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A Study On WhyAnd How Blockchain Can Aid In The Protection Of Intellectual Property In The Internet Of Things Era

Running Title: -A Study On Why And How Blockchain

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Abstract
As we know from the last some decades the block chain technology development grow day by day in the field of research, academic commercial circles and many more are exploring rapidly. Now days in sales, finance and medical blockchain already play a vital role. In this research paper, our aim is to focus the uses of blockchain applications for intellectual properties and also analyzing and give directions in academic research and also in commercialized application .We also tried to give an optimal direction using blockchain technology in the field of research in the next higher level.

Keywords: IP (Intellectual Property), Blockchain, IoT, PoW.

Introduction

Blockchain was proposed in white paper by Satoshi Nakamoto in 2008[1]. It is a distributed peer-peer network to disseminate , identify and record processing data .I the year 2009 a community (Nakamoto) developed the "Creation block " as first block and founded social network of bitcoin[2]. Blockchain is the trending technology as clouding computing, mobile internet, big data etc.

Blockchain acquire special attention as many international agencies and organization uses blockchain as the game changer in many areas such as finance, sales, supply chain Management etc. [3].

At same time we are facing Intellectual property issues in the informatics era .Blockchain technology solves many issues as discuss above. The main use of blockchain technology to contribute in the field of intellectual property for protection and trading[5].

Status of Research

Paper No.	Research Status
[6]	In this paper author shows the vulnerability of mining of Bitcoin
[1-10]	In these papers authors gives the various applications and various platform of blockchain
[11-20]	Here authors gives the uses of blockchain in physical property transaction and medical field also
[21-30]	In these papers authors gives various security and privacy mechanism of the applications of blockchain.
[31-33]	Shows privacy and security of information in blockchain of self-regulatory nature of bitcoins, smart contact design and internet rental vehicles business etc.
[34-37]	Here authors gives various consensus algorithms
[38-45]	Safety problem and actual use from macro perspective was analyzed.

Blockchain and Intellectual Property

"Now the functionalities of blockchain not only to limited to cryptocurrency but also used in the field of medical, notaries and intellectual property." Blockchain immutable nature gives a mechanism to keep track the ownerships as well as creation which can't be modified. It is very important to an IP owner as it stops claims to ownership by another person. With the help of smart contacts we can improve security and provide licenses and also obtain royalties. Block chain technology also be used with IoT in IP fields to ensure user's data is secure and protected.

It is still crucial to hire qualified legal counsel experienced in intellectual property law even if you want to store your intellectual property data utilising blockchain. Your options for the best ways to safeguard your works of art can be discussed with an intellectual property attorney. In the event that someone tries to copy your work or disputes your ownership, legal advice can offer helpful direction during the collecting of evidence and the court case.

Application of Blockchain

By using blockchain, it is possible to create a chain of proof for copyright ownership that cannot be altered. The block's hash value would change if someone were to alter the data contained inside. The initial hash value connecting to the first block would still be present in the next block, though. When the linking hash is changed, the block's hash value likewise does. The contents of a block cannot be changed by a user unless they have access to modify every block on the chain with the updated associated hash values. This poses little risk because it is unlikely that someone would have access to the processing power necessary to alter the hash of each block.

The owner of a work may securely maintain their copyright information since blockchain offers a tamper-proof method of data storage.

Blockchain offers a mechanism to track the ownership of a work and is also tamper-proof. The original copyright date could be included in the block's data. If your copyright is ever contested, the information can be utilised as ownership proof. The ability to monitor ownership will save time and money when gathering evidence if litigation is ever sought since other parties will be able to see the chain of ownership. Additionally, it may be used to record the date of filing for patents or trademarks, categorise original works, and store them.

Additionally, storing your documents on a blockchain enables them to be kept globally rather than just with a national patent office.

The usefulness of using blockchain to secure one's intellectual property has expanded with the incorporation of smart contracts. When requirements are satisfied, smart contracts on the blockchain carry out tasks like granting access to data contained in the block. By accepting the user's digital signature, an owner can provide licences to users who wish to access the intellectual property. A person's access to their work might likewise be denied by the owner in this way. By creating a contract, smart contracts may also be used to impose royalties on those who use and access intellectual property.

IoT might be viewed as a data host for intellectual property. However, security issues with IoT continue to be a serious worry. Data security is at danger due to an increase in cyberattacks. While hosting IoT devices on a private network may increase security, combining IoT and blockchain technologies will further boost security. If a system has a cyber incident, storing intellectual property on a blockchain will ensure that the data cannot be altered.

In general, while choosing how to store data, blockchain is a technology that should not be disregarded. The technology has improved since it was first used to cryptocurrencies. Blockchain now offers a safe way to store important intellectual property data for documents like patents and copyrights.

Blockchain applications in intellectual property fields-

The sector of intellectual property may be significantly affected by blockchain due to its accountability, security, transparency, and immutability. Blockchain applications for intellectual property may expand significantly in the near future, though, as the technology is still in its early stages of development.

There are five potential use-cases that blockchain-based intellectual property management offers given the state of the industry today.

1. Blockchain-based smart contracts for IP

A smart contract is a piece of blockchain-based software that runs automatically when a given transactional condition is met. When it comes to intellectual property, transactions like purchasing a patent necessitate a number of steps, including verifying the patent's assignment and validity, haggling over the sale agreement, carrying out and paying the

transaction, and finally notifying all relevant patent offices of the transaction. Smart contracts may be used to streamline each of these procedures.

Current cutting-edge instruments: PATENTICO, Bernstein IP, and IPwe

Future Perspective: Given the requirement for a digitalized and secure transaction system that fosters relationships of trust between people while maintaining security, smart contracts can be broadly incorporated in the IPR sector with the ever-increasing innovation of Blockchain technology. Smart Contracts are seen as being particularly helpful in terms of the automated commencement of legal and enforceable contracts, especially for contents like songs, images, and other media, as the IP world opens up to the benefits of new age technology.

2. Using blockchain to establish authorship and ownership
Blockchain technology may be utilised as a reliable platform for confirming the legitimacy of IP work ownership. A person who wants to protect his intellectual property can go to the patent office to submit a patent application. The burden of demonstrating ownership of a piece of creative work falls on the creator in cases of copyright, however, due to the lack of any legal proof. In the age of the internet, when anybody may download creative content such as a recorded music, an image, a painting, etc. and use it at their discretion, exercising copyright has become even more difficult.

Orbit Blockchain, Bernstein IP, PT&S Intellectual Property, Binded, Vaultitude, Artizyou, and NPER Project are examples of current state-of-the-art tools.

Future Aims: With the development of industry 4.0 and digitization, it is necessary for the system to provide evidence of ownership for the security of intellectual property. Fortunately, one technology that might meet the system's needs by offering both security and evidence of ownership for intellectual property is blockchain. For the protection of one's digital assets, many businesses have already begun offering blockchain-based timestamping and validation systems.

3. Using blockchain to enable the IP market
One kind of distributed ledger technology is blockchain (DLT). Several separate computers (nodes) are used by the distributed ledger technology to record, share, and synchronise transactions in each electronic ledger. Blockchain has the ability to serve as a marketplace for intellectual property by allowing innovators to store their ideas and digital works as ledgers with brief descriptions. Additionally, patent holders and inventors who want to locate possible licensees for their ideas' relevant know-how might utilise blockchain to do so.

Modern, cutting-edge tools include DEIP Ledger, IPwe, GoChain, and IP Chain

4. Blockchain could synchronise the world's IP/patent systems
The issue of integrating the patent systems of different nations would be resolved by blockchain and its decentralised ledger technology. This might greatly increase the efficiency of IP management, hasten corporate innovation, and promote information sharing among them via the ledger.

State-of-the-art at the moment: The legal system and patent offices are gradually coming around to the idea of accepting blockchain as "admissible proof." Here are a few situations when courts or other authorities have taken blockchain into account while evaluating electronic evidence.

- In Vermont, legislation was approved in 2016 stating that blockchain receipts with a written declaration from a witness attesting to the specifics of the transaction are acceptable. Blockchain receipts are likewise deemed to be legitimate in accordance with Vermont Rules of Evidence under 12 V.S.A. 1913.

- The Delaware General Corporation Law (DGCL) was revised in 2017 to add a provision known as 224 that permits businesses to keep records utilising "distributed electronic networks or databases." Source

- In a copyright case in which the plaintiff employed a third-party blockchain deposition service to protect online site proof of the claimed copyright violation, Hangzhou Internet Court acknowledged blockchain-authenticated evidence in June 2018. The nation's first court to do so was this one. Source

- In India, Section 65B (Admissibility of electronic documents) of the Indian Evidence Act, 1872, may be crucial for the enforcement and jurisdiction of transactions through a blockchain network. Blockchain records, signatures, and smart contracts are now included in the Arizona Electronic Transaction Act and "may not be denied legal effect,

validity, or enforceability," according to Arizona HB 2417, which updated the law. 2018 saw similar laws approved in Ohio.

5. Blockchain for keeping track of digital assets' versions

There is a need for a solution that enables linking of different versions of digital assets over their lifecycle since digital assets like patents, research articles, copyrights, etc., have many versions over the course of their lives. Blockchain technology may be applied in systems where users can utilise its ledger technology to link every version of their digital assets and perhaps use it for end-to-end asset lifecycle maintenance.

Application of Blockchain's version control in intellectual property: Defensive publications are a means to stop someone from patenting an idea by making it publicly known and establishing the innovation as prior art. Blockchain may be used as a platform for defensive publication, where each file is given a distinct fingerprint, duplicates are eliminated, versioning is supported, each network node can pick which material it is hosting, and the database is indexed and searchable.

Modern state-of-the-art equipment IP Bernstein

Future Aims: Utilizing a blockchain-based system for connecting various digital assets and having timely control over them creates a variety of opportunities for individuals to work together on various projects and gives them the freedom to form their ideas, which spurs more creativity in the market.

The time-stamping function of blockchain technology is what led to its use in the sphere of intellectual property. Figure 1 depicts the structure of blockchain technology stamps.

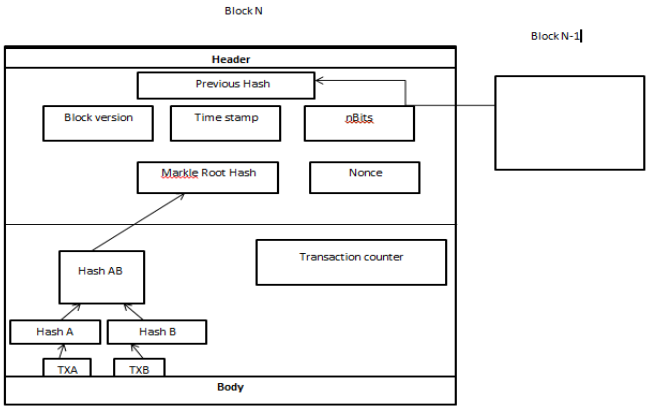

Fig.1.1 Blockchain Structure

Intellectual Property confirmation and blockchain-

According to legal system of china, patent and trademark is different as compare to copyright, It is automatically published from completion date of creation of the work, without ant survey and admission by administrative agencies[46].Here the work can be spread very easily cause of hidden and unverifiable identity of author due to some unclear and mismatch signature and it make the work as “orphan”[48]. The country like china established a system for copyright registration with high fee [48].

The creator is usually the first person who create the work and authorized to access the full document to keeping in mind using blockchain technology the copy right registration cost is very low around 0.4 yuan[52].

IP transaction and Blockchain

As when we want to watch movies, videos etc. the desired platform will pay some fee to owner of copyright and distributor according to smart contact [51].Smart contact can also take place to IP crowdfunding .Books, films, T.V works are recently have two different types of crowdfunding[52].

IP protection and Blockchain

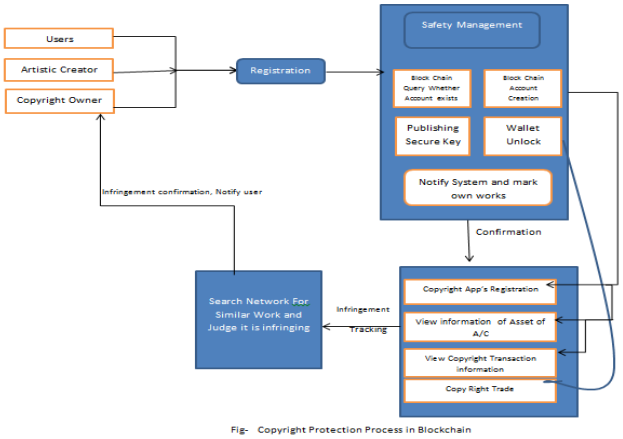

Fig- Copyright Protection Process in Blockchain

Incentive Mechanism of Intellectual Property and Block Chain

The algorithms used in the incentive mechanism in the currently popular blockchain projects primarily fall into the following four categories: PBFT (Practical Byzantine Fault Tolerance) [53,54], PoW (Proof of Work, Workload) Proof] [53,55], PoS (Proof of Stack) [56,57], and DPoS (Delegated Proof of Stake) [54]. Table 2 displays the benefits and drawbacks of these four methods. However, PEBT, PoS, and DPoS have their place under various demand situations. It is challenging to achieve the same processing power to maintain its own security and stability utilising the blockchain system of the PoW mechanism [55, 58].

The incentive Mechanism basically having following four categories

- ✓ Pow(proof of work)
- ✓ PoS(proof of stack)
- ✓ Dpos(Delegated Proof of Stake)
- ✓ PBFT(Practical Byzantine Fault Tolerance)

A few observations on knowledge blockchain-

How to transfer the current copyrighted works to the blockchain is yet unexplored in domestic research and practical projects, and should be pursued in next research and practical applications.

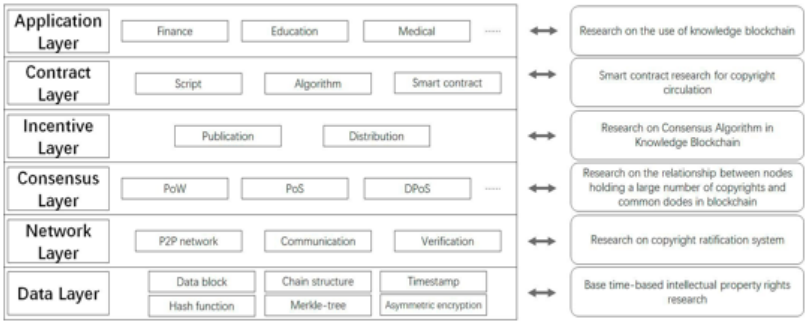

Fig. 3. Blockchain structure and corresponding application in the field of intellectual property

The core components of the data layer, network layer, and consensus layer have been established. This layout is followed by the widely used blockchain technology today. It may be employed in the content of several implementation methods, such as encryption algorithms, if it is applied to the sphere of intellectual property.

Different consensus algorithms can be compared and analysed in the incentive layer along with the application direction to find appropriate incentive mechanisms in various usage scenarios or to further investigate new consensus algorithms to satisfy the requirements of particular intellectual property systems.

The main area of study for the blockchain and intellectual property combination might be the contract layer. First off, it may be said that smart contracts written in computer language represent how intellectual property transaction laws exist in real-world society. The individual contract rules can then be implemented in accordance with the distinctive blockchain processes. The security of smart contracts may also be a major area for research, based on the most recent study on smart contract attacks.

In overall, using blockchain technology to the field of intellectual property is the appropriate direction and supportive of the growth of blockchain and the trend of copyright protection at a time when this technology is progressively advancing into more social domains.

Future Scope: 1. Blockchain technology has the potential to become a universal system for safeguarding digital assets because to its immutability, security, and transparency. Different laws and governments are gradually embracing and incorporating blockchain as a kind of proof of evidence. Future governments may recognise blockchain as a foundational technology, which may potentially unite the whole intellectual property system.

2.The way information is shared in this sector has been transformed by blockchain ledger technology. This new method of information exchange, which doesn't sacrifice speed, security, or openness, will have broader implications across all industries. In reality, IPR is another area where information sharing must adhere to the relevant standards. Given the potential of blockchain ledger technology, we may see an application in the sharing of IPR-related data.

Conclusion

The technologies associated with Industry 4.0 are still in their infancy. However, it is evident that the digitalization and automation of entire sectors is advancing quickly and will impact how we live in the next decades. It is obvious that IP attorneys will need to acquire the requisite IT know-how to provide efficient legal advice with regard to blockchain and the creation, monitoring, and enforcement of smart contracts. First use cases seem promising and should be actively monitored from the outset, despite the fact that it may not yet be totally evident how much these new technologies will be deployed or when the required software standards will be accessible [59].

Important conclusions

- In summary, the initial applications of blockchain and smart contracts seem promising, but more study is needed to determine their full potential and any future legal issues.
- The necessary legal tools are provided by copyright and patent law to safeguard any novel progress in this area.
- Smart contracts might control and manage IP. However, there are some thresholds where using human judgement is important (e.g., construction of legal concepts such as "reasonable" or "necessary).

References

1. NakamotoS.Bitcoin:Apeer-to-peerelectroniccashsystem [I].Consulted,2008.
2. Swan M. Blockchain: Blueprint for a New Economy [M]. O'Reilly Media, Inc. 2015.
3. Yuan, Wang. Development Status and Prospects of Blockchain Technology [J]. Journal of Automation, 2016, 42(4):481-494.
4. Guo Y, Liang C. Blockchain application and outlook in the banking industry [J]. Financial Innovation, 2016, 2(1):24.
5. Ishmaev G. Blockchain Technology as an Institution of Property [J]. Metaphilosophy, 2017, 48(5):666-686.
6. Eyal I, Sirer E G. Majority is not enough: Bitcoin mining is vulnerable [J]. Communications of the ACM, 2018, 61(7): 95-102.
7. Yelowitz A, Wilson M. Characteristics of Bitcoin users: an analysis of Google search data [J]. Applied Economics Letters, 2015, 22(13): 1030- 1036.
8. Ron D, Shamir A. Quantitative analysis of the MI bitcoin transaction graph[C]//International Conference on Financial Cryptography and Data Security. Springer, Berlin, Heidelberg, 2013: 6-24.
9. Yermack D. Is Bitcoin a real currency An economic appraisal [M]//Handbook of digital currency. 2015: 31-43.
10. Reid F, Harrigan M. An analysis of anonymity in the bitcoin system [M]//Security and privacy in social networks. Springer, New York, NY, 2013: 197-223.
11. RaeC,ThorwirthNJ.SystemsandMethodsforDecentralizingCommerceandRightsManagementforDigitalAssetsUsing aBlockchain Rights Ledger: U.S. Patent Application 15/336,778[P].2017-4-27.
12. Mizrahi A. A blockchain-based property ownership recording system [J]. A Blockchain-based Property Ownership Recording System, 2015. International Conference on. IEEE, 2017: 464-467.
13. vTianF.Anagri-foodsupplychaintraceabilitysystemforChinabasedonRFID&blockchaintechnology[C]//ServiceSystemsandService Management (ICSSSM), 2016 13th International Conference on. IEEE, 2016:1-6.
14. KshetriN.Canblockchainstrengthen theinternet ofthings[I].ITProfessional,2017,19(4):68-72.
15. SamaniegoM,DetersR.HostingvirtualIoTresourcesonedge-hostswithblockchain[C]//ComputerandInformationTechnology(CIT), 2016 IEEE International Conference on. IEEE, 2016:116-119.
16. BahgaA,MadisettiVK.Blockchainplatformforindustrialinternetofthings

[J].JournalofSoftwareEngineeringandApplications,2016, 9(10): 533.
17. DorriA,KanhereSS,JurdakR.Blockchaininginternetofthings:challengesandsolutions [I].arXivpreprintarXiv:1608.05187,2016.
18. LazarovichA.InvisibleInk:blockchainfordataprivacy [D].MassachusettsInstituteofTechnology,2015.
19. Yue X, Wang H, Jin D, et al. Healthcare data gateways: found healthcare intelligence on blockchain with novel privacy riskcontrol[I].Journal of medical systems, 2016, 40(10): 218.
20. HuhS,ChoS,KimS.ManagingIoTdevicesusingblockchainplatform[C]//AdvancedCommunicationTechnology(ICACT),2017l9th
21. Zyskind G, Nathan O. Decentralizing privacy: Using blockchain to protect personal data[C]//Security and Privacy Workshops (SPW), 2015 IEEE. IEEE, 2015:180-184.
22. KangI,YuR,HuangX,etal.Enablinglocalizedpeer-to-peerelectricitytradingamongplug-inhybridelectricvehiclesusingconsortium b1ockchains[J]. IEEE Transactions on Industrial Informatics, 2017, 13(6):3154-3164.
23. Yuan Y, Wang F Y. Towards blockchain-based intelligent tmnsportation systems[C]//Intelligent Transportation Systems (ITSC), 2016 IEEE 19th International Conference on. IEEE, 2016:2663-2668.
24. SunJ,YanJ,ZhangKZK.Blockchain-basedsharingservices:Whatblockchaintechnologycancontributetosmartcities [I].Financial Innovation, 2016, 2(1):26.
25. EbrahimiA.Identitymanagementserviceusingblockchainprovidingcertifyingtransactionsbetweendevices:U.S.Patent 9,722,790[P].2017-8-1.
26. Xiong Z, Feng S, Niyato D, et a1. Edge computing resource management and pricing for mobile blockchain [I]. arXivpreprint arXiv:1710.01567,2017.
27. Hou H. The application of blockchain technology in E-government in China[C]//Computer Communication and Networks (ICCCN), 2017 26th International Conference on. IEEE, 2017:1-4.
28. DorriA,StegerM,KarihereSS,eta1.Blockchain:Adistributedsolutiontoautomotivesecurityandprivacy [J].IEEECommunications Magazine, 2017, 55(12):119-125.
29. Jacobovitz 0. Blockchain for identity management [I]. The Lynne and William Frankel Center for Computer Science Department of Computer Science. Ben-Gurion University, Beer Sheva Google Scholar, 2016.
30. EbrahimiA.Identitymanagementserviceusingablockchainprovidingcertifyingtransactionsbetweendevices:U.S.Patent 9,722,790[P].2017-8-1.
31. Wan M. Blockchain thinking: The brain as a dac (decentralized autonomous organization)[C]//Texas Bitcoin Conference. Chicago, 2015: 27-29.
32. Zhang, Zhong. Research on Personal Privacy Protection Mechanism Based on Blockchain, Taking Internet Car Rental as Application Scene [J]. Computer Application, 2017:0-0.
33. A1imo1uA,zturanC.DesignofaSmartContractBasedAutonomousOrganization forSustainableSoftware[C]//e-Science(e-Science),2017 IEEE l3th International Conference on. IEEE, 2017:471-476.
34. Vuko1iM.Thequestforscalableblockchainfabric:Proof-of-workvs.BFTreplication[C]//InternationalWorkshoponOpenProblemsin Network Security. Springer, Cham, 2015:112-125.
35. [35] DeshpandeA,StewartK,LepetitL,etal.DistributedLedgerTechnologies/Blockchain [J].2017.
36. MurphyS,CooperC.CanSmartContractsBeLegallyBindingContracts [I].2016.
37. MingxiaoD,XiaofengM,ZheZ,eta1.Areviewonconsensusalgorithmofblockchain[C]//Systems,Man,andCybemetics(SMC),2017 IEEE International Conference on. IEEE, 2017:2567-2572.
38. Lin I C, Liao T C. A Survey of Blockchain Security Issues and Challenges [I]. IJ Network Security, 2017, 19(5): 653-659.
39. Ramachandran A, Kantarcioglu D. Using Blockchain and smart contracts for secure data provenance management [I]. arXiv preprint arXiv:1709.10000,2017.
40. KarameG.Onthesecurityandscalabilityofbitcoin'sblockchain[C]//Proceedingsofthe2016ACMSIGSACConferenceon Computerand Communications Security. ACM, 2016:1861-1862.
41. Chavez I I G, da Silva Rodrigues C K. Automatic hopping among pools and distributed applications in the bitcoin network[C]//Signal Processing, Images and Artificial Vision (STSIVA), 2016 XXI Symposium on. IEEE, 2016:1-7.
42. ParkIH,ParkJH.Blockchainsecurityincloudcomputing: Usecases,challenges,andsolutions [J].Symmetry,2017,9(8):164.
43. Jiang,Wei.Discussionontheapplicationprogressandvalueofblockchain[I]. GansuFinance, 2016,(02):19-21.
44. MettlerM.Blockchaintechnologyinhealthcare:Therevolutionstartshere[C]//e-HealthNetworking,ApplicationsandServices(Healthcom), 2016 IEEE 18th International Conference on. IEEE, 2016:1-3.
45. WeberI,XuX,RiveretR,eta1.Untrustedbusinessprocessmonitoringandexecutionusingblockchain[C]//InternationalConferenceon Business Process Management. Springer, Cham, 2016:329-347.
46. Feng.DiscussiononTechnicalMeasuresandCopyrightProtection[J].Journaloflaw,2007,28(4):20-23.

47. Wang.ABriefDiscussionontheDesignof"OrphanWorks"System[I].Chinesecopyright,2013(1):30-33.
48. Hua.Theapplicationofblockchaintechnologyandsmartcontractsinintellectualpropertyrightsandtransactionsanditslegalregulation[I].Intellectualproperty, 2018(02):13-19.
49. Liu, Ge, Dong. Discussion on the Application of Blockchain Technology in Book Copyright Protection and Transaction [I]. Technology and publishing.2017(06)
50. Meng, Wu. The technical way of network copyright trading from the perspective of blockchain [J]. Publishing science, 2017, 25(06):25-31.
51. Han,Gu,Jia.AnIntellectualPropertyCrowdfundingModelBasedonBitcoinBlockchain[J].TsinghuaFinancialReview,2014(6):98-101.
52. Liu.TheProblemofNetworkLiteratureCopyrightProtectioninChina[J].Chinesepublishing,2016(15):14-16.
53. CASTRO M, LISKOV B. Practical Byzantine Fault Tolerance [EB/OL]. http://dtswebl.i-t.vanderbi1t.edu/Wowdy1w//courses/cs381/castro.pdf,2017-4-15.
54. Han,Liu.ResearchonConsensusMechanisminBlockchainTechnology[J].Informationnetworksecurity,2017(09):147-152.
55. Block. Global power distribution. [EB/OL]. http://www.qukuai.com/pools,2017-6-25.
56. Wang,Song,Ke.Blockchain indigitalcurrencyanditsprivacyprotectionmechanism[J].,&@AR,2017(7):32-39.
57. LarimerD.Delegatedproof-of-stakewhitepaper [EB/OL].http://www.bts.hk/dposbaipi-shu.html,2014.
58. Jiang,Wen,Jia.Vernacularblockchain.MechanicalIndustry Press,Beijing,2017
59. https://www.cliffordchance.com/news/news/2018/01/digitale-transformation--clifford-chance-buendelt-globale-tech-e.html