Alexander Savelyev

COPYRIGHT IN THE BLOCKCHAIN ERA: PROMISES AND CHALLENGES

Alexander Savelyev[1]

COPYRIGHT IN THE BLOCKCHAIN ERA: PROMISES AND CHALLENGES

The paper focuses on various legal-related aspects of the application of blockchain technologies in the copyright sphere. Specifically, it outlines the existing challenges for distribution of copyrighted works in the digital environment, how they can be solved with blockchain, and what associated issues need to be addressed in this regard. It is argued that blockchain can introduce long–awaited transparency in matters of copyright ownership chain; substantially mitigate risks of online piracy by enabling control over digital copy and creating a civilized market for "used" digital content. It also allows to combine the simplicity of application of creative commons/open source type of licenses with revenue streams, and thus facilitate fair compensation of authors by means of cryptocurrency payments and Smart contracts. However, these benefits do not come without a price: many new issues will need to be resolved to enable the potential of blockchain technologies. Among them are: where to store copyrighted content (on blockchain or "off-chain") and the associated need to adjust the legal status of online intermediaries; how to find a right balance between immutable nature of blockchain records and the necessity to adjust them due to the very nature of copyright law, which assigns ownership based on a set of informal facts, not visible to the public. Blockchain as a kind of time stamping service cannot itself ensure the trustworthiness of facts, which originate "off-chain". Much work needs to be done on the legal side: special provisions aimed at facilitating user's trust in blockchain records and their good faith usage of copyrighted works based on them need to be introduced and transactions with cryptocurrencies have to be legalized as well as the status of Smart contracts and their legal consequences. Finally, the economics of blockchain copyright management systems need to be carefully considered in order to ensure that they will have necessary network effects. If those issues are resolved in a satisfactory way, blockchain has the potential to rewrite how the copyright industry functions and digital content is distributed.

 Keywords: copyright, blockchain, smart contracts, cryptocurrency, digital content

JEL Classification: Z

---

[1]Alexander Savelyev PhD, senior researcher of International Laboratory on IP and IT law Higher School of Economics, senior legal attorney of IBM East Europe/Asia Ltd. Russia, 123112, Moscow, Presnenskaya emb., 10, Russia. Email address: garantus@rambler.ru.

The views expressed are the personal views of the author and are not intended to reflect either the opinion of IBM, HSE or any other organization on relevant matters.

International laboratory on IP and IT law, Higher School of Economics. Moscow, Russia

1. Introduction

We become more and more immersed in the so-called networked information economy. It is displacing the industrial information economy that typified information production from about the second half of the nineteenth century and throughout the twentieth century. What characterizes the networked information economy is that decentralized individual action—specifically, new and important cooperative and coordinate action carried out through radically distributed, nonmarket mechanisms —plays a much greater role than it did or could have, in the industrial information economy[2].

One of the most promising technologies of the new economy is distributed ledger technology also known as "blockchain". The World Economic Forum estimates that more than 25 countries are investing in blockchain technology, filing more than 2,500 patents and investing \$1.3 billion[3].Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, provides the following definition of this technology: *"[i]n essence, the blockchain is a shared, programmable, cryptographically secure and therefore trusted ledger which no single user controls and which can be inspected by anyone."[4]*

Blockchain technology has been frequently analogized to the TCP/IP protocol, on which the Internet is based. Both of them enable application of a new layer of services on the top. Similar to how the Internet fundamentally changed the way we share information, blockchain is an open source-based innovation that promises to revolutionize the way how transactions between individuals, businesses, and even machines are performed. Some experts even argue that *"blockchain concept is even more: it is a new organizing paradigm for discovery, valuation, and transfer of all quanta (discrete units) of anything and potentially for the coordination of all human activity at a much larger scale than has been possible before"[5]*.

Blockchain is a type of distributed ledger in which value-exchange transactions are sequentially grouped into blocks. Each block is chained to the previous one and immutably recorded across a peer-to-peer network, using cryptographic trust and assurance mechanisms. It maintains a coherent state, as agreed upon by all participants, without requiring trust or a central authority.

Blockchain provides new paradigm for data storage security, based on the principle of decentralization. Its main features are:

• *Transparency*: all the data on blockchain is public, it cannot be arbitrarily tempered with and easily auditable.

• *Redundancy*: every user of the blockchain solution holds a copy of the data, thus it cannot be easily taken offline due to a system malfunction or malicious actions of third parties.

• *Immutability*: changing records in blockchain is prohibitively difficult and requires consensus provided in accordance with the protocol (e.g., by the majority of blockchain users). Thus, integrity of records is ensured by intrinsic properties of the underlying code rather than from the identities of system operators.

[2]Benkler Yochai, *The Wealth of Networks*. Yale University Press. 2006. P. 3.
[3] *Disruptive innovation in financial services: A Blueprint for Digital Identity*. World Economic Forum. (Aug. 12, 2016). URL: http://www3.weforum.org/docs/WEFA_BlueprintforDigitalIdentity.pdf.
[4] Klaus Schwab, *The Fourth Industrial Revolution*. NY. 2016. P. 19.
[5] Melanie Swan, *Blockchain: Blueprint for a New Economy*. O'Reilly. 2015. Preface.

- *Disintermediation*: the removal of middlemen such as banks or collective societies from transactions decreases transaction costs and risks associated with presence of such intermediaries. It does not mean, however, that a new kind of intermediaries will not be created as a result of deeper implementation of blockchain technologies in the social fabric.

Currently the best-known example of successful implementation of blockchain-based distributed ledger technology is Bitcoin. Some other cryptocurrencies, such as Ether or Litecoin are trying to replicate its success. But its potential far exceeds the sphere of payments. Among the most promising spheres of its application are managing ownership rights over various assets and automatization of contractual relationships via self-enforcing "Smart contracts"[6].

Before turning to more specific issues related to application of blockchain to copyright, it is necessary to outline the important distinction of blockchain-based solutions on public/permission less and private/permissioned blockchains.

Public blockchains grant read access and ability to create transactions to all blockchain users. Users can transfer value without the expressed consent of the blockchain platform operator. The core property of these blockchains is censorship resistance, i.e., any valid transaction broadcast over a permissionless blockchain network would be included into the blockchain. Such blockchains are by their nature free for entry or exit both for users and application developers. The most prominent example of public blockchain is Bitcoin – everyone is free to create a wallet, perform transactions with bitcoin units or become a miner (a nod, performing transaction verification functions for a fee in the form of newly created bitcoin units) by installing and using special publicly available software on its infrastructure.

Private blockchains limit access to the predefined list of known persons. Such persons should receive approval from a blockchain operator, thus the use of blockchain is restricted by end users and application developers. Such blockchains to a certain extent contradict to decentralized nature of blockchain technology itself, but still resemble certain advantages of this technology: transparency and resilience to attacks[7].

Among existing permissionless blockchain networks that could be used as a basis for overlay asset protocols, Bitcoin is considered to be more secure than existing alternatives in terms of attack costs[8]. But management of such blockchain is very difficult. Besides, it is hardly compatible with the legal framework. As it will be shown later, only permissioned blockchains can co-exist within the legal framework and augment it instead of competing with it. It can be explained with the matters of sovereignty. The powers of the government can co-exist with Blockchain with its distributed nature where no central authority is presented only if it has the status of "super user", through which the decisions of the courts and administrative authorities can be enforced via modification of the content of Blockchain databases.

2. Core issues of copyright law in digital environment

---

[6] For more details on Smart-contracts see generally: Alexander Savelyev, Contract law 2.0: 'Smart' contracts as the beginning of the end of classic contract law // Information and Communications Technology Law. 2017. Vol. 26. No. 2;

[7] See generally: Tim Swanson, *Permissioned distributed ledgers*. 2015. URL: http://www.ofnumbers.com/wp-content/uploads/2015/04/Permissioned-distributedledgers.pdf

[8] BitFury Group (2015). Proof of stake versus proof of work URL: http://bitfury.com/content/5-white-papers-research/pos-vs-pow-1.0.2.pdf

2.1. Lack of transparency about the legal status of copyrighted works

The lack of transparency and a central database that organizes information about music, photos and other copyrightable objects has created substantial problems when trying to determine the right owner in order to arrange subsequent use of such objects. Information about copyright owners is scattered in various databases of publishers, record companies, collecting societies, and other entities, which do not have incentives to share it. Sometimes it is simply unavailable or its receipt is prohibitively costly both from a timing and financial perspective. All this creates substantial transaction costs for users of such digital content, who sometimes have even to refrain from using certain copyrighted work due to its unclear legal status. Lack of transparency and publicly available conveniently presented information about copyright ownership also impacts authors and other right owners, who do not receive remuneration for usage of their works or have to share such remuneration with intermediaries, such as collective societies, which retain a substantial part of such remuneration.

To a certain extent the above issues are driven by the lack of cost-friendly widely accepted technology. Using different proprietary databases, which are not interoperable with each other is one of the obstacles for data-sharing. Certain commercial considerations are another. This is one of the spheres where blockchain technology may become a game changer and bring standardization and network effects in the sphere of copyright management.

But the core reason for the described lack of transparency lies in the copyright law itself: a very low threshold defining the eligibility for copyright protection leads to circulation of enormous amounts of works formally protected by copyright, especially on the Internet. The absence of any formal certification/approval requirements for copyright ownership leads to its invisibility to third parties. Although this problem is not created by the technology, it is substantially amplified by it. Therefore the right technology with the right implementation can fix it, if not completely, but at least to a certain extent.

2.2. Piracy

Right owners cannot effectively control usage of their works on the Internet. Digital copies of copyrighted works have the unique attributes of loss, less replication and near-zero transmission costs. Digital copies are perfect replicas, each a seed for further perfect copies. There are no more natural barriers to infringement, such as the expense of reproduction and the decreasing quality of successive generations of copies in analog media. The average computer owner today can easily undertake the kind and extent of copying that would have required a significant investment and perhaps criminal intent only a few years ago[9]. There is also no technological limit to the number of people who can access such digital works simultaneously, from literally anywhere on the planet where there is an Internet connection. Besides, modern Internet technologies enable sending information products worldwide, cheaply and almost instantaneously. As a consequence, it

---

[9]See: The Digital Dilemma: Intellectual Property in the Information Age. Washington, National Academy Press, 2000.

is easier and less expensive for individuals or pirates to make and distribute unauthorized copies[10].

Sharing the work on the Internet means losing control over it. If copyright belongs to an individual, he probably will not know about the infringement. Moreover, if he did know about it, it is very burdensome to take effective legal action about it. The resulting status quo can be described *"like having the title and keys to your car, but not knowing where it's parked: in theory you own it, in practice you can't use it in the intended way"[11]*.

Digital Right Management (DRM) tools although can to some extent mitigate piracy issues, still do not provide a perfect solution to it. First of all, DRM adds complexity to digital works distribution together with substantial overhead transaction costs for right owner (distributor). Not every right owner is ready to apply DRM for every work and administer it. Secondly, DRM creates lots of complications for end users: it may discriminate users by regions (e.g. English speaking person cannot easily purchase English language copies of digital content in Germany); DRM may create vulnerabilities in consumer's software. A good example is famous Sony rootkit case, where Sony installed DRM on music CDs, which resulted in slowing down user's computers and opened security holes[12]. Thirdly, since DRM is based on the code: like any code it can be hacked, thus depriving the right owner of all expectations associated with it. It is worth recalling an example with "Content Scramble System" ("CSS"), which together with regional coding is still used to protect DVDs, was broken by a teenaged computer programmer as far back as 1999.

Finally, DRM may prevent some uses of the work that the law would recognize as fair. It is argued that DRM grants to copyright owners the power to unilaterally eliminate the public's fair use rights. For example the movie industry's use of encryption on DVDs has curtailed consumers' ability to make legitimate, personal-use copies of movies they have purchased[13]. Moreover, DRM is claimed to chill scientific research, what the case with prosecution of the Russian programmer Dmitry Sklyarov illustrated[14]. He was charged with trafficking in and offering to the public a software program that could circumvent technological protections on copyrighted material under section 1201(b)(1)(A) of the U.S. Copyright Act.[15] Although the charges against Dmitry Sklyarov were subsequently dropped, the whole situation did not work well for DRM's reputation. Finally, even if DRM does not eliminate fair use, it definitely makes it far less convenient. Therefore, DRM is not a solution to the problem, but sometimes can become a problem in itself. Better solutions are needed, more effective from a technical perspective and friendlier both for users and right owners.

---

[10] Idem

[11] Trent McConaghy and David Holtzman, *Towards An Ownership Layer for the Internet*. Ascribe GmbH. 24 June 2015. P. 10. URL: https://bravenewcoin.com/assets/Whitepapers/ascribe-whitepaper-20150624.pdf

[12] See: Revisiting the Sony Toolkit. Free Software Foundation Europe. URL: https://fsfe.org/activities/drm/sony-rootkit-fiasco.en.html

[13] See: Unintended Consequences: Sixteen Years under the DMCA. Electronic Frontier Foundation. September 2014, URL: https://www.eff.org/files/2014/09/16/unintendedconsequences2014.pdf

[14] Idem

[15] United States v. Elcom Ltd. And Dmitry Sklyarov. U.S. District Court Northern District of California, 28 August, 2001. URL: http://news.findlaw.com/cnn/docs/skylarov/indict82801.pdf

2.3. Difficulties for authors to get compensated fairly

Given the great amount of content available on the Internet and the fact that its authors can be located in various jurisdictions and as a result – subject to various legal formalities relating to payment's processing - it may be very difficult to recover license fees for usage of their works. In most cases to facilitate license fee payment requires the presence of a dedicated agreement signed by both user and right owner, imposing substantial transactions costs on both sides. Traditional creative commons licenses are not suitable for direct commercialization of works, since they are intended to be royalty-free[16]. Open source licenses used for software distribution also feature royalty-free distribution provisions. According to the first criteria of open source, "the license shall not require a royalty or other fee" for selling software[17]. Thus, software open source/creative commons licenses are not tailored to receive license fees. Their main goal is to facilitate sharing of copyrighted works, their subsequent legal use, sharing, repurposing use with relevant attribution and exemption from potential liabilities and warranties. Achieving such goals is not compatible with complexities of formalities necessary to perform payments of license fees in cash or via traditional financial institutions. Consideration in a form of license fee therefore remains the province of proprietary licenses.

The promise of using electronic money as a mean of cheap and convenient micropayment instrument failed due to lack of true global electronic money payment systems, which in turn was driven by diversity of national legislations and various regulatory restrictions including monetary policy, currency control, anti-money laundering and other public law-related legislative provisions. Instead, most Internet business-models are based on user's data processing: personal data became a valuable asset[18] and it is easy to secure the right to process it via standardized agreements like "terms of use". However, the commercial value of an Internet user's personal data materialize only if its amount is substantial and enables the creation of insights to be applied by the processor or otherwise commercialized by him. An author of a copyrighted work does not meet those criteria in most situations. He needs something more tangible and immediate in value together with ease of use and global reach. Without it, it is really difficult for creators of digital content to obtain fair compensation for their work.

Another problem is intermediaries. A common complaint lodged by artists , concerns performance-rights organizations and new intermediaries such as Spotify and YouTube that increasingly insert themselves into the value chain between artists and their audiences. Artists receive smaller cuts of revenue and have less say over how their creative works are priced, shared, or advertised. For example, on Spotify it would take between 120 to 170 streams for rights holders to receive their first penny[19]. Taking into account the bargaining power of such online intermediaries, it is difficult to expect fairer distribution of revenue for the authors if the status quo remains.

---

[16] See, e.g., Section 2 (a) of Creative Commons CC BY 4.0 license: "Subject to the terms and conditions of this Public License, the Licensor hereby grants You a worldwide, **royalty-free**, non-sublicensable, non-exclusive, irrevocable license to exercise the Licensed Rights in the Licensed Material". Similar provisions can be found in other types of Creative Commons licenses.

[17] The Open Source Definition. Open Source Initiative. URL: https://opensource.org/osd

[18] Personal Data: The Emergence of a New Asset Class. World Economic Forum, January 2011.

[19] Ryo Takahashi, *How can creative industries benefit from blockchain?* 18 July 2017. URL: https://www.weforum.org/agenda/2017/07/how-can-creative-industries-benefit-from-blockchain/

Thus, there is a need for new approaches for payments of license fees, which would be fair, easy to use and have potential global reach.

3.   How Blockchain may fix them

3.1.   Transparent information about copyright ownership

Blockchain may substantially increase visibility and availability of information about copyright ownership. Such information can be provided by means of so-called "Trusted Timestamping". A timestamp is a sequence of characters or encoded information identifying when a certain event occurs, usually giving date and time of day, sometimes accurate to a small fraction of a second[20]. Trusted Timestamping[21], understood as the process of securely keeping track of the creation and modification time of a document, is an indispensable tool in the business world. It allows interested parties to know, without any doubt, that the document in question existed at a particular date and time. According to the eIDAS Regulation (Regulation (EU) No. 910/2014) on electronic identification and trust services for electronic transactions in the internal market adopted on 23 July 2014, time stamping is one of the electronic trust services, which are considered to be key enablers for secure cross-border electronic transactions and a central building block of the Digital Single Market.

To some extent blockchain may be viewed as a database of verified public timestamps. It creates the possibility for anyone to state publicly and immutably, that a certain event happened at a certain time. Thus, blockchain can be very useful for defining the presumption of authorship and resolving disputes as to priority in this sphere. This potential of blockchain in the IP sphere is already recognized in specialized literature. As Melanie Swan states, *"people can use the [blockchain] web-based service to hash things such as art or software to prove authorship of the works"[22]*.

Hash function forms the basis of the security and immutability of blockchain. By means of hash function, which is a type of mathematical function which turns original data into a fingerprint of that data called a "hash", an author or other right owner may obtain a unique digest of their copyrighted work. Two digests can be the same only if the initial data is the same: minor differences will lead to a different hash amount. Such hash will distinguish one copyrighted work from another. If there is some transaction with a copyrighted work (e.g. assignment or license), a hash of such work is included in the transaction and once it becomes verified in accordance with blockchain protocol (such a transaction is "mined" into block), the transaction becomes timestamped and the content of the transaction becomes encoded on a blockchain. As a result, information about copyright ownership and its subsequent changes with relevant timing is integrated on a blockchain and cannot be forged[23]. Thus, records about ownership of a copyrighted work may be

---

[20] Taken from Wikipedia. https://en.wikipedia.org/wiki/Timestamp
[21] According to the RFC 3161 standard, a trusted timestamp is a timestamp issued by a trusted third party (TTP) acting as a Time Stamping Authority (TSA).
[22] Melanie Swan, *Blockchain: Blueprint for a New Economy*. O'Reilly. 2015.
[23] Theoretically, information on blockchain can be forged by user, who has more than 50% of computing power of the overall blockchain network ("51% Attack Problem"). But such concentration of power in a decentralized network is

immutably reflected in the blockchain database, and therefore easily verifiable by any interested person.

Implementation of such technology may replace existing cumbersome analog mechanisms of proving authorship of copyrighted works, such as registration with national copyright government authorities (e.g. registration of software in Patent offices) or collective societies, or even sending by the author of a letter containing the work to himself in order to have a post stamp with the date affixed. – This has become outdated and unnecessary.

Of course, quite similar solutions can be provided by a third party based on conventional (non-blockchain) technology. The most prominent example is the ContentID technology used in YouTube as a part of a rights management system. Content ID generates a digital fingerprint from the reference material downloaded by the user and subsequently scans other users' videos against the fingerprint and identifies any matches. If necessary, it claims matching user videos and applies the partner's match policy[24]. Similar technologies were implemented by the Russian social network VKontakte as a part of the policy against piracy.[25]

The difference which blockchain introduces is in the level of trust and potential scalability: a digital fingerprint's main purpose is to serve as a tool for enabling a liability exemption for online intermediaries and thus is highly dependent on the policy of particular online platform and its infrastructure. Terms of their use may be changed unilaterally at any time. This is the inevitable price of centralization. Blockchain offers a solution based on the principle of decentralization: there is no dependence on particular provider and the terms of use can be embedded in the code, changes to which would require a consensus among a majority of users. Such system may be more trustworthy and viable from a long-term perspective.

Besides, if the register is based on blockchain, its copies are available for all users: therefore the recordings relating to copyright ownership will not suddenly disappear with the company maintaining the database. Immutability of blockchain ensures that the content of the database will not be tampered with or otherwise compromised.   It increases the trustworthiness of recordings from blockchain and potentially their status as evidence in court in case of a copyright dispute, although judges will have to pass some period of acclimatization for such kinds of evidence, like for any new types of evidence based on technical innovation.

It is worth noting that services offering at least some of the functionality described above based on blockchain technology are already becoming a reality. For example, the service known as Ascribe.io offers to attribute ownership of creative works in a secure manner by providing each creative work with a unique cryptographic ID, verified with the blockchain. Although such solutions have a quite limited sphere and user base for now, they represent a valuable "playground", in which successes and failures will generate valuable experience to be taken into account for the creation of more global 'IPchains" in the future.

---

generally considered to be a risk but improbable in current realities. For discussion see: Paul Vigna, Michael J. Casey, The Age of Cryptocurrency: How Bitcoin and the Blockchain Are Challenging the Global Economic Order. 2006.
[24] https://creatoracademy.youtube.com/page/lesson/cid-manage-rights?cid=contentid&hl=en#yt-creators-strategies-3
[25] VKontakte was mentioned in the United States Trade Representative's "Priority Watch List" of the Special 301 Report as an online platform where large scale copyright infringements occur. See e.g. 2012 Special 301 Report. P. 37

3.2.   Control over digital copies

By default, each digital copy of the copyrighted work is the same and cannot be distinguished from another by their quality. Blockchain allows scope to individualize each digital copy of a copyrighted work. It may be done by means of the same hash function, described above with regard to time stamping functionality of blockchain. Cryptographic hash functions are optimized to generate a unique hash with low probability for collisions. This means that inputs with small differences generate very different hashes. Therefore, a hash function can be used to self-issue new and unique identifiers for each copy, which may have minor differences in them e.g. adding simply the serial number to each digital copy will create a new hash for otherwise similar content.

The functionality of the relevant blockchain-based copyright management service may allow assignment of separate license terms to each copy, e.g. one copy can be provided with the modification rights, another – with limited public access rights via the Internet. Or, for example, it is possible to assign different types of open source licenses to each copy of computer code distributed via blockchain.

Individualizing each digital copy of the content together with the possibility to track the individual history and destiny of each, creates necessary preconditions for flourishing technologically-enabled secondary markets of digital content. Thus, the prerequisites of the existing approach of the European court of Justice, according to which the resale of digital music, film, and e-book files duly purchased by way of download from the Internet will be considered as copyright infringement. That will be the case if resale is not authorized by the copyright holders, since *"applying the rule of exhaustion of the distribution right would deprive those right holders of the possibility of prohibiting those objects from being distributed or, in the event of distribution, of requiring appropriate reward for the commercial exploitation of their works"*[26]. If blockchain-based technology allows right owners both to control subsequent distribution and to receive reward for its use – there would be no 'show-stoppers' left for legalizing the "used" digital content market.

It also allows the ability to track who is using a particular copy of a copyrighted work and take appropriate action (e.g. to initiate legal proceedings, takedown request, request for payment of license fee, etc.).

3.3.   Automatic payments

Blockchain became famous for the creation of a new phenomenon - cryptocurrency, which facilitated a truly global system of payments, not complicated with the formalities associated with creating a bank account/traditional e-money account. The most popular examples such as Bitcoin or Ether have real market value[27] and liquidity and do not require the completion of any formalities for use. Besides, it has global reach and is available to everyone who has access to the Internet, making it an ideal instrument for

---

[26] Art & Allposters International BV v Stichting Pictoright, ECJ, Case C-419/13, 22 January 2015. Different approach is implemented by ECJ with regards to "used" software, but it is due the specific language of Directive 2009/24 on software protection, which is not applicable to other types of copyrighted works. See: UsedSoft GmbH v Oracle International Corp., ECJ, Case C-128/11, 3 July 2012. In Russia, exhaustion of rights concept is applicable neither to software, nor to other types of copyrighted digital content, so there is no secondary market for digital content legally possible.

[27] As of September 1, 2017 exchange rate of 1 Bitcoin was nearly 5 000 USD, while the exchange rate of 1 Ether was around 390 USD - See: https://www.coindesk.com/price/

payment of license fees for using digital content online. Thus, payments made via Blockchain using a cryptocurrency can be a solution to the problem of fair compensation for authors on the Internet, which does not imply dependence on intermediaries such as collective societies or streaming companies. Moreover, one of the key elements of the solution is the opportunity to use Smart contracts.

Smart contracts will allow automatic and instantaneous payments to designated parties, and expiration of a license after a certain amount of time. Royalties could be designed to be more inclusive, offering fairer terms for composers, lyricists, and musicians—all stakeholders involved in the creative process.

There are already some working prototypes of solutions created on blockchain. PeerTracks is an example of a service for artists to seek immediate royalty payments and ownership of their content. The service works by attaching a smart contract to every song an artist uploads and dividing the revenue according to the terms the contract stipulates[28].

Needless to say, such solution enables an unprecedented level of transparency. Right owners can directly see their revenue stream and receive direct feedback from their fans.

3.4.   Simplified licensing

The license agreement is the main legitimating basis for using copyrighted works. Preparation of a license agreement and its subsequent negotiation with the potential user is not an easy thing for an average author not familiar with the nuances of copyright law. The situation is further complicated by the fact that there is no such thing as global copyright law: there are as many copyright laws as countries adopting relevant laws[29]. Of course, international agreements like the Berne Convention or WIPO Copyright treaty help to harmonize national laws, but they do not make them unified. Diversity in terminology, copyright doctrines and case law remains and creates many complexities and costs even for wealthy transnational companies. Thus, license agreements for copyrighted works, which are intended to be distributed in a transborder environment, should take into account that diversity, requiring the qualified help of local legal counsel. Needless to say, such associated transaction costs are hardly acceptable for an average rights owner.

The open source movement and creative commons project to a certain extent has resolved this problem by means of special types of standardized license agreements which can be used for sharing software and other copyrighted works on a global scale[30]. For example, the latest version 4.0 of the Creative Commons licenses, released on November 25, 2013, are generic licenses that are applicable to most jurisdictions and do not usually require ports[31]. The popularity of these contractual instruments is very high and continues to increase. They facilitate sharing of copyrighted works on the Internet by choosing from

---

[28] http://peertracks.com

[29] See: Jane Ginsburg, *Copyright without borders? Choice of Forum and Choice of Law for Copyright Infringement in Cyberspace* // 15 Cardozo Arts & Ent. L.J. 1997, P. 154 ff.

[30] Open source licenses are used for distribution of software and associated documentation. Creative Commons licenses are used for distribution of other copyrighted works: photos, literary works, images, etc. Creative Commons is not recommended as a license for software. See: Creative Commons FAQ: Can I use a Creative Commons license for software?". Wiki.creativecommons.org. July 29, 2013. Retrieved September 20, 2017.

[31] Peters Diane, *CC's Next Generation Licenses — Welcome Version 4.0!* // Creative Commons. November 25, 2013.

several pre-existing templates, containing various terms of distribution. Such an approach eliminates the necessity to create custom license agreements and substantially minimizes transaction costs associated with distribution of digital content and infringement risks among potential users. Thus, the creative commons license provides an author with flexibility (for example, they might choose to allow only non-commercial uses of his/her own work) and protects the people who use or redistribute an author's work from concerns of copyright infringement as long as they abide by the conditions that are specified in the license by which the author distributes the work. The same is true for open source licenses, used for distribution of software[32].

There is one main problem with such types of license agreement: they are royalty-free: usage of works in accordance with their terms do not require payment of any fee, only attribution and compliance with stipulated limitations of use. This is enough for those right owners who are willing to share their works freely, but hardly acceptable for those of them who want to commercialize their efforts.

As was noted in the previous section, blockchain enables new type of payments – cryptocurrency payments, which in its turn may be used as consideration in license agreements. Thus, it is possible to combine the simplicity of using open source/creative commons licenses with receipt of a licensee fee by the licensor. It can be facilitated by a set of standardized smart contracts, the terms of which can be described in comprehensible language ("laymen code"), as is already done with regard to creative commons licenses. An author or another right owner, willing to take advantage of receipt payments in cryptocurrency may either choose a smart contract template, based on its description in laymen code, or create its custom smart contract with the terms of license payment and even its split between various beneficiaries (e.g. co-authors).

4.   Challenges

4.1.   Storage of metadata and digital content

One of the main questions, which needs to be answered in the process of designing a solution, is where copyrighted works themselves will be stored—on the blockchain itself or elsewhere? The current state of blockchain technology imposes substantial constraints in putting creative content directly on the blockchain. For example, the size of bitcoin blockchain, which consists only of metadata (data about transactions), reached almost 130Gb in September 2017[33] and it contains only metadata about transactions, no heavy files. Since Jan 2013 the Blockchain's size increase has been exponential. It doubles in size every year. And it is regardless of the fact that at present the Bitcoin block size is limited by the code to 1MB per block[34].

So storage of content on blockchain is a problem, especially if we are talking about a large network of users with increasing transaction amounts, which needs to be reflected

---

[32] For a list of open source licenses see: https://opensource.org
[33] https://blockchain.info/en/charts/blocks-size?timespan=all
[34] It is noted among current challenges of blockchain technology that the amount of data that can be attached to any one record (transaction) is quite limited. For example, only one free metadata field per transaction, is allowed. See: Blockchain: The Operating System for the Music. Revelator Whitepaper. P. 4. URL: http://www.the-blockchain.com/docs/Blockchain%20Solution%20for%20the%20Music%20Industry.pdf

on a blockchain. Finding correct incentives for users, which are ready to store relevant data will be a very challenging task, since their costs associated with storage may be substantial.

If it is decided that digital files with copyrighted works themselves will exist outside of blockchain, then the following question needs to be addressed: how is it possible to ensure that the blockchain data stays linked to the relevant copyrighted work, meaning that blockchain data remains actual at all times? Such content may become unavailable due to technical malfunctions of the infrastructure of the person responsible for storing it, or due to the deliberate actions of such a person. Thus, storing digital content "off-chain" creates an issue of accessibility of such content and challenges the effectiveness of the overall blockchain solution.

Besides, although at first glance it seems to be mostly a technical matter, architectural choices relating to storage of data in blockchain will have legal implications as well. If there is some kind of centralized silo for storing digital content linked with the rights management database on blockchain, the administrator of such a silo will "use" relevant copyrighted works at least in a form of their reproduction. It potentially makes him a target for infringement claims.

Such an administrator will meet the criteria of the online intermediary similar to hosting online platforms, a status which grants certain exemptions from liability for copyright infringement. However, the immutable nature of information on the blockchain creates some problems with the application of such exemptions.

For example, in accordance with E-commerce Directive where an information society service is provided that consists of the storage of information provided by a recipient of the service, such service provider is not liable for the information stored at the request of a recipient of the service, on condition that: (a) the provider does not have actual knowledge of illegal activity or information and, as regards claims for damages, is not aware of facts or circumstances from which the illegal activity or information is apparent; or (b) the provider, upon obtaining such knowledge or awareness, acts expeditiously to remove or to disable access to the information (Article 14 (1) of the Directive on electronic commerce 2000/31/EC). Quite similar provisions are provided in the Russian Civil Code (Article 1253.1, which became effective in 2013).

As may be seen, one of the conditions for exemption is either removal of relevant content or blocking access to it ("notice-takedown" mechanism). If digital content is stored on a blockchain, it may be problematic to delete it or remove access to it, since it will be contrary to the principles of blockchain operation. In such case, the administrator of the blockchain platform will not be able to benefit from the liability exemption for an online intermediary.

If digital content is stored not on a blockchain, and the latter only provides a link to it, it will be technically possible to remove/block access to such content, but in this case metadata stored on a blockchain with relevant links will become outdated and generally dependent on the actions of a third party, which happens not to be compatible with the ideals of blockchain.

So, future legal regulation will have to address the specifics of blockchain storage/flow of data and provide adjusted provisions relating to exemptions for nodes and platform operators for infringing content which was put in blockchain by the users. Such adjusted provisions will have to address problems of deletion or blocking access to

blockchain-related content, since such actions compromise the whole blockchain ecosystem.

In addition, in case of centralized administration of storage of copyrighted content, the issues of trust appear as well as of arranging an adequate information security system. In the case of decentralized management of such silos, the need for necessary incentives for investments in storage space arise as well as guarantees from illegal usage of such content by the keeper should be established.

4.2. Disputes over copyright and blockchain immutability

The essence of this problem can be stated as follows: how is it possible to align the existing approach to originating of copyright with the immutable nature of records in blockchain?

Traditional copyright law provides that, from the moment a creative work is fixed in a tangible medium of expression, the creator of the work enjoys statutorily enumerated exclusive rights, including the right to make and distribute copies of the work, to perform the work publicly, to prepare derivative works and some others. Rights to a copyrighted work appear in a very informal manner and the circumstances associated with their appearance are not visible to the public. Moreover, even if the copyright law of a certain country establishes some kind of registration process for copyrighted works, it does not change the essence of the problem: such registration only provides a rebuttable presumption of authorship/ownership, and it is still possible to challenge that in the court. This is the law in most countries, solidified by the provisions of the Berne Convention, thus it cannot be changed easily[35].

As a result that no one can be 100% sure that the person indicated as a copyright owner is a true owner indeed. The situation is further complicated by the fact that most copyrighted works are not created from scratch: they are based on some pre-existing works, which have their own authors and rights owners, and the chain of such works can be quite long (a vivid example is computer programs). Therefore, the records about copyright ownership may change from time to time: it is not possible to input such data into blockchain with 100% guarantee of accuracy that it will not change later. Besides, such changes may be sanctioned by a court decision resulting from the copyright dispute. Court judgments are obligatory for everyone on the territory of jurisdiction of such a court, a feature that has its core in the matters of state sovereignty, which no state is ready to give up easily.

Thus, if blockchain-based systems of copyright management wants to be compliant with basic principles of copyright law and in line with considerations of national sovereignty, they need to be adaptable to such changes. But it is not an easy deal. For example, Blockchain *de facto* facilitates existence of two realities: the first one is depicted in blockchain in accordance with which, e.g., the copyright owner is A. The second reality is created by the legal order: according to the official judgment the copyright owner for the same object is B. It is evident, that blockchain as such can lead to the appearance of duality of copyright ownership regimes. The question arises then how to align these realities in a way that would be acceptable for all the stakeholders and will not diminish the advantages

---

[35] According to Article 5 (2) of the Berne convention, the enjoyment and the exercise of copyright shall not be subject to any formality

of new technologies? This is the ultimate question the answer to which will define the degree of implementation of blockchain technologies for activities having legal significance. Currently, it is possible to envisage two solutions, neither of which seems to be optimal enough:

(1) To introduce the concept of a 'Superuser' for government authorities, which will have a right to modify the content of blockchain databases in accordance with a specified procedure in order to reflect the decisions of state authority. In this case, it is possible only to talk about private/permissioned blockchains; public blockchains are not compatible with this approach.

(2) To enforce decisions of state authorities in 'offline' mode by pursuing the specific users and forcing them to include changes in the blockchain themselves, as well as by using traditional tort claims, unjust enrichment claims, and specific performance claims.

The problem with the first solution is that it leads to substantial mutation of blockchain technology and strips it of its main advantage: viz. resilience to data manipulations from outside and a facilitated unique level of trust. If some kind of user of blockchain technology will have extra powers, including the power to influence the data in it, the resulting solution based on such a blockchain will be hardly more attractive than traditional databases and registers maintained by the state authorities. All the most attractive and innovative features of blockchain will be diminished.

The problem with the second solution is that it is associated with instruments from the old era, which are time-consuming and inefficient in transborder cases, and which do not keep pace with new technologies. De-anonymization and jurisdictional problems will substantially weaken the effectiveness of such an approach and lead to the diminishing of sovereign power of the national authorities in the cyberspace area.

Most likely blockchain-based copyright management systems sponsored by governments will follow the first approach, with implementation of the second one on a case-by-case basis. Governments will hardly allow public blockchains with records having legal significance in any sphere, including IP.

Therefore, it is necessary to manage expectations of copyright owners and users accordingly: they have to admit that blockchain does not guarantee trustworthiness of information originating from the off-chain reality, only immutability of information generated within blockchain itself. In addition, some extra tweaks in existing copyright law need to be introduced. As a general rule, persons receiving rights to use copyrighted works based on the records available in blockchain, sponsored or administrated by a government authority, should be shielded from potential infringement claims: after all they rely on publicly available information provided in a system having intent to increase the liquidity of digital content. Therefore, shifting upon them the infringement risks associated with false records in such databases, can hardly be considered as a fair allocation of risks.

The ways of implementation of such defense can be different and depend on the specifics of copyright law in a particular country. In common law countries it may be possible to use "fair use" doctrines as a basis. Relevant actions of such persons can be interpreted as falling within its scope. Although it may be challenging, taking into account the existing factors for assessing fair use (the purpose and character of the use; the nature of copyrighted work; the amount of the work used; the economic impact of the use[36]) after

---

[36] See e.g. 17 USC § 107

all, as Paul Goldstein puts it, *"fair use" is a judicial safety valve, empowering courts to excuse certain quotations or copies of copyrighted material even though the literal terms of the Copyright Act prohibit them*[37].

In countries relying on a closed list of copyright exceptions, like most European countries Russia included, the introduction of a new exception specifically tailored for usage and driven by reliance on records in blockchain-based copyright management systems sponsored/administered by the state, may help. However, it is also not a perfect solution. Maintaining a closed list of copyright exceptions is increasingly difficult in a world of rapid and unpredictable technological development, and hard to reconcile with the generally recognized need to create technologically neutral copyright norms.

Another possible option is a radical one: introduction of the concept of good faith acquisition of the right to use a copyrighted work within certain limits. The doctrine of good faith acquisition (in Russian law – "dobrosovestniy priobretatel"; in German law – "gutgläubiger Erwerber") has been working well in the sphere of property law with tangible property. The value of this approach is in the possibility to re-use from an established set of rules and principles within property law that defines "good faith" in various contexts, instead of trying to formulate them *ex ante* in a very concise manner as another type of copyright exception.

Regardless of the approach taken, trust in blockchain-based registers dealing with off-chain legal rights can be facilitated only by establishing some extra-legal guarantees for their users in the off-chain world. These would accommodate the specifics of blockchain technology. The interests of copyright owners can be protected by means of the introduction of special insurance mechanisms, but this matter requires dedicated research.

It will also be necessary to adjust provisions relating to the presumption of copyright. According to Article 1257 of the Russian Civil Code *"the person indicated as the author on the original or other copy of a work shall be considered its author, unless it is proved otherwise"*. The symbol of protection of copyright, which contains information about the copyright owner is also tied to a copy of the work (Article 1271 of the Russian Civil Code). Similar provisions can be found in most national laws on copyright.

It can be seen that the above presumption is linked to the copy of a work. However, in a blockchain-based system, such information is provided in a database, which exists separately from the copy of the work. It is necessary to extend the scope of assumption to the information existing in public registers. In addition, it is advisable to limit the possibility to rebut the presumption only to court judgments and/or decisions of arbitration, in case alternative dispute resolution systems accommodating the specifics of blockchain are created. Of course, decisions of such jurisdictional bodies relating to copyright status should be reflected on a blockchain, as well as the fact that there is a dispute in place. Such provisions should strengthen reliability of information on the status of copyright available on blockchain and the trust of third parties in it.

---

[37] Paul Goldstein, *Copyright's Highway*. 1994, P. 84.

4.3. Network effect issues

In order to unleash the full potential of a new blockchain-based copyright management system, it needs to be used by a large amount of right owners and users and cover sufficient numbers of popular copyrighted works. Thus, such a system will be highly dependent on the so-called network effect, where the value of a product is dependent on the number of others using it[38]. As the number of users increases, the system will become even more valuable and able to attract a wider user base. A popular, and very compelling example, is the telephone network. Everyone would agree that the value of the phone service depends heavily on the number of other people who use it . The same is true for copyright management systems: the more user base they have, the more valuable they become both for authors/right owners and users.

However, blockchain-ready right owners remain a small minority. It is not yet clear what threshold for the number of users will be sufficient to begin to disrupt the existing *status quo*. Therefore, one of the key challenges in implementation of effective blockchain-based copyright management system will be bringing enough people into it.

Unfortunately, the existing examples of centralized databases for copyright management are not inspiring. One of them is the database of copyrighted works, which had to be created pursuant to the provisions of Article 1233 (5) of the Civil Code, which was included in the Civil Code in 2013 and became effective January 1, 2015[39]. The rationale behind that provision was to create some kind of centralized depository of 'free' works, where any interested party may either place his or her work or alternatively find something interesting for subsequent use. It was expected to become some kind of alternative to existing mechanisms of open source/creative commons licenses, which were mistakenly considered to be non-enforceable in Russia[40]. Although this provision has been formally effective for almost three years, it has still not found its practical implementation. There are still disputes about which government authority should be in charge of the administration of such a database (Ministry of Culture, Ministry of Industry and Commerce, Russian Patent Office, or another). But apart from that there are serious concerns about the real interest of right owners and potential users in such a database. Its potential scope is limited from the very beginning: the target audience is limited to those who are ready to give up their rights "freely" and remain willing to waste time on

---

[38] See generally: Carl Shapiro, Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy.* Harvard Business School Press. Boston, Massachusetts. 1999.

[39] The text of the Article 1235 (5) in English is as follows:

"The owner of exclusive rights may make a public statement communicated to an indefinite amount of persons, granting to any person the right to use his copyrighted works/object of neighboring rights under specific conditions and for a period specified by such an owner. Within such a period, any person may use such intellectual property in accordance with the specified conditions. Such a public statement should be made on an official web-site of government authority. Such government authority and the procedure should be defined by the regulations of the Government of the Russian Federation.

The statement should contain information allowing to identify the rightowner and the copyrighted work/object of neighboring rights. Unless otherwise indicated in the statement, such a period for which the right to use is granted constitutes five years and the territory will be the territory of the Russian Federation.

Within the validity period of such an application, it cannot be withdrawn or changed.

The owner of exclusive rights is not entitled to make such a statement if there are valid exclusive license agreement granting the same scope of rights. If such a statement is made in situations where there is a valid [non-exclusive] license agreement granting the same scope of rights for a fee, such license agreement is considered terminated and rightowner is liable for damages the licensee incurred.

The provisions of this paragraph shall not apply to the open licenses. (Article1286.1)".

[40] For critics of the suggested approach see: Savelyev Alexander. Open source: the Russian experience (legislation and practice) // Information & Communication Technology Law. 2012. No. 22 (1).

registration of their good intentions in a local government-owned database, instead of turning to an easy-to-use globally-recognized open source/creative commons license facility. Without the presence of a considerable amount of available works in such a database, it is difficult to expect substantial amounts of users. Thus, from the start, the potential of the solution suggested in Article 1233 (5) was never evaluated from a network effects perspective and, as a result, its destiny is likely to be seen as disappointing. .

Another of the biggest obstacles to creating blockchain-based copyright management solutions with a big enough database of copyrighted works and user base will be the resistance of collective societies and other intermediaries, which would become redundant if publishers start to license songs and other copyrighted content directly, with no intermediaries in between.

There is another good example of ill-fated attempts to build a single comprehensive database of copyrighted works, such as the Global Repertoire Database (GRD). Its creation was initiated by the EU Commissioner Neelie Kroes who created Global Database Repertoire Working Group (GRD WG) in September of 2008. In December 2010, it issued a set of recommendations, where the group suggested that the GRD should provide access to authoritative, comprehensive, multi-territory information about the ownership and control of the global repertoire of musical works, and that it should be openly available to songwriters, publishers, Collective Rights Management (CRM) organizations, and other potential users[41]. In July of 2014, the attempt to create the GRD was shelved, leaving behind a debt of more than $13.7 million. It was reported that critical contributions from participating collection societies and publishers never materialized[42]. Collection societies had begun pulling out, with The American Society of Composers, Authors and Publishers (ASCAP) allegedly being the first one to retract from the project and stop funding it because of the fear of losing revenue from operational costs under a more efficient GRD system. Another reason could be a dispute over control of the global database[43].

The above examples show that there are serious economic interests at stake in all solutions relating to copyright management system, which cannot be ignored even if the underpinning technology itself is superior: without necessary network effects it won't work.

4.4. Legal issues

"Blockchain", "Smart contracts", "Cryptocurrencies": all these terms are currently the subject of hot debates among lawyers and regulators all over the world. While many are intrigued by the possibilities blockchain enables, there are lots of contradicting and cautionary statements from the regulators about cryptocurrency and the risks associated with them. Some countries prohibit certain activities with cryptocurrencies[44], others ban

---

[41] Recommendations For: The Way Forward For the Development of a Global Repertoire Database". GRD-077, Global Repertoire Database Working Group, 2010. P. 4.

[42] Paul Resnikoff, *Global Repertoire Database Declared a Global Failure…* // Digital Music News, July 10, 2014. URL: https://www.digitalmusicnews.com/2014/07/10/global-repertoire-database-declared-global-failure/

[43] See generally: *Klementina Milosic*, GRD's Failure // Music Business Journal, August 2015. URL: http://www.thembj.org/2015/08/grds-failure/

[44] For example, China recently announced an immediate ban on ICO funding, which has "seriously disrupted the economic and financial order. See: Jon Russell, China has banned ICOs. 4 September 2017, URL: https://techcrunch.com/2017/09/04/chinas-central-bank-has-banned-icos/

them completely [45] . While the overview of existing approaches to cryptocurrency regulation is not within the scope of this paper, it is necessary to mention here, that legalization of cryptocurrency and the operations that go with it is one of the essential conditions of facilitation of blockchain technologies. Verifications of transactions in blockchain requires substantial investments of computing power and such investments should be compensated somehow in order to be feasible. In Bitcoin blockchain it is implemented via a so-called "proof-of-work" concept, where miners compete with each other in solving complex mathematical formulas. Those miners who succeed, receive a remuneration in the form of newly created "mined" bitcoins, which can be later converted in fiat money through a cryptocurrency exchange. Such a solution ensures the viability and self-sufficiency of the blockchain economics. Besides, cryptocurrencies play an important function of preventing overloading of blockchain with spam-like transactions: if a person has to pay a certain amount of cryptocurrency in order to facilitate processing/verification of its transaction in blockchain, he will think twice prior to sending such a transaction there. Thus, cryptocurrencies form an essential part of blockchain ecosystem (at least, if it is based on a proof-of-work consensus approach).

Prohibition of transactions with cryptocurrencies puts them in a shadow zone, where companies with a reputation as well as users that are not technically savvy do not want to operate, since conversion of cryptocurrency into fiat money and vice versa become a nightmare. All this negatively impacts upon the volume of users of blockchain solutions and their network effects. Besides, potential benefits associated with simplified licensing for a fee with royalty payments split, as outlined above, become unavailable for mass usage. Therefore, the lack of relevant legal provisions regulating the status and transactions with cryptocurrencies becomes one of the key inhibitors for development of blockchain projects, including in the IP sphere.

Another inhibitor is current lack of understanding of what Smart contracts are from a legal perspective. Whether such a contract is simply a piece of code which automates performance of some obligations by the parties, or is also a self-sufficient binding agreement existing in the form of computer code, which has specific features in the contract law realm, remains to be seen. The issue is how to apply traditional rules of contract law, relating to termination, amendment, remedies for breach to such Smart contracts? Further, there is the question how to define the liability of the parties in case the Smart contract does not work due to faulty code or hacker attack? There are no answers to these questions yet. The International Organization for Standardization (ISO) is currently working on the analysis of the current understanding of smart contracts from both technical as well as appropriate legal perspective, specifically, on their *"interoperability with the law, enforcement, and life cycle of smart contracts"* [46], but it is unlikely that the results will be available in the short-term. Besides, ISO documents are non-binding and therefore cannot resolve all the above questions.

As already mentioned above, amendments are needed in the copyright law itself. It is possible to outline at least three directions, where such changes may be needed:

---

[45] For example, in Kyrgyzstan, Bolivia, Ecuador. URL: http://bitcoinist.com/bitcoin-still-illegal-six-countries/ Ideas to introduce criminal liability for operations with cryptocurrencies were not alien for Russian Ministry of Finance, which prepared a draft of the amendments to the Russian Criminal Code in 2015. Fortunately, they were not supported by the Russian Government.
[46] ISO/TC 307. Blockchain and distributed ledger technologies https://www.iso.org/committee/6266604.html

1) Introduction of additional legal protections for users relying on the records, available in a blockchain-based copyright management system, specifically for the situations where such persons start to use copyrighted works based on information on blockchain and receive claims from third parties regarding infringement of their rights. It is hardly possible to expect wide adoption of blockchain technologies in the copyright management sphere if such users do not possess exemptions from liability for infringement. Such exemptions may be tailored to specifics of a particular legal system (e.g. extension of the fair use doctrine, establishment of additional statutory copyright exemptions, good faith acquisition of a license, etc.). Of course, such protections should be balanced with the interests of copyright owners and should not become a basis for subsequent abuses. First of all, such protections should be granted only to users of blockchain-based copyright management systems, which are controlled to a certain extent by government authorities, and therefore receive some statutory 'blessing". But government supervision cannot itself ensure the presence of a necessary balance; it is mostly one of the safeguards necessary to introduce legitimacy to the records on blockchain. The balance itself can be ensured only with the possibility of new exemptions to reimburse financial losses incurred by right holders in case of abuse committed by users . Probably, insurance mechanisms may help to find such a balance, so this direction can be worth researching further.

2) Blockchain platform operators as well as persons storing digital content to which blockchain record links, will need to have special online intermediary exemptions from liability, taking into account the specifics of the blockchain records immutability principle. Current law, requiring deletion or blocking access to relevant content as a necessary condition of application of the exemption, needs to be adjusted to reflect the realities of blockchain functioning.

3) The legal status of the records in the blockchain system should be increased. Relevant records in a blockchain-based copyright management system should not only serve as a source of information about copyright ownership, but also create a strong presumption of authorship/copyright ownership, which can be rebutted only by a decision of the court and/or specialized ADR body. Information about potential disputes concerning ownership initiated by such authorities should be immediately available on blockchain.

Such increased status of records about copyright ownership on blockchain, may lead to the appearance of another layer of copyright law based on formal criteria, parallel to the traditional one based on creation/fixation criteria. How they will correlate with each other and whether the new one will completely supersede the other will be one of the most intriguing points to monitor in the further development of copyright law in the blockchain era.

For the sake of clarity, it is necessary to mention that the list of legal issues is not by any means an exhaustive one. It was intended to outline the core problems, which need to be addressed if some kind of mass copyright management system based on blockchain technology is going to be built and to be something more innovative than just another ill-fated database of copyrighted works. Apart from those problems, there are many others, e.g., matters of information security, identification of users, etc. These matters are important, but more general since they are applicable to all information systems built on blockchain, not only to copyright-related ones. Therefore they deserve dedicated discussion and research.

5. Conclusion

Blockchain technology has the potential to change the way, in which copyrighted content is distributed in a digital world. Specifically, it may enable unprecedented levels of accessibility to information about copyright ownership, transparency and traceability of its subsequent changes. Getting royalty payments instantly and having technically-enabled sovereign ownership over digital content produced should be attractive for all copyright owners. Simplified licensing arrangements facilitated by a standardized set of self-enforcing Smart contracts will substantially decrease transaction costs for both right owners and users and protect the latter from concerns over copyright infringement.

However, such a brave new world does not come without a price. There are lots of problems which need to be resolved first. One of them is the architectural one, but having legal implications as well: where the digital content itself will be stored: on blockchain together with metadata about ownership and transactions or separately. Both options have their benefits and challenges. Another problem is to align blockchain-created reality with jurisdictional privileges of state authorities. Blockchain records need to be changed in accordance with the decisions of courts and state authorities, otherwise blockchain will become an enemy of the state, not its ally.

On the other hand, immutability of the blockchain records is the main selling point of this technology facilitating trust in it. Therefore, finding the right balance between these considerations will not be an easy task. And the results will have impact on the attractiveness of such a system both for copyright owners and users. Due to network effects, sufficient presence of both groups is critical for the success of any copyright management system, including blockchain-based. Finally, it is necessary to address multiple legal issues connected with implementation of the promises of blockchain systems in the copyright sphere into legal reality: cryptocurrency and Smart contract status; adjustments in copyright law granting necessary guarantees for those relying on data provided on blockchain systems and facilitating their functioning.

Of course, the number of issues needed to be resolved is substantial, but if it is done and blockchain-based systems manage to prove their feasibility in the copyright sphere, they have the potential to revolutionize copyright law. Furthermore,it will definitely have consequences even beyond this sphere, since it will be possible to implement such systems for other objects of IP that will lead to the appearance of a specific type of intellectual property: "Smart IP". If the above issues are not resolved, then the created system of copyright management based on blockchain will hardly be substantially different than the conventional ones. It will represent nothing more than the exploitation of the hype with blockchain used as thesource of attraction of new investment but without tangible improvement or gain.

References

1. Alexander Savelyev, Contract law 2.0: 'Smart' contracts as the beginning of the end of classic contract law // Information and Communications Technology Law. 2017. Vol. 26. No. 2;
2. Benkler Yochai, The Wealth of Networks. Yale University Press. 2006.
3. Blockchain: The Operating System for the Music. Revelator Whitepaper. URL: http://www.the-blockchain.com/docs/Blockchain%20Solution%20for%20the%20Music%20Industry.pdf
4. Carl Shapiro, Hal R. Varian, Information Rules: A Strategic Guide to the Network Economy. Harvard Business School Press. Boston, Massachusetts. 1999.
5. Jane Ginsburg, Copyright without borders? Choice of Forum and Choice of Law for Copyright Infringement in Cyberspace // 15 Cardozo Arts & Ent. L.J. 1997
6. Jon Russell, China has banned ICOs. 4 September 2017, URL: https://techcrunch.com/2017/09/04/chinas-central-bank-has-banned-icos/
7. Klaus Schwab, The Fourth Industrial Revolution. NY. 2016.
8. Klementina Milosic, GRD's Failure // Music Business Journal, August 2015. URL: http://www.thembj.org/2015/08/grds-failure/
9. Melanie Swan, Blockchain: Blueprint for a New Economy. O'Reilly. 2015.
10. Paul Goldstein, Copyright's Highway. 1994.
11. Paul Resnikoff, Global Repertoire Database Declared a Global Failure… // Digital Music News, July 10, 2014. URL: https://www.digitalmusicnews.com/2014/07/10/global-repertoire-database-declared-global-failure/
12. Paul Vigna, Michael J. Casey, The Age of Cryptocurrency: How Bitcoin and the Blockchain Are Challenging the Global Economic Order. 2006.
13. Peters Diane, CC's Next Generation Licenses — Welcome Version 4.0! // Creative Commons. November 25, 2013.
14. Recommendations For: The Way Forward For the Development of a Global Repertoire Database". GRD-077, Global Repertoire Database Working Group, 2010.
15. Revisiting the Sony Toolkit. Free Software Foundation Europe. URL: https://fsfe.org/activities/drm/sony-rootkit-fiasco.en.html
16. Ryo Takahashi, How can creative industries benefit from blockchain? 18 July 2017. URL: https://www.weforum.org/agenda/2017/07/how-can-creative-industries-benefit-from-blockchain/
17. Savelyev Alexander, Open source: the Russian experience (legislation and practice) // Information & Communication Technology Law. 2012. No. 22 (1).
18. The Digital Dilemma: Intellectual Property in the Information Age. Wahington, National Academy Press, 2000.
19. Trent McConaghy and David Holtzman, Towards An Ownership Layer for the Internet. Ascribe GmbH. 24 June 2015. URL: https://bravenewcoin.com/assets/Whitepapers/ascribe-whitepaper-20150624.pdf
20. Unintended Consequences: Sixteen Years under the DMCA. Electronic Frontier Foundation. September 2014, URL: https://www.eff.org/files/2014/09/16/unintendedconsequences2014.pdf

Alexander Savelyev

Alexander Savelyev PhD, senior researcher of International Laboratory on IP and IT law Higher School of Economics, senior legal attorney of IBM East Europe/Asia Ltd. Russia, 123112, Moscow, Presnenskaya emb., 10, Russia. Email address: garantus@rambler.ru

Any opinions or claims contained in this Working Paper do not necessarily reflect the views of HSE.