracts, which are impartial and flawless computer programs that create, carry out, and uphold agreements, will soon replace the latter (Mik, 2017).

Unfortunately, the "Computer code that executes on a distributed ledger (or blockchain) upon the occurrence of a specified condition or conditions" is the widely agreed definition of SC. Blycha and Garside (2021) This makes it abundantly evident that "smart contracts emphasize the technical aspect of contracts to the detriment of the complex ways wherein the individuals utilize them and the social settings they function" and are not significant compared to contracts (Levy, 2017). Blockchain-based Smart Contracts (SCs) be used in conjunction with SLCs to fully address legal issues and support the registration, tracking, auditing, and monetization of digital asset rights (XrML in Wikipedia, n.d.). From an IT standpoint, legal and contractual matters (Like the transfer of rights) were not tracked or handled directly. Therefore, we can: (a) Take advantage of the best results from the 2000s initiatives (like REL); (b) Profit from the "law automation" research and development; and (c) Use blockchain to enable trustworthy, secure, and fully decentralized platforms for rights management automation. These are the current research projects that deal with "law automation." The novel component of the Media Verse method relates to the fusion of new and, to some extent, emerging innovations (Such as blockchain and Smart Contracts) to solve problems that are still not fully resolved. A conference on blockchain technology's potential applications in the domain of intellectual property data sets was organized by the World Intellectual Property Organization (WIPO), in 2004. To explore the possibility of applying blockchain technology to intellectual property rights protection processes and handling data regarding IP objects and their usage, WIPO also established a task group dedicated to blockchain. Since then, there has been a lot of interest in the potential application of blockchain technology to IP management. The collection of operations that enhance IP-related products or services is known as the IP value chain. The creation, protection, management, and commercialization phases of a lifecycle model can be used to depict the value chain, even though intellectual property frequently does not go through all of these stages or does so in a non-sequential fashion.

Blockchain technology, along with DLTs, has the potential to guarantee intellectual property management and monitor the transfers of ownership in the media industry. Moreover, the blockchain would eliminate the need for middlemen like record labels and social media by disintermediating the revenue process, leaving just customers and writers involved. Content creators can handle copyrights by registering their artworks on the blockchain and using smart contracts to manage licensing and royalties. Moxie (2022); Madushanka *et al*. (2024) Any intangible invention made by a single person or by a collective mind, such as ideas, crafts, or intangible knowledge, is categorized as Intellectual Property (IP). Patents and copyrights, Among the various forms of intellectual property (Castaldi *et al*., 2024; Šarčević *et al*., 2024) are trade dress, geographical indications, trademarks, industrial design rights, plant variety rights, and, in some cases, trade secrets protection that are generally recognized by most nations worldwide. The intangible character of Intellectual Property (IP) poses challenges for protection in the modern digital and globalized economic era, making it more difficult to safeguard than traditional assets like cash, real estate, food (Amentae *et al*., 2024), and merchandise. First off, when information or creativity is digitized, it becomes easier to replicate and plagiarize works and it becomes more difficult and expensive to determine whether a piece is original. Second, big data and the explosion of data are the period we live in. The capacity to examine and confirm the legitimacy of large samples is necessary for intellectual property protection.

Lastly, there is a high necessity for timeliness in determining the privileges and violation of intellectual property laws in original ideas as a result of digitization and globalization of production, which has accelerated infringement and dissemination. Expertise in traditional intellectual property protection is essential, necessitating

professionals with a foundation in law and regulation knowledge. Large gaps exist among IP practitioners and there is a severe workforce shortage due to issues with cost and institutional settings. The protection of innovators' creative passion necessitates the utilization of technology. The abuse of intellectual property is sadly not sufficiently detected, tracked, authorized, or prohibited by the current IP protection technologies. This is particularly true for digital products, which are easily copied and distributed over networks, as well as for non-digital works that are occasionally counterfeited and altered. Beijing Palace Museum and Prince Gong's Mansion, for instance, frequently start crowdfunding projects centered around the creation of art. However, in the early stages of the industry, these organizations frequently have their ideas stolen, counterfeited, or even put up for sale in advance, which results in a loss of originality or the project failing. Concerning the aforementioned matter, "Maker-IP" is a novel approach to intellectual property protection that has been studied by the Intellectual Property Publishing House in China. An inventive platform for certification protection called Maker-IP was developed by the Intellectual Property Publishing House and has been approved and overseen by China's National Intellectual Property Administration. The "Maker IP" platform is capable of real-time screen recording, capturing, uploading, depositing, and authenticating documents on many operating systems. Numerous categories and fields, such as academic writing, commercial documentation, industrial design, and creative production, are included in the certification's scope (Alibaba-NTU, n.d).

A trademark is any term, fragrance, design, or combination that identifies and sets one company's or individual's products apart from those of competitors [United States]. When a mark satisfies the standards for federal registration, authorities at the United States Patent and Trademark Office (USPTO) (Cabeca, 2024) carefully review each application for a trademark to ensure that it complies with all applicable federal laws and regulations. Getting a trademark is a difficult process that entails several steps, such as looking up pending and registered trademarks, filing an application, having trademark examining authorities review the application, publishing the mark for public opposition, and, if no opposition-related filings are made or the opposition is successfully rebutted, final registration of the mark. The USPTO's central database of federal trademark registrations houses the trademark's registration data after it has been registered. Similar to this, other nations have their own centralized trademark registration dataset and have unique intellectual property regimes, such as those in Europe, China, Japan, and other regions. Blockchain technology has recently shown tremendous promise and opened up new avenues in many industries, including social media, healthcare, education, and the IOT (Internet of Things) (Huh *et al*., 2017; Azaria *et al*., 2016; Schmidt, 2016; Chakravorty and Rong, 2017). In Nakamoto (2008) originally proposed the idea of blockchain for the Bitcoin cryptocurrency. A blockchain is a peer-to-peer network of shared, dispersed, tamper-evident digital ledgers used to monitor assets and record transactions.

Intellectual property like Intangible assets includes things like copyrights, trademarks, and patents. Tangible assets include things like vehicles and houses. The blockchain keeps a permanent record of transactions in a series of groupings called blocks that are connected cryptographically. Every block has a copy of the preceding block's hash as well as a hash of the transactions in that block. Blockchains may be broadly classified into two classes: Private (or permission) like Hyperledger (XrMLin Wikipedia, n.d.), Hyperledger Foundation is now a part of LF Decentralized Trust (2018) Kadena (http://refhub.elsevier.com), and open-source (permissionless) platforms like Ethereum (Levy, 2017) and Bitcoin (Blycha and Garside, 2021). Companies now have an effective means of transparently communicating information and enhancing the validity and authenticity of the information exchanged across the network thanks to the decentralization and non-tampering capabilities of blockchain technology.

Research Questions

Research question 01: How to Provide Security in Intellectual Property Rights using Blockchain?

The system strengthens copyright data aspects with blockchain technologies, providing strong security. The procedure uses safe algorithms based on hash functions and encryption to improve accuracy while streamlining patents and trademarks.

Research question 02: What are the systems utilized by blockchain-based systems for managing rights in digital form?

A cutting-edge digital rights management solution built on blockchain. This system creates a thorough framework for strong Intellectual Property (IP) rights protection by merging blockchain technology, perceptual hashing, Quick Response (QR) codes, and the Interplanetary File System (IPFS) seamlessly, system for managing digital rights (Sharma and Ananya, n.d.).

Blockchain and its Types

The transactions or information exchange over a secure network is carried out using blockchain technology. In addition to the digital currency that people use, distributed ledger and blockchain technologies are also utilized. Blockchain technology finds applications in Private networking and other situations in which only particular network users have access and authorization. In this case, network administrators are authorized to oversee the actions. Network administrators are authorized to oversee the actions

in this instance. New nodes or users requesting permission are required to get in touch with the system or network administrators. Keep in mind that all Blockchains are essentially made up of a collection of nodes that perform as part of a peer-to-peer (Peer-to-peer) network infrastructure. A copy of the public ledger, which is also frequently updated and used to send and receive transactions, is kept on file by each node in the network. Because blockchain technology is so wide, experts have categorized it into three categories. (Gamage *et al*., 2020; Sakhipov and Baygozhanova, 2020; Yang *et al*., 2017). The question of how to move already copyrighted works to blockchain technology remains unanswered in domestic research and practical projects; this is something that has to be investigated further in future studies and applications. Figure (1) depicts the general layout and application of the blockchain for intellectual property. In essence, there is the manufacturing of the data layer, network layer, and consensus layer. The majority of blockchain available technology in use follows this pattern. When implemented in intellectual property, it can be used in the content of various implementation strategies, such as encryption algorithms. Different consensus algorithms can be compared and analyzed in combination with the application direction in the incentive layer to find appropriate incentive mechanisms in different usage scenarios or to further investigate new consensus algorithms to meet the requirements of specific intellectual property systems.

One potential avenue for research when combining blockchain technology with intellectual property is the contract layer. First, smart contracts can be thought of as computer language maps onto the real society's laws for intellectual property transactions. Subsequently, the particular contract terms might be implemented by the distinct blockchain processes. Furthermore, the security of smart contracts can be one of the main study fields, according to the current attack research on smart contracts (Alimoğlu and Özturan, 2017).

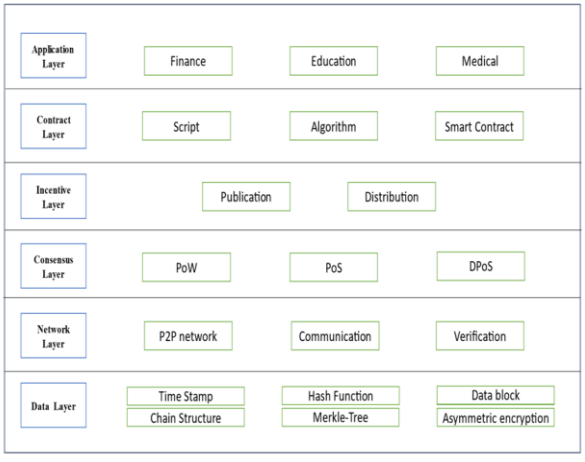

Fig. 1: Blockchain structure and corresponding application in the field of intellectual property

There are three types of blockchain:

- Hybrid blockchain
- Private blockchain
- Public blockchain

Public Block Chain

The most common kind of blockchain is public blockchain, which is open and decentralized by design. Computer networks are also essentially open to anybody interested in transacting through this kind of Blockchain technology. Here, in essence, transaction incentives are granted to the verified person by their validation; two kinds of Proof-of-work and Proof-of-stake models are also relevant. Additionally, a distributed ledger system is what the public blockchain offers that is unrestrictive and doesn't require any form of authorization. Anyone with access can be granted permission to access all or a portion of the blockchain's data. This type of blockchain also permits the verification of historical and present records. In addition, mining and cryptocurrency exchange is done with this. The blockchains for Litecoin and Bitcoin are the most popular in this market. It is largely safe as long as stringent security procedures and guidelines are followed. It could be dangerous, though, if the security procedures are not followed. These kinds of blockchains include but are not limited to, Bitcoin, Ethereum, and Litecoin. Lin *et al*. (2020).

According to experts, Ethereum and Bitcoin are two well-known instances of public blockchains. The subsequent characteristics hold significance for this type of blockchain:

- Complete privacy and security
- Flexible and open space
- Quiet surroundings
- There are no rules or stringent policies and there is complete transparency and systems.
- Distributed, among other things

Nonetheless, the experts claim that the following are significant advantages and benefits of the public blockchain:

- Trustable and faith: Public blockchains are reliable, so users don't need to be concerned about authenticity here, in contrast to private blockchains. Transaction fraud is absent in this type of public blockchain since nodes are not required to know one another. Nodes in this category are free to communicate blindly with each other without having to trust them (Milovanova *et al*., 2020)
- Secure and safe: The public blockchain enables connections with other users and nodes that are part of the same open platform, resulting in more

extensive and frequent communication and involvement. Because of this feature, all nodes carry out transactions and verifications by standards, making it more difficult for attackers to compromise the systems. Some experts claim that because this uses intelligent cryptogenic encryption techniques, it is far safer than the private blockchain

- Open and transparent: A public blockchain also has openness characteristics. In this case, data is essentially transparent to all nodes and all permitted nodes typically have access to a single blockchain record. Consequently, all of the nodes in this instance become open and transparent and there are no fraudulent transactions or information hiding. Siyal *et al.*, (2019)

While there are many advantages and benefits, there are also a variety of drawbacks and flaws, some of which are listed below:

- Lower transaction per second: The public blockchain System has an extremely low transaction rate per second, which can be attributed to its wide network and numerous nodes. In this case, it takes time for each node to complete the proof of work and validate the transaction.
- Scalability matters: Experts state that scalability is another issue that is similar to the one on the public blockchain at a slower transaction rate per second. The enormous size essentially generates scalability in this regard and experts believe that Bitcoin lightning networks are crucial to solving the issue.

Private Blockchain

Although private blockchains are not public, they do have certain access-related capabilities. With the help of this blockchain, the transaction can be approved with the system administrator's help (Radanović and Likić, 2018). The following characteristics of these platforms which are created by private blockchain solutions are:

- Full of privacy
- High efficiency
- Faster transactions
- Better scalability
- Faster and speedy

Because private blockchains are only operated by authorized nodes, information and transaction-related data shared between nodes cannot be seen by anyone outside the private network. Compared to public blockchains, private blockchains have several other benefits and drawbacks, a few of which are highlighted here.

The experts claim that the following are significant advantages and benefits of the private blockchain:

- Speed and velocity: Because private blockchains operate more quickly than public blockchains, a higher TPC (Transaction Per Second) rate can be seen here. Additionally, because there are fewer nodes visible here, the speed is higher. Because every node in this instance can verify transactions, new transactions can be added to blocks quickly. Here, a few hundred thousand or more TPS can be processed at once. Viriyasitavat *et al*. (2019)
- Scalability: In comparison to a public blockchain, a private blockchain offers greater scalability due to its faster processing speed. Here, it gets simpler and faster to add nodes to already existing ones. Private blockchains are therefore incredibly flexible and scalable as a result. Furthermore, the current systems are unaffected in this case by the addition or removal of nodes.

While there are many advantages and benefits, there are also a variety of drawbacks and flaws, some of which are listed below:

- Requires trust-building: Because a private blockchain has fewer users and is an open ledger, trust-building is more important than it is in a public blockchain, which is worried about each other's security and legitimacy of the user.
- Lower security: When someone outside of the company gains entry to the central administration system, the private blockchain becomes vulnerable, making it simpler for a node to compromise the entire system

Hybrid Blockchain

Hybrid blockchains integrate public and private blockchain technology, essential for achieving higher goals and having more control. Although a hybrid blockchain is closed and uses centralized and decentralized systems, it has integrity, transparency, and security features. It is superior to conventional blockchains in several ways. Maximum customization is said to be one of the key advantages of hybrid blockchains, which combine a public permission-less system with a private permission-based system. Because of the advantages of the ledger's records, users of this kind of blockchain system can view and pick portions, the remainder, however, can be secured or preserved. Due to hybrid blockchains' extreme flexibility, users can easily join them as private blockchains. This kind of blockchain can improve the blockchain network's security and transparency. Omar *et al*. (2021).

Smart Contracts

We are essentially discussing the idea of automated systems that are intended to carry out transactions automatically. The creation of what is now known as

smart contracts has evolved (Kushwaha *et al*., 2022) (Buterin, 2014). A framework for electronic contractual interaction with autonomous agents that would bargain with one another according to predetermined criteria was the focus of early discussions on autonomous contracts Sallé (2002). It was once recognized, theoretically, that electronic autonomous agents may behave like acquiring and even transgressing standards. The concept of self-executing contracts necessitates both the codification of those standards into code and the allowance of some degree of autonomy, allowing an agent to both obey commands and create new ones on its own Sallé (2002).

A little software contained within a blockchain block is known as a smart contract. There could only be one short-term transaction record per block on the original blockchain, the Bitcoin blockchain. A few years ago, new blockchains appeared that included programs that could specify terms for the transactions' execution in addition to the transactions themselves. A smart contract states, " To carry out such an order if such terms." One can create a smart contract that stipulates, for instance, that users can only send cryptocurrency to one another after a predetermined amount of time has passed. Another example is defining the terms of a transaction using data that is available to the public. After that, GPS information, for example, can be used to determine the object of the transaction's position and to approve or disapprove any activities taken with it. As a result, the smart contract is a program that checks to see if all conditions are satisfied before confirming the transaction and exchanging the assets.

One component of the blockchain is Transparency is ensured by smart contracts (All Contract Participants Can View the Specifics of Operations). Irreversibility (The Inability to Cancel Program Actions Unless Specifically Stated in The Code) and transaction traceability. Because the smart contract is distributed and encrypted, it ensures defense against theft or unapproved alteration. The first sort of smart contract, which we chose for legal research and which describes the transfer of digital assets in circulation, is the one that most closely resembles a civil contract. A contract is defined as an agreement between two or more parties on the creation, modification, or termination of civil rights and duties under Article 420 of the Russian Civil Code. The programmer defines a smart contract as a set of digitally expressed promises along with the protocols that the parties must follow to carry out these promises (Avdonina *et al*., 2022).

Thus, a smart contract can be viewed as a means of carrying out a transaction, as well as a method of fulfilling an obligation. Different digital assets (LV, 2019) can be exchanged between parties via a smart contract. The smart contract, as it is appropriately described in the literature, is the digital counterpart of an agreement that permits monitoring of every stage of its operation (from creation to completion). The algorithm's use enables the subject's effect on the carried-out agreement to be nullified. As the simplest smart contract transfers a token for a cryptocurrency, Noteworthy is the fact that a smart contract is capable of more than just automating contract execution. In addition, a digital asset must be included in the contract as a special subject. Without tokens and cryptocurrency, a smart contract cannot be executed. It is real and takes place in a virtual environment. A smart contract is typically written out as a type of agreement. One notable aspect of the electronic contract format is that it is created via electronic communication methods, with the help of service providers who act as information intermediaries, via the exchange of electronic data, rather than through direct communication between the parties. An electronic signature, which verifies the parties' intention is the executable code that makes up a smart contract and starts the algorithms for the transaction. When a smart contract is made and an electronic signature is entered, a series of transactions are created. These transactions, along with the responsibilities in a traditional contract, define the parties' legal relationship about the smart contract's implementation. As we see it, in this instance, the transactions carried out by the algorithm can be classified as independent, legally significant transactions. These are deliberate information-sharing actions to face legal repercussions (token disposal, cryptocurrency, etc.).

Literature Review

The main obstacles to economic development in the modern world are the distribution of income and the capacity to produce and manage knowledge effectively. The concept of wealth in business has changed over time and knowledge and human capital are now widely regarded as the most significant intangible assets. As a result, IPRs are now the foundation and main source of inspiration for new academic disciplines and technological breakthroughs. The creation and dissemination of new knowledge, innovations, and social welfare have all contributed to the development of a structured Intellectual Property Rights (IPR) system that supports (Vig, 2022) creative and innovative activities by offering financial incentives and exclusive commercial rights for creators. The discussion between Aristotle and Hippocampus of Miletus in the fourth century BC gave rise to this type of protective notion and reward. However, the current notion of rights to intellectual property (IPRs) (Suominen *et al*., 2023; Abdin *et al*., 2024) was developed in Venice around the 13th century as a means of compensating foreigners who contributed new information to the Venetian industry and safeguarding the expertise ingrained in the glass industry.

After that, IPR protection extended from Venice to other industrialized nations in Europe, the US, Japan, South Korea, and Taiwan. Developing and industrialized

nations have different IPR regimes (Nason, 2001). The IPR framework in industrialized nations has robust procedures to protect all types of intellectual property and is administratively well-structured to provide incentives for significant R&D expenditures. Promoting economic growth through the encouragement of innovative and creative endeavors. Only limited categories of intellectual property are protected in poor nations and even then, only minimally. Foreign developed companies can invest in underdeveloped nations encouraging imitation thanks to this type of protection or rather, its absence. The primary driver of technical advancement in these nations is imitation; promoting more profitable domestic business ventures while maintaining sustainable economic growth appears to be best achieved by reducing IPR protection. The foundation and source of incentives for Indigenous innovative activity appears to be the transfer of information from affluent nations.

Structured Literature Review

- Patent management: In the systematic literature review, the largest field is patent management. Usually, quantitative secondary data serves as the foundation for the investigation. Here are some of the most extensive research areas and some more focused findings. According to relatively recent studies, patents help both large and small businesses increase their profit margins. Van de Kaa *et al*., (2018) This is consistent with some of the findings mentioned above, including the fact that the returns on innovations are 40-50% higher for patents (Petra Andries and Faems 2013) and have a positive correlation with venture capital funding. Jensen *et al*. (2011) raise the question of whether increasing patenting alone will be sufficient for businesses to reap these benefits. No, the proper kind of patenting must be used. Two elements that account for a business's success with patenting. Two factors that positively indicate a company's patenting performance are the internal legal patenting competence and the senior management's prior patenting experience. Hoenen *et al*. (2014) patent analytics and the applications of patent data for technology forecasting, patent mapping, and other purposes constitute a significant area of research within the field of patent management. This line of research makes use of the extensive data included in aggregated patent information and patent documents to inform decision-making algorithms. Somaya *et al*. (2007)
- IP management: Similar to the process for managing patents, a thorough search for literature on IP management turned up a large number of articles. This section of the review has the most integration and links to general management and strategy. Although the term "intellectual property" is broad, the identified literature frequently subtly concentrates on specific IPR categories, most commonly patents. (Rivette *et al*., n.d.) Many articles highlight the strategic significance of intellectual property. Pisano and Teece (2007) Due to IP's significance in establishing and maintaining a competitive advantage, the management of IP must be elevated to the highest management level when it represents an ever-growing portion, frequently a majority, of the firm values. (Reitzig, 2004) To increase competitiveness, specific patent strategies must be linked to company strategy (Rivette *et al*., n.d.). Additionally, IP management ought to be combined utilizing business strategy and general management. Granstrand (2000). The integration and disintegration of ideas is one of the central concerns in strategy and IP management is crucial in facilitating both of these processes. Granstrand and Holgersson (2013)
- License management: The importance of licensing for corporate strategy and IP management is well-documented in the literature and a sizable body of research supports this claim. The evaluation suggests that formal modeling and quantitative data analysis are the mainstays of licensing research. Granstrand (2004) Several studies have attempted to answer the topic of what factors influence decisions about in- and out-licensing. For instance, it has been discovered that organizational structure (Arora *et al*., 2013) and in-licensing decisions are influenced by several factors, including prior licensing experience, the cost and value benefits of licensing, knowledge of licensing options, and the licensees' R&D capabilities. Arora *et al*. (2013) The latter is associated with absorptive capacity (Atuahene-Gima, 1993), indicating that the successful utilization of external technology requires intrinsic technological ability. Though expenses and a loss of autonomy are significant drawbacks, the necessity to swiftly establish a competitive edge is the main factor driving in-licensing decisions. Cohen and Levinthal (1990) These various factors could influence not just the choice of what kind of license to utilize but also the decision of whether to obtain one at all. Atuahene-Gima and Patterson (1993). There is a lot of conceptual and modeling research in the licensing literature in addition to the empirical findings previously discussed. The literature in this area focuses on designing licenses assigned to a particular business plan (Sen *et al*., 2008). This also covers several licensing stipulations (Niculescu and Wu 2014), as well as various payment plans (Crama *et al*., 2008), including "royalty rate," "milestone," and "upfront." and how to assemble them. This relates to an extremely significant field of study, which is licensing pricing. See *et al*. (n.d.)

The goal of this study is to protect the flow of capital and information from generation to consumption in the energy sector. This study encompasses the entire energy sector, including producers, consumers, traders, retailers, and electric vehicle drivers and charging stations. Smart contracts are also used to streamline corporate transactions with other clients. Apart from eliminating the necessity for middlemen, Bitcoin guarantees that every transaction utilizing the developed distributed software is documented and accessible to the public. Farshidi *et al*., (2020) introduced a technique for assessing a blockchain's ability to manage electricity using fuzzy DEMATEL technology. The study's authors regarded the situation of distributed generation, in which individual homes either create their electricity or purchase it from utilities or other clients. Peer-to-peer and smart contract management are also made easier by the blockchain. Additionally, a unique modeling technique for clever blockchain data-finding applications was provided (Sharma *et al*., 2020; Goh and Sigala, 2020) The suggested paradigm is also known as "a guidance approach". Because analytics, data analysis, and statistical modeling tools are readily available, businesses today have a greater understanding of how to create products that sell.

Furthermore, (Marques *et al*., 2020) discussed how the health sector is evolving as a result of the digital revolution. This research has two goals: First, it will ascertain whether current Digital technologies can improve the requirements and safety of healthcare; second, it will examine how digital medicine is evolving. Similarly, (Karoui and Ftima, 2021) offers a novel method for analyzing risks in mobile healthcare systems. The four main components of the authors' methodology are risk parameter estimation, evaluation, archiving, and trading. By contrasting their conclusions with the outcomes of the Weighted Average approach, we could validate and verify their correctness. To evaluate the effectiveness of their method against a focused onion attack, the authors made certain modifications. Akin *et al*. (2019); Cayirci and Oliveira (2018); Dubey *et al*. (2013).

The data consistency of the scheme (Alaba *et al*., 2020) is ensured by the blockchain's immutability and user-friendliness. This will raise the overall effectiveness, dependability, and resilience of the plan. Gourisetti *et al*. (2020) created Enhanced Prioritized Gap Analysis (EPGA), a different technique for lowering cyber dangers. By evaluating the proposed system against cyber injections in an actual cyberattack and comparing it to relevant current frameworks, its efficacy is demonstrated. Furthermore, (Modgil and Sonwaney, 2019) look into the main issue of product counterfeiting in the contemporary world. Here, the requirements and capabilities of distributed ledger systems are examined. Furthermore, (Modgil and Sonwaney, 2019) look into the main issue of product counterfeiting in the contemporary world. Here, the requirements and capabilities of distributed ledger systems are examined. The Weighted Aggregated Sum Product (WASPS) and methods using the Move Weight Assessment Accounting Ratios (SWARA) are used in the study. WASPS is used to rank and weight the alternatives, while SWARA is used to generate the parameter weights. Lastly, (Sun and Zhang, 2020) proposed a three-tiered blockchain design for government information resource sharing and exchange that is made up of layers for business applications, infrastructure, and networks. The feasibility of the proposed solution to the problem of sharing information services connected to the government is validated by five infrastructure networks. It offers fresh perspectives on information-sharing topics such as trust islands, non-real-time exchange, standards compatibility, peer management, and data ownership. In addition, this study assesses Smart Hefei's advancements from 2012 to 2017 by creating a thorough evaluation technique predicated on the TOPSIS framework. During the policy-making process, individuals from several departments can securely communicate with one another thanks to blockchain technology. For example, (Alexander *et al*., 2019) talked about how blockchain could make financial transactions (Smith and Dhillon, 2019) more secure. Managers must comprehend how blockchain technology affects financial transaction cyber security. Establish a process for looking at barriers to blockchain adoption and effective application across various industries (Biswas and Gupta, 2019).

Cybersecurity Threats and Smart Contracts: Lessons Managed to Learn

Blockchain-enabled intelligent contracts have completely changed the way agreements are carried out across a range of industries, including supply chain and banking (Melkonyan *et al*., 2019). They do, however, also present certain security problems that must be fixed to guarantee their stability and reliability. This essay examines the methods used to address security issues and the lessons that can be drawn from different parts of smart contracts. Smart contracts are encoded, self-executing contracts into code directly, doing away with the need for middlemen and automating procedures while increasing transparency. Smart contract execution is guaranteed to be trustworthy due to the blockchain's immutable and decentralized structure. Implementing and Smart contract execution is permitted by Ethereum and other platforms (Pokrovskaia, 2017), which also give developers access to a rich environment in which to design a wide range of applications. But these platforms also turn them into prey for cybercriminals. Among the security techniques used in smart contracts are formal

verification and analysis, both static and dynamic. While static analysis examines code without actually running it, code audits review code to find vulnerabilities. Runtime vulnerabilities are found by dynamically analyzing the code as it is being executed. To facilitate the identification and remediation of vulnerabilities security applications taxonomy splits security issues into several smaller groups. Due diligence must be taken while designing a safe smart contract because errors in any one of these areas could result in security lapses. Attacks like denial-of-service, integer overflow, and reentrancy are all potential targets for smart contract attacks. Smart contracts need to go through extensive audits.

In conclusion, although smart contracts have the potential to be revolutionary, security risks still exist. By putting in place by adopting formal verification, conducting thorough audits, and adhering to secure design, developers can minimize vulnerabilities and produce reliable smart contracts that promote creativity while safeguarding resources and information. Ethereum.org is the marketplace that is used to build intelligent contracts:

- Time stamping: Intellectual property is time-stamped and stored on the blockchain for Proof of Existence (POE) when a user asserts it. Unlike Ascribe.io, this is not published at any license; rather, it is more along the expected Bernstein line, with the exception that it is revealed within an NIR per an NDA Smart contract. Whenever the IP registration time is set to a block timestamp, how safe is it? The timestamp itself cannot be verified cryptographically; only the arrangement of specific cryptographic structures can. It is unclear how much a miner can erroneously supply a timestamp in a block header before other nodes reject it. As a result, block. Timestamp has to be used in conjunction with an additional tactic that has not yet been identified for further research
- Evidence of Stake (POS): Even though the ledger validation procedure may be divided among Cryptocurrency and other blockchain-enabled systems, they are still centrally controlled systems that are freely taken over by a small number of powerful individuals who have access to greater infrastructure. The infrastructure might not be decentralized, but the contracts and transaction ledger might be. All online users are required to contribute to the IP timestamp under this give-and-take regulation. p. Accordingly, miners in our concept are all users of the online OI platform rather than specialized nodes. Recognizing information that makes sense to others but not to oneself, that can be readily adjusted to the NIR's formulation, the disclosed intellectual property, and other information that can be measured in wits, which act as a kind of Ethereum's gas and are accessible to all validating nodes on the NIRVANA platform (Rosa *et al*., 2021)

Materials and Methods

There are several applications for Patents and Trademarks that use blockchain technology (Fig. (2) shows the classification between Pu and Private). For example, access permissions are managed by a Knowledge Shared Network using blockchain. The logic behind trademark systems is distinct and unconnected to innovation and inventiveness. Trademarks are intended to improve market efficiency by mitigating information asymmetry. In some markets, such as hospital management, trademarks serve as information signals.

Trademark Implementation

The following is the procedure for utilizing the blockchain network for the trademark system to register, distribute, and validate trademarks:

- Register trademark: After the user inputs the information for the brand into the system and uploads the certificate, an Application Program Interface (API) called "Create Service" is activated. As can be seen, this procedure involves signing and encrypting the trademark certificate. In Fig. (3) the content store houses the signed certificate, which then provides the "File Store Service" with a distinct hash of the certificate. After a smart contract is ultimately carried out, the permissioned blockchain network stores the certificate's unique hash and the trademark's associated metadata
- Disperse trademark: As illustrated in Fig. (4), the "Produce Service" API is activated when the user inputs the registered trademark's registration number along with any pertinent details. The "Deliver Service" API then activates the "Smart Contract" by retrieving the distinct hash and specific data about the trademark from the blockchain. After that, the trademark certificate is obtained from the "Content Store" by the "File Storage System" using the distinct hash of the trademark. At last, the user receives the trademark certificate

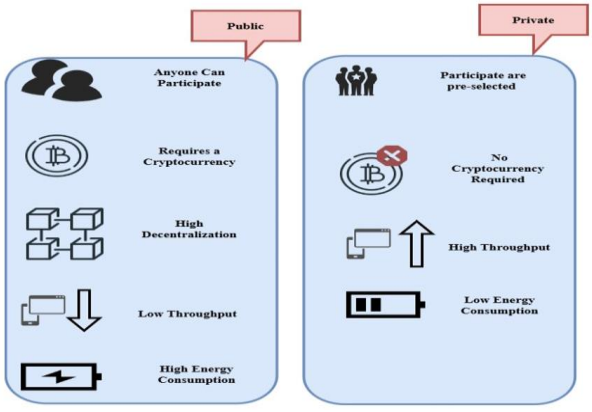

Fig. 2: Classification between private and public blockchain

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- Validate trademark: A "Validation Service" API is triggered when a registration number and trademark certificate are uploaded by the user into the system. This starts the "Smart Contract," which is then carried out to retrieve the distinct hash of the trademark and associated data from the smart contracts. As seen in Fig. (5), the "File Storage System" uses. The registration number and trademark certificate are uploaded by the user into the system. This starts the "Smart Contract," which is then carried out to retrieve the distinct hash of the trademark and associated data from the blockchain. Determining if it is revoked, expired, or still in use, as well as the trademark certificate's legitimacy. Afterward, the end users receive a report with these validation findings

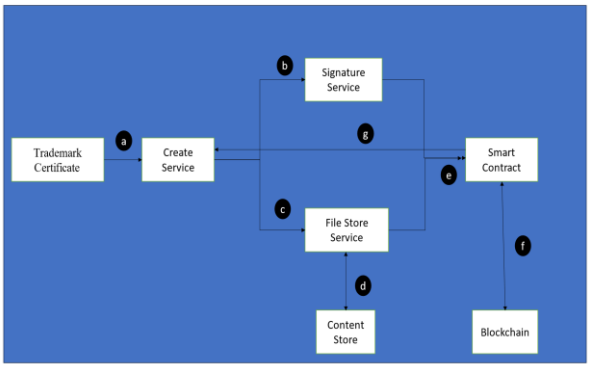

Fig. 3: Register /renew the trademark

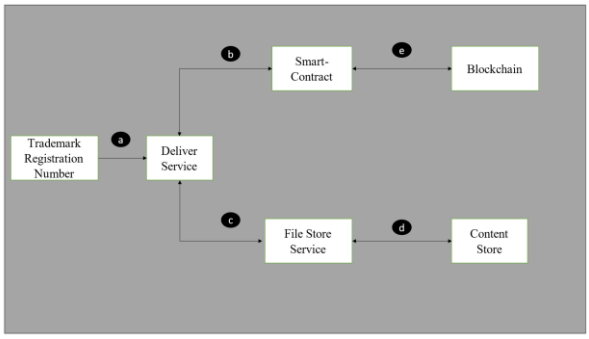

Fig. 4: Distribute trademark

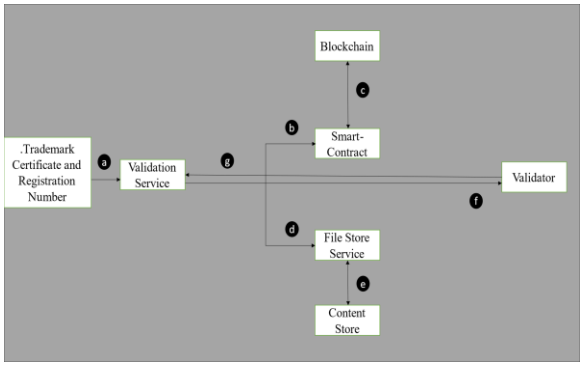

Fig. 5: Validate trademark

Results

In the following Fig. (6), write a digital agreement regarding patient health records (intellectual property). Once completed deploy and run transactions.

In the following Fig. (7), we can see some Method calls like grant Access and revoke Access. In the grant Access method call, the Provider box field with the Owner address and access Duration field with Time, and in the revoke Access method call, fill the Provider box with the correct owner address.

In Fig. (8) the health Record Method calls, to get the health records of a particular patient and fill in the field with the Patient's Address.

In Fig. (9) to view or send the health records of a patient get the authorized access user's Address and fill the field with the address.

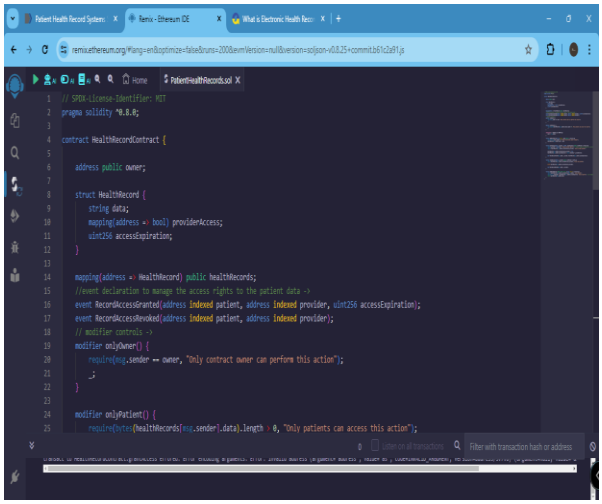

Fig. 6: Smart Contract for Patient Health Record

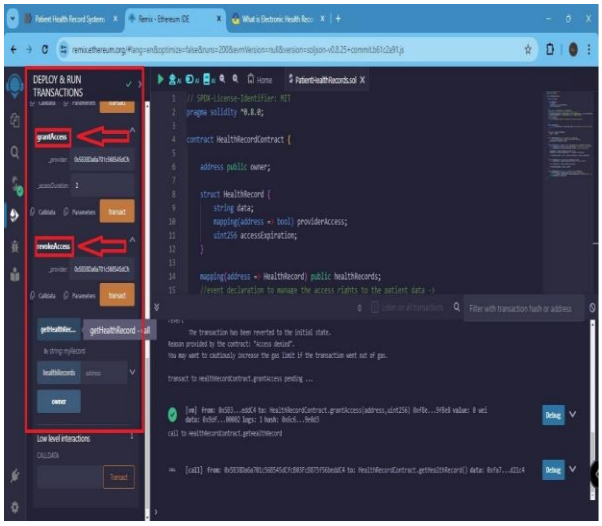

Fig. 7: Deploy and Run transactions

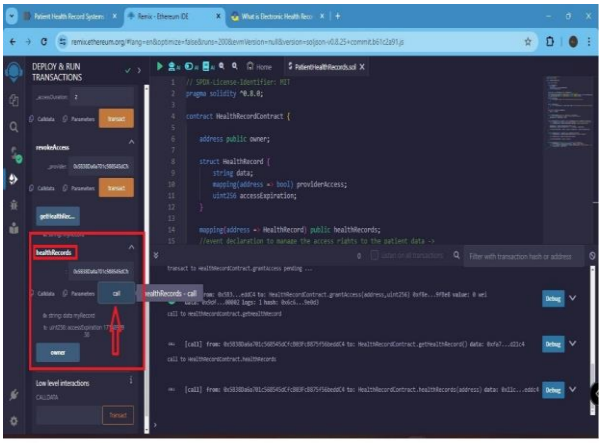

Fig. 8: To obtain the health records

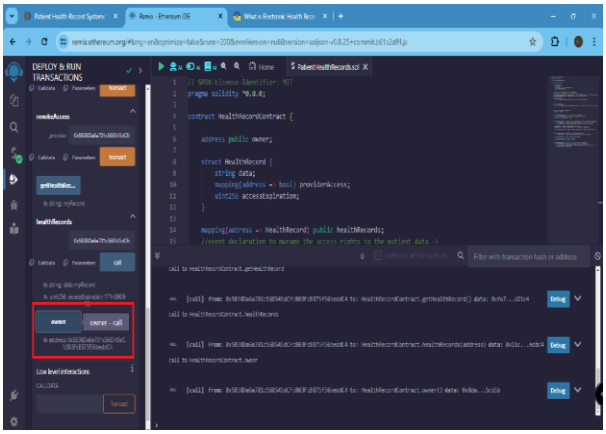

Fig. 9: To get the owner's address

Challenges

- Changing dynamics of digital piracy: In the past, when people shared data via peer-to-peer networks, digital piracy took a quite different form. With today's sophisticated global pirate networks, it is harder and harder to stop copyright infringement. File-sharing forums, torrent websites, and streaming platforms have developed into havens for content piracy, giving consumers access to protected media without the required permission
- Significant effect on content creators and enterprises: Digital piracies have a significant effect on companies and content creators. Intellectual property is created with significant financial investment by software developers, authors, singers, and film producers. Their revenue streams are immediately impacted by piracy, which results in significant Financial setbacks. Particularly Independent and small-scale creators face the possibility of job loss as a result of pervasive copyright violations. Additionally, piracy hurts legal companies, resulting in lower sales and an unfair competitive environment
- The digital footprint: Information as Proprietary Knowledge Data has become a valuable commodity in the digital era, sometimes called the "new oil." Through their online activities, people produce enormous amounts of data, leaving a digital trail that records their choices, behaviors, and even feelings. After processing and analysis, this data can produce insightful findings and innovative solutions. As a result, concerns about who owns this data surface. Does ownership of the data remain with the person creating it, or does it transfer to the platform or organization gathering it?
- Legal frameworks and challenges: The problem is made more complex by the disparate legal systems that regulate intellectual property and data privacy around the world. The Personal Data Protection Bill in India combines current intellectual property rules to protect individuals' data privacy. The difficulty is in bringing these regulations into harmony so that personal information and intellectual property rights are adequately protected. It is very difficult to find a compromise between both the rights of artists and innovators and the privacy of personal data. Maintaining this equilibrium necessitates careful legislative drafting and ongoing technological adaption

Future Work

- Technology-based remedies and counter-piracy steps: Anti-piracy principles and technological remedies have been developed to try and combat copyright theft. Utilizing DRM (Digital Rights Management) and encryption techniques, digital content is shielded against unwanted access and distribution. Watermarking methods and content identification algorithms are also employed in the track-and-trace of stolen content. But pirates are always adapting and discovering methods around these controls, so content producers and infringers are engaged in a never-ending game of cat and mouse
- Increasing public information and understanding: The public must be aware of the negative effects of piracy. Many customers may be unaware of how much piracy affects companies and content companies. Education campaigns emphasizing the negative effects of piracy on the economy and creative industries can encourage consumers to take responsibility for their actions. The public can be extremely skilled about the implications of patent rights on a moral and legal level through the use of online tools, educational institutions, and other establishments
- Global collaboration and legal reforms: Global collaboration is required to fight digital piracy. Since

piracy has no national boundaries, foreign collaboration is required to fight global piracy networks. The exchange of information and the extradition of digital pirates can be facilitated by international treaties and agreements. In addition, legislative changes are required to bring copyright rules up to date with the digital era. A careful legal analysis is necessary to strike an equilibrium between safeguarding and protecting trade secrets and making knowledge and culture more accessible. Intellectual property rights law faces serious concerns from digital piracy and copyright violation. Because digital technologies are always changing, legal frameworks must also be always innovative and adaptable. With the help of international cooperation, public education campaigns, and technological advancements, authorities may be able to successfully stop digital piracy. Policymakers and legal professionals must be alert as the digital landscape develops, foreseeing new obstacles and coming up with proactive plans to safeguard creators' intellectual property and promote a just and fair online community

- The role of education and awareness: Lastly, a thorough instructional strategy is required to bridge the gap between local reality and global IP requirements. Educating innovators, companies, and the audience about the nuances of both domestic and international intellectual property laws can help participants successfully navigate this difficult environment. The foundation for achieving a peaceful coexistence of local circumstances with international intellectual property norms is education. Policymakers, lawyers, and civil society in India need to take the initiative to navigate the complex link that exists between international intellectual property rules and regional realities. India can create a strong, complex intellectual property framework that satisfies its international responsibilities, supports innovation, and caters to the many interests of its people by comprehending the nuances of both local requirements and global norms
- New innovations: AI, IOT, big data, blockchain advances in Artificial Intelligence (AI), Internet of Things (IOT), massive privacy protection analytics, and other cutting-edge technologies have complicated the link between intellectual property. Large datasets are usually needed for AI systems to function well, which raises privacy concerns about the use of data. Similarly, the frequent collection and transfer of data by IOT devices makes it more difficult to discern whether data is personal. Although data mining offers unparalleled insights, it also raises questions regarding the extent to which data may be utilized without infringing upon privacy rights. To solve these problems, proactive legislation and moral guidelines that consider how emerging technologies may impact data protection and copyrights are needed, Integrate private blockchains such as Corda / Hyperledger with blockchain

Conclusion

Intellectual Property Rights (IPR) are facing previously unheard-of difficulties as a result of the digital age, calling for a clear future strategy that takes into account the intricacies of the contemporary world. A comprehensive legal scholar, framework must be created through collaborative efforts between policymakers and stakeholders that protects intellectual property and encourages innovation and creativity in light of the exponential advancement of technology. It is essential to have a thorough awareness of the digital landscape to proceed with effectiveness. Acknowledging the several types of intellectual property that are at risk, such as databases, software, and digital material, is part of this. It's also critical to understand the mechanisms behind copyright violations and digital piracy. Through a detailed grasp of the issues, policymakers may create focused plans of action.

The upholding of existing intellectual property laws in the online sphere is one of the most important issues that needs to be addressed right away. It is essential to strengthen enforcement procedures Regarding legal structures and the ability to enforce laws. To properly manage crimes involving digital intellectual property, law enforcement officials may need to undergo specialized training. Furthermore, establishing courts specifically for intellectual property with justices knowledgeable about digital matters could speed up judicial proceedings and guarantee prompt justice. A better-informed public is able to uphold intellectual property rights. Reducing instances of piracy and infringement can be greatly aided by promoting digital literacy and awareness efforts. Respect for digital works can be promoted by teaching people about the importance of intellectual property and the repercussions of infringement.

To promote innovation, Research and Development (R&D) incentives are essential. A creative culture can be sparked by offering tax breaks, subsidies, and other types of assistance to companies and individuals working on cutting-edge digital projects. Furthermore, fostering industry-academia cooperation can result in ground-breaking discoveries, enhancing India's standing as a global center for technical breakthroughs. International cooperation is essential since the digital world transcends national boundaries. India ought to initiate proactive discussions with other countries to standardize intellectual property laws, promote information exchange, and expedite legal procedures about issues involving cross-border intellectual property. Global cooperation can result in the creation of uniform guidelines and procedures,

guaranteeing a more consistent method of guarding digital intellectual property. The creation of cutting-edge technological instruments can greatly support the defense of digital intellectual property. The defense against intellectual property violations can be strengthened by investing in technologies like digital watermarking for packet filtering, blockchain for copyright management, and Intelligence algorithms for piracy identification. India can proactively counteract possible dangers in the digital ecosystem by maintaining its technology leadership. The quick speed at which technology is developing means that laws need to be flexible and dynamic. It is vital to regularly analyze current rules and regulations to find any gaps and areas that need to be modified. In addition to legal professionals, technicians and representatives from the commercial and creative sectors should be involved in this process. Legislation that is flexible guarantees that, even in the face of changing digital challenges, the legal system is still applicable and efficient.

In conclusion, addressing the issues within the digital age, patent and copyright law necessitates a multidimensional strategy. The potential to build a future in which intellectual property is protected and acts as a catalyst for innovation and social development. To achieve this, the country should understand the digital environment, strengthen the legal framework, increase public awareness, promote international collaboration, invest in technology, and diligently review its laws. Many procedural, financial, enforcement and protection-related obstacles face the current trademark registration, renewal, and validation process. These include the time-consuming and expensive nature of trademark registration, the need to prove the legitimacy of physical trademark documents, the necessity of registration in multiple jurisdictions, the upkeep of centralized databases across jurisdictions, and so on. Our permission blockchain network for trademarks aims to address the procedural and financial, problems with the present trademark system in terms of enforcement and protection by offering an easy-to-use, secure, decentralized, and unchangeable framework that intellectual property organizations in various jurisdictions can use to register, renew, validate and distribute digital trademark certificates.

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Vikram Shirol: Written the entire manuscript.
Shanmuga Rathinam: Evaluation of the manuscript.

Ethics

This article is unique and contains unpublished material. The comparing creator affirms that all of the different writers have perused and endorsed the composition what's more no moral issues are included.

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