

# BLOCKCHAIN, SMART CONTRACTS AND COPYRIGHT MANAGEMENT DISRUPTION



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**B**LOCKCHAIN IS THE LATEST IN THE SERIES OF DIGITAL TECHNOLOGIES THAT, DUE TO THEIR DECENTRALIZED, HORIZONTAL, DISTRIBUTED AND OPEN SOURCE NATURE, ARE EXPECTED TO CAUSE FUNDAMENTAL AND LARGE-SCALE CHANGES IN HOW OUR CURRENT SOCIAL, ECONOMIC, POLITICAL RELATIONS AND INSTITUTIONS ARE ORGANIZED [1]. SLIGHTLY MORE THAN 20 YEARS AFTER THE DECLARATION OF THE INDEPENDENCE OF CYBERSPACE AND THE CRYPTO ANARCHIST MANIFESTO, MANY NOW BELIEVE BLOCKCHAIN WILL EMPOWER AN OPEN, DISINTERMEDIATED, DECENTRALIZED, TRUSTLESS, SMART, AND CRYPTOGRAPHIC MODE OF SOCIAL ORGANIZATION.

The copyright domain can be tokenized in various ways, tokens representing works, ownership metadata, licensing terms and remuneration. With these characteristics, Distributed Ledged Technologies (DLTs) appear to provide a decentralized platform to build and maintain registries of works. Relying on the registries of such tokenized elements, smart contracts come in handy for the automation and standardization of a multitude of copyright-related transactions, for instance those authorizing the use and exploitation of copyright-protected content, and remuneration. Although, copyright registration is not an effective requirement of form, the copyright registration certificate is a significant advantage for the right holder as it can be used as *prima facie* evidence in court. Due to its decentrali-

zed nature, the blockchain could help legal agencies cope with a predicted surge in copyright registration requirements. If a user were to log into the copyright registration website using the blockchain technology, the user could register at any time and in any place, enabling a more efficient registration process than the copyright registration agency can provide [3]. The registration information is recorded on the chain with an immutable timestamp, which forms a powerful proof of rights.

This article examines the relationship of blockchain technology with copyright, using international copyright law as a frame of reference for the analysis.

## I. Overview on blockchain technology and copyright

One way to explain blockchain in its simplest form is that it is a decentralized technology for exchanging transactions. In reality, there is no such thing as *'the Blockchain'*. Instead, there is a range of different DLTs, which share some fundamental principles, but vary *inter alia* in their design, purpose and affordances. For the purpose of this overview we focus on some of the common characteristics relevant to the copyright domain: distributed ledgers; tokenization and digital scarcity; smart contracts and decentralization. We explain each one in

turn below, as well as the relevance of design choices in the characterization of blockchains.

### A. Distributed ledgers

In its simplest description, a blockchain is a distributed ledger, digital and immutable, which records transactions as they occur. In an ideal blockchain system, the ledger is instantly replicated in a large number of decentralized, but identical databases. Anyone who has access to the ledger has access to the same full transaction history and the ability to verify the validity of all records. Sophisticated consensus mechanisms ensure that new entries can only be added to this distributed database if they are consistent with earlier records [1]. Any kinds of data could be recorded on such a distributed database; by saving an arbitrary piece of information on blockchain, it becomes part of the permanent record. Ledgers can also be used to keep track of tokens belonging to specific accounts (or 'wallets') and the time-stamped transactions of tokens between accounts. In that case, DLTs can ensure that the transactions are consistent over time, and tokens are not spent twice. Depending on the actual technological design, the platform allows that the account holder can be an individual, a legal entity, a smart contract (software code), or any group or combination thereof [6]. As such, virtually anything can represent a token: a unit of virtual currency, an asset, a physical object in the world, or any other abstract entity.

Various DLT configurations are currently being explored in the copyright domain. For example: if tokens represent rights, and wallet holders represent rights holders, DLTs may host public copyright registries, which record (in a transparent manner) the ownership, distribution, use and remuneration of works [2]. Another example would be a private distributed database set up by Collective Management Organizations (CMOs) to facilitate the inter-organizational identification of works and payment of royalties.

### B. Decentralization and disintermediation

One of the most important claims in this field is that blockchains are 'trustless', in the sense that the term is used to describe an environment in which there is no need to route transactions through central trusted third parties for 'untrusting' entities to

be able to engage with each other [4]. The rules embedded in the design of the technology are meant to ensure that interacting actors remain honest, at least vis-à-vis on-chain transactions.

In the copyright domain, disintermediation would affect incumbents at every level:

- (i) publishers and music labels,
- (ii) CMOs, and
- (iii) online platforms, including those that host user-uploaded content.

Some hope that blockchain applications would be able to remove all middlemen between artist and audience, and thus enable a direct relationship where artists can directly authorize uses, distribute their works and collect remuneration.

### C. Smart contracts

Nick Szabo first introduced the concept of smart contracts in 1997. Szabo stated that: *many kinds of contractual clauses (such as collateral, bonding, delineation of property rights, etc.) can be embedded in the hardware and software we deal with, in such a way as to make breach of contract expensive (if desired, sometimes prohibitively so) for the breacher* [7].

Smart contracts are described as algorithmic account holders on the blockchain. Mainly, they represent pieces of code that generate transactions if the conditions encoded in them are met. In most cases, smart contracts encode 'if-then' conditions, such as: if a user pays X amount of cryptocurrency to the smart contract account then the contract grants them access to a digital copy of a work. In a similar vein, a smart contract may help the distribution of revenues: if a copyright work generated Y amount of remuneration in its corresponding account, the smart contract can distribute the revenue amongst rights holders according to the RMI token Z.

A blockchain-based smart contract can be set up to allow users to download content when payment is completed. For instance, on the Ethereum-powered music platform 'VOISE', artists upload their music and can set their own prices. A user pays them directly for the music via electronic currency, which then allows them to instantaneously download it [5].

Since blockchain is near-immutable, smart contracts implemented through this technology can help overcome other shortcomings. Firstly, they

do not rely on any third parties, such as banks, and therefore reduce transaction costs and improve transaction efficiency. Secondly, the data cannot be deleted and can only be added, making it traceable. Thirdly, blockchain creates a distributed ledger: every device connected to the network has access to a shared and synchronized copy. This means that the data, in theory, will never be lost.

Furthermore, digital publications are generally extremely easy to copy, disseminate and pirate on a large scale, causing potential revenue loss [1]. Monitoring of smart contracts using blockchain can assist in overcoming such a problem by allowing the author to save the work on the blockchain and assigning a timestamp to the work. This type of smart contract can automatically search for pirated content online, triggering copyright protection mechanisms once pirated content is found.

Yet, there remain substantial unresolved issues limiting the applicability of smart contracts. Among others, legal systems lack a consensus on how code as contract fits into the traditional concepts of contract law [9]. Open questions include: the identification of the pseudonymous parties that are typical for blockchain-based smart contracts; remedial measures for the breach of smart contracts; and how to address and resolve jurisdictional conflicts – a crucial question for a markedly territorial right, like copyright. More broadly, it is unclear how dispute resolution takes place.

#### **D. Tokenization and digital scarcity**

DLTs record the ownership and transactions of digital tokens, in the case of copyrighted works these would be 'copyright tokens' [4]. By using a cryptographic signature, virtually any kind of information may be expressed as a token. Any such token can be 'stored' on a blockchain or a DLT.

Copyright tokens can vary in nature. They can represent a copy of a protected work, or a record of rights management information (RMI) for protected content. They might encode a subset of information mentioned under the definition of RMI, namely the terms of use of the protected content, or they could represent remuneration for use of a work, which can be encoded in so-called cryptocurrencies or fiat currency equivalents, constituting the counter-performance for a transaction on the corresponding (copy of a) work.

#### **E. Blockchain architecture**

Blockchains can be open, like an open marketplace where anyone can come and trade, or closed, like invitation-only trading rooms. Between the two extremes are a number of applications that differ on the extent of openness.

For example, a public blockchain copyright registry needs to be accessible and open on most if not all of its possible dimensions to enable any creator to register their ownership and to fulfil its informative function vis-à-vis third parties (other rights holders, the public, and administrative or judicial bodies) [2]. That is to say, such registry would have to rely on an open permissionless blockchain, running on open source software developed and managed by a diverse group of developers and other stakeholders. If the history of peer-to-peer file sharing is prologue for blockchain, it will be challenging for copyright law to adjust its rules to open and decentralized systems. On the other extreme, for example, the cross-border accounting of royalties among national CMOs could be implemented on a closed model. The transparency of transactions may be a good reason to make a blockchain readable for anyone. However, transaction verification, token generation and the writing of data on a blockchain is probably best left closed. Such an arrangement is unlikely to lead to decentralization and disintermediation *per se* and may even result in the entrenchment of the status quo, especially as the legality of such an arrangement appears unproblematic. In other words, blockchain technology in and by itself does not necessarily entail decentralization, disintermediation, or the removal of trusted intermediaries. In some fields, complete disintermediation may not be practical, possible or even desirable [5]. This is illustrated in the field of online music, where many blockchain platforms promise disintermediation of the relationship between artist and audience. In reality, however, wither the platform in question is assuming the role of intermediary or lacks the necessary resources to make good on its promise. This is because current intermediaries control critical assets for disintermediation, such as the type of comprehensive RMI datasets for musical works and sound recordings held by CMOs. In a weak blockchain future scenario, where applications of this technology play only a marginal role

in the wider copyright ecosystem, solutions relying on it may emerge to enable new intermediaries that serve niche markets, as is already the case for instance in some segments of the Dutch Electronic Dance Music licensing market. In a scenario where blockchain eventually manages to significantly penetrate mainstream copyright licensing markets, a likely outcome is an active competition/cooperation between new and old middlemen [1].

## II. Smart copyright disruption

The explosive development of blockchain technology and the surrounding hype have led to the emergence of a number of blockchain applications that have the potential to disrupt the domain of copyright, mainly the online music sector.

This article has identified four copyright domains where the implementation of blockchain technology is both promising and challenging, giving rise to a host of complex (and often interconnected) legal issues, among which the potential overreach of smart contracts and right fragmentation, copyright registries, the articulation with the legal regime of digital rights management (DRM), and fair remuneration. As such, this article aims to map out the copyright/blockchain intersection in these domains and pinpoint some of its normative implications.

### A. Rights fragmentation

Can the blockchain be used as a licensing tool for 'international' copyright rights? Although it is not inaccurate to speak of international copyright law, as contained for example in international treaties, there is no such thing as an international copyright right. The treaties recognize the protection of copyright in multiple jurisdictions, but based on the law of each jurisdiction. Under the Berne Convention, an author thus gets 179 different national bundles of copyright rights [8], if one counts the author's own country. Each of those rights can be fragmented. For example, the author of a literary work may license or transfer to a third party only the right to translate the work in a specific different language or market. In other words, each right in the copyright bundle can be owned and exploited separately, as far as the Berne Convention goes, 179 times [8].

Moreover, each country is free to choose which form of exhaustion rule it will apply, as this matter is yet to be settled at international level. There are

three main types of exhaustion: national, regional and international [3]. Under a national exhaustion regime, a copy of a work may only be sold with the consent of the copyright holder in that territory. National exhaustion means that parallel importing is not permitted because the rights of the copyright holders are treated as having a wholly independent existence in each national market. A variation on this theme is regional exhaustion, a regime under which a copy put on the market legally in a region can be exploited in the entire region. This is the case within the EU for example, at least with respect to sales of physical copies of copyright works. The other 'extreme' is international exhaustion, a regime under which a copy put on the market legally anywhere in the world can be sold in a country, such as the US, that opts for this regime. There are a number of grey areas that need to be belaboured here.

The owner of a title to a right may transfer the title, but they may decide only to permit its use by a third party under a license. A license may be exclusive or nonexclusive. The transfer of a copyright title often requires a written instrument [1]. Whether courts interpret smart contracts (or laws are amended to that effect) as constituting a 'written instrument' is a matter we do not cover here, as this will impact many other types of transaction that require written form. Still, to the extent the consequence attached to a blockchain based transaction is technologically enabled or determined, it will occur *de facto*, even if the desired or corresponding legal effects of the transaction do not occur *de jure*. That is to say: the person giving a token representing a copyright claim away may intend to transfer ownership of the work, but the applicable law may impose requirements for the transfer to be valid or effective that are not met by the token transaction.

### B. Copyright management via smart contract licensing

Smart contracts pose interesting challenges to the classic copyright management scheme, especially in terms of licensing agreements. Once a creation or work that is subject to copyright is created, a bundle of IP rights is automatically created as well, and these rights can be owned by different legal identities. After the creation (and throughout the years of existence) of these rights, the difficulty of identifying their rightful owners and the calculation

of the different amounts of payments due to each right holder when the work is used constitutes a serious challenge for the right holders and the licensees of the copyrighted work.

The relevant records today are held by either governmental bodies, private companies or right holder organizations. However, these databases are mostly not interoperable and are not always public either. The cost of maintaining a public and interoperable database can exceed the available resources of some of these organizations as well. The security of these records is also in question and the IP rights are mostly managed by outside parties [7]. As a result, the management of these rights is costly, complicated and time-consuming.

This is where blockchain comes in handy, by offering the option of migrating registries in blockchain, where the rights related to the copyrighted work would constitute a block in the chain. This would not only be cheaper and easier to deploy, but also the IP rights would be managed by their owners themselves rather than by outside parties. Moreover, right holders would also be able to generate smart contracts that would be used in possible future transactions concerning the copyrighted work. By having such contracts running on a blockchain, the processing of such transactions would be much simpler and right owners would be able to increase their earnings considerably, as transaction costs would be substantially reduced.

As an example, consider someone using an online video platform such as Vimeo who might want to use a copyrighted song or a scene from a movie in their own video creation. Now, either they would be prevented from using someone else's copyrighted work by the platform or they would be given notice to take the video down when it is detected by the right owner. However, a blockchain system that included a smart contract in one of its blocks would enable Vimeo or the right holder to ask the Vimeo content creator whether they would like to sign the smart contract and be able legally to use the song/movie scene in their work. In such a scenario, the content creator would be able to use the copyrighted work in a matter of seconds and Vimeo (or any other online platform) and the right holder(s) would both receive compensation for their parts as well. Vimeo would be paid for its services as the

online platform enabling this transaction, and the right holder(s) would be paid for the use of their original, copyrighted work [3].

Although using blockchain technology for copyright licensing requires a massive amount of coordination both on-chain and between on- and off-chain transactions. While coordination of strictly on-chain uses and users can be to an extent automated via smart contracts, we argue that conflict resolution may require off-chain institutions.

To empower the development of blockchain-based smart contracts, the simplest solution would be that authors retain all their copyright rights. Each author could then allow some uses under exclusive licenses if and when appropriate, and then use blockchain technology to license mass uses on a non-exclusive basis. The smart contracts authorizing their use would be prima facie valid in each and every territory [2].

That does not prevent all potential conflicts, however. A non-exclusive licensee's right to use might conflict with the rights of an exclusive licensee in a given territory, even if both were done through a blockchain. This may then become a matter of contract rather than copyright law (and possible infringement) between the author and the exclusive licensee. Few, if any, courts would be likely to find the non-exclusive license liable in such a scenario and if they did, sanctions would probably be minimal.

Conflicts could emerge between smart contracts and 'normal' or traditional licenses. A desynchronization of a blockchain can happen if off-chain transactions are not properly recorded on a digital ledger. Hence, rather than reducing information uncertainty and increasing trust, the introduction of a blockchain-based system may have the opposite effect. Does this require yet another layer of coordination? Not necessarily. Conflicts can be avoided either by foregoing entirely non-blockchain licenses or, more realistically, by ensuring that the same coordinating entity has responsibility for both [9]. Even assuming automated coordination will one day be possible for uses licensed through smart contracts, a possibility yet to be demonstrated on any credible scale, avoiding this type of conflict with non-blockchain licenses cannot be achieved by automated means. It will require human coordination.

dination and access to all pertinent information. Ensuring that rights are pooled may make this task easier.

### C. 'Smart' IP rights and registries

The potential to use blockchain technology for the management of IP rights is vast. Recording IP rights in a distributed ledger rather than a traditional database could effectively turn them into 'smart IP rights'. Related is the idea of IP offices using distributed ledger technology to create 'smart IP registries' in the form of a centralized solution run by the IP office as an accountable authority, which would create an immutable record of events in the life of a registered IP right [2]. It would also resolve the practicalities of collating, storing and providing the evidence. The ability to track the entire life cycle of a right has multiple benefits, including smoother IP right audits and simplified due diligence exercises in the context of IP transactions. Confidentiality concerns on the side of the IP owners could be addressed by an opt-in scheme.

By 'copyright registries' we mean the range of DLT applications that create a registration of information regarding works. As noted above, such information can refer to a protected work (e.g. initial ownership, moment of creation/expression), RMI, terms of use (e.g. orphan status of a work) or any other related element.

Registries can be voluntary or mandatory. A real-world attempt at creating a voluntary registry is the joint project between groups of different CMOs: Société des auteurs, compositeurs et éditeurs de musique (SACEM), American Society of Composers, Authors and Publishers (ASCAP) and PRS for music. This project aims to develop a proof of concept on the use of blockchain to improve data accuracy for rights holders. The objective is to create a prototype for a shared system that manages authoritative music copyright information. The system would consist of a decentralized database of metadata on musical works 'with real-time update and tracking capabilities' [2]. It would manage the links between two existing music recordings standard codes. The idea of a reliable central database on music ownership and use has long been a purported goal of the music industry, one with which it has failed to achieve.

DLT based registries can also be passive or active. In passive form DLTs are used to record RMI

information as a time-stamped entry into a public ledger that anyone can consult. Given that such information is only useful if it is authoritative, RMI is most likely to be maintained by trusted intermediaries. In such a scenario DLT is one, but certainly not the only, or even the most effective way to publish and maintain an authoritative public record of RMI. In the active DLT based registry scenario rights are tokenized, rights holders are account holders, so DLTs not just record, but facilitate the transactions of rights [1].

Assuming applications of this type are scalable and reach a critical mass, one could envision a world where the exploitation of works (at least of a certain type, such as sound recordings) in the digital realm is dependent on registration in a digital ledger. Copyright works within this blockchain-based system could be easily licensed, their use tracked (and the corresponding remuneration paid), and of course enforced if that function can be performed by the accompanying smart contract. While not imposed by law, registration on such a ledger would become de facto an essential prerequisite to exploitation. The main legal issue that arises in this context is whether such a registry would constitute a prohibited formality under international law.

### D. Rights management information

The World Intellectual Property Organization (WIPO) Treaties impose obligations to provide adequate legal protection and effective legal remedies against:

(i) the circumvention of effective TPMs used by authors, performers or phonogram producers in connection with the exercise of their rights and that restrict acts not authorized by rights holders or permitted by law; and

(ii) the removal or alteration of RMI, as well as a number of unauthorized uses of works, phonograms or performances with knowledge that RMI on them has been removed or altered.

Blockchain-based systems make it easier for various players to cooperate [4]. This is the case, for example, of numerous stakeholders in the music industry that may each own a 'piece' of music, including songwriters, performers, publishers and record companies. As a matter of political economy, ownership or at least control of the data is often perceived as a source of power, an aspect that disin-

centives the ‘sharing’ of data openly. Absent the cooperation of major RMI holders, a database of such information could be built through crowdsourcing.

One major problem in that regard is the possibility of conflicting claims on the same work. Blockchain technology may be excellent at safeguarding the validity and provenance of information already in the distributed ledger but cannot in any meaningful sense check the validity of the information when it is first put into the system. Any blockchain-based solution must ensure that only truthful, valid, verified information gets into the ledger, and that there are appropriate dispute-settlement instruments to handle conflicting claims. Blockchain-based transparency may diminish the need to have a third party determine ownership, but it does not eliminate the need for other functions provided by such third parties [5]. That said, a shift is likely to occur once (and if) a significant amount of data is entrusted to one or several blockchains. As this pool of open data grows, proprietary control of rights data becomes proportionally less attractive and the incentive to cooperate increases.

#### **E. Remuneration considerations**

In the context of ensuring creator remuneration, blockchain technology can play three types of role. Firstly, it can enable payments similar to those already taking place through existing platforms. Secondly, it may open up uses currently licensed through statutory or compulsory licenses and collective rights management schemes to smart contract licensing. Thirdly, blockchains may provide greater transparency, especially from the perspective of authors and performers.

#### **Conclusion**

The largescale adoption of blockchain technology faces a number of obstacles: technical hurdles, such as scalability and interoperability standards and protocols; legal hurdles, such as questions of governing laws and jurisdictions; enforceability of smart rights, data security and privacy concerns and resistance. On the other hand, blockchain technology is slowly but surely becoming mainstream: various governmental agencies and IP offices are actively looking into the capabilities of blockchain; the EU Commission has launched the blockchain observatory, and the US Congress created a Con-

gressional Blockchain Caucus. In the UK, the Ministry of Justice is piloting a blockchain-based project to secure digital evidence.

The ultimate aim of the intellectual property law is to foster innovation and creativity, through providing protection for intellectual property. The motivation to create something useful or beautiful lies within the lines of the law, giving individuals certain rights to benefit from their creation while allowing them to provide the humanity with something new or better. The underlying question of this paper is whether blockchain technology can contribute to that target and if yes, how such contribution should be made.

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#### ABSTRACT

**Blockchain, smart contracts and copyright management disruption.** The article examines the differences between new, blockchain and smart contract-based private ordering regime and the fundamental components of copyright law, such as

exceptions and limitations, the doctrine of exhaustion, restrictions on formalities, the public domain and fair remuneration.

**Keywords:** *copyright; blockchain; intellectual property rights management; smart contracts.*

#### REZUMAT

**Blockchain, contractele smart și perturbarea managementului dreptului de autor.** Acest articol analizează diferențele între regimul nou, bazat pe blockchain și contracte smart și componentele fundamentale ale dreptului de autor, cum sunt excepțiile și limitările, doctrina epuizării drepturilor, restricții la formalități, domeniul public și remunerația echitabilă.

**Cuvinte-cheie:** *drept de autor; blockchain, managementul drepturilor de proprietate intelectuală; contracte smart.*