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COPYRIGHT UNCHAINED: HOW BLOCKCHAIN TECHNOLOGY CAN CHANGE THE ADMINISTRATION AND DISTRIBUTION OF COPYRIGHT PROTECTED WORKS

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N O R T H W E S T E R N
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ABSTRACT—Blockchain technology is mainly discussed in connection with cryptocurrencies such as Bitcoin. However, blockchain is a multipurpose technology with many other potential applications. This article analyzes how blockchain technology can be used in relation to copyright, especially the administration and distribution of copyright protected works. It also examines the questions and challenges that may arise from such use.

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INTRODUCTION

In 2008, Satoshi Nakamoto, the pseudonym used by the creator(s) of the cryptocurrency¹ Bitcoin, published a paper describing the technical features of Bitcoin.² Nakamoto had the vision of “an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a

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¹ A cryptocurrency is a digital currency that relies on cryptography.

² See Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, BITCOIN.ORG (2008), <https://bitcoin.org/bitcoin.pdf> [<https://perma.cc/CAD6-4C5P>].

trusted third party.”³ The underlying technology, blockchain,⁴ is not only supposed to revolutionize the financial industry,⁵ but also transform almost every part of our lives, such as real estate transactions, voting, car leasing and sales, supply chain management, and healthcare.⁶ One of the most promising areas of use is the management of intellectual property rights, especially of copyright protected works such as music, videos, software, images, and text. This article analyzes how blockchain technology can be used in connection with the administration and distribution of copyrighted works. The discussion begins with (I) an overview of the shortcomings of the current system in the United States. The following section (II) describes how a blockchain-based solution can be designed to solve these issues and also addresses open questions and challenges.

I. ISSUES IN THE CURRENT SYSTEM

Issues in the current system of administration and distribution of works can be grouped into five categories, namely (A) the lack of reliable information on ownership, (B) the fragmentation of ownership, (C) the lack of transparency in content usage and payments, (D) the inequality in revenue distribution, and (E) piracy.

A. Lack of Reliable Information on Ownership

In the past, United States copyright law relied heavily on formalities such as notice, registration, deposit, renewal, and recordation.⁷ The situation is different under the current legal framework. While registering a work of U.S. origin with the U.S. Copyright Office is both necessary for the filing of a civil action for copyright infringement⁸ and provides several other advantages,⁹ the coming into existence of a copyright is not subject to any formalities. The only requirement is the creation of an “original work[. . .] of authorship fixed in any tangible medium of expression.”¹⁰ Therefore, the

³ *Id.* at 1.

⁴ Often, the terms “blockchain” and “distributed ledger” are used synonymously. Strictly speaking, a blockchain is a specific type of a distributed ledger.

⁵ See Joichi Ito et al., *The Blockchain Will Do to the Financial System What the Internet Did to Media*, HARV. BUS. REV. (Mar. 9, 2017), https://hbr.org/2017/03/the-blockchain-will-do-to-banks-and-law-firms-what-the-internet-did-to-media?referral=03758&cm_vc=rr_item_page.top_right [<https://perma.cc/9KEY-2KPX>].

⁶ *Banking Is Only the Beginning*, CB INSIGHTS (Apr. 2, 2020), <https://www.cbinsights.com/research/industries-disrupted-blockchain> [<https://perma.cc/HY8R-RDN4>].

⁷ See STEF VAN GOMPEL, FORMALITIES IN COPYRIGHT LAW: AN ANALYSIS OF THEIR HISTORY, RATIONALES, AND POSSIBLE FUTURE 94–97 (2011).

⁸ 17 U.S.C. § 411(a).

⁹ See discussion *infra* Section II.A.3.m.i.

¹⁰ 17 U.S.C. § 102(a).

person who creates a work (its author)¹¹ is awarded a copyright in the work the moment he or she writes it on a sheet of paper, paints it on a canvas, or saves it on a hard drive.¹²

Copyright ownership can be bequeathed or transferred by assignment,¹³ and the owner of a copyright can also retain ownership and grant exclusive or non-exclusive licenses.¹⁴ A transfer of rights does not have to be recorded to be valid. Section 204(a) of the Copyright Act merely requires a transfer of copyright ownership—which includes the assignment of a copyright and the grant of an exclusive license¹⁵—to be “in writing and signed by the owner of the rights conveyed or such owner’s duly authorized agent.”¹⁶

This absence of formalities creates difficulties with respect to the identification of the current right holder.¹⁷ The problem is exacerbated when an older work is concerned, the rights in the work have been transferred to another person, or when a work has multiple right holders.¹⁸ The latter applies especially for music where there are separate copyrights in the musical composition (i.e., music and lyrics) and the sound recording (i.e., the embodiment of the musical composition in a specific medium,¹⁹ for example on a CD or a digital file).²⁰

The lack of information on ownership has negative impacts on (1) exploiters, (2) right holders, (3) consumers, and (4) the public.

1. Exploiters

First, missing information on ownership affects the determination of whether a work is still protected under copyright law or not.²¹ Under current law, the term of protection lasts from creation of the work until seventy years after the death of the author.²² Anonymous works, pseudonymous works, and works made for hire are protected for ninety-five years from publication or

¹¹ In the case of a work made for hire, it is the employer or commissioning party and not the author who owns the copyright. *Id.* § 201(b).

¹² See *Fourth Est. Pub. Benefit Corp. v. Wall-Street.com, LLC*, 139 S. Ct. 881, 887 (2019) (“An author gains ‘exclusive rights’ in her work immediately upon the work’s creation[.]”); *Eldred v. Ashcroft*, 537 U.S. 186, 195 (2003) (“[C]opyright protection . . . run[s] from the work’s creation[.]”).

¹³ 17 U.S.C. § 201(d)(1).

¹⁴ The change of ownership and licensing rights are hereinafter referred to as “transfer of rights.”

¹⁵ 17 U.S.C. § 101.

¹⁶ *Id.* § 204(a).

¹⁷ VAN GOMPEL, *supra* note 7, at 5; LAWRENCE LESSIG, *FREE CULTURE: HOW BIG MEDIA USES TECHNOLOGY AND THE LAW TO LOCK DOWN CULTURE AND CONTROL CREATIVITY* 249 (2004).

¹⁸ VAN GOMPEL, *supra* note 7, at 6–7.

¹⁹ 17 U.S.C. § 101.

²⁰ U.S. COPYRIGHT OFF., *COPYRIGHT AND THE MUSIC MARKETPLACE* 18 (2015).

²¹ VAN GOMPEL, *supra* note 7, at 5.

²² 17 U.S.C. § 302(a).

120 years from creation, whichever expires first.²³ When the term of protection ends, the work is in the public domain and can be used without permission and payment. However, without reliable information on the author, the date of creation, and the date of publication, the term of protection cannot be calculated accurately.

If a work is still protected, potential exploiters such as radio and TV stations or providers of Internet platforms have to acquire a license from the right holder unless the envisaged use is covered by exceptions or limitations. The identification and localization of the current right holder is time- and resource-intensive and leads to high transaction costs.²⁴ For example, a study conducted by the Music Business Association in 2012 showed that licensing music for an on-demand streaming service in the U.S. took eighteen months on average.²⁵ If the owner of a work cannot be identified within a reasonable period of time with reasonable costs, a potential exploiter can either refrain from using the work or use the work without permission.²⁶ In the first case, an exploiter can be prevented from recouping the costs incurred. According to the study by the Music Business Association, around 15–20% of the music streaming projects were not able to collect the necessary rights to start their service.²⁷ On the other hand, an exploiter who does not acquire a license must bear the risk of litigation. For example, the music streaming service Spotify was sued several times for using songs without a license in recent years.²⁸ According to Spotify, the problem lies in insufficient data on ownership over songs.²⁹

Even if an exploiter is able to track down the presumed right holder, he or she cannot be sure that the right holder is in fact in possession of the required rights. This applies, in particular, if rights have been transferred to the current right holder via several other parties. In such cases, the sequence of transfers that connects the current and initial right holders (“chain of title”) is often not traceable. Typically, the right holder warrants that he is in possession of all rights. Nevertheless, exploiters often take out additional

²³ *Id.* § 302(c).

²⁴ U.S. COPYRIGHT OFF., *supra* note 20, at 124; Dev S. Gangjee, *Copyright Formalities: A Return to Registration?*, in *WHAT IF WE COULD REIMAGINE COPYRIGHT?* 228 (Rebecca Giblin & Kimberlee Weatherall eds., 2017); James Gibson, *Once and Future Copyright*, 81 NOTRE DAME L. REV. 167, 216, 227 (2005).

²⁵ DAVID TOUVE, *THE INNOVATION PARADOX: HOW LICENSING AND COPYRIGHT IMPACTS DIGITAL MUSIC STARTUPS* 6 (2012).

²⁶ Gangjee, *supra* note 24, at 216, 227; Gibson, *supra* note 24, at 216.

²⁷ TOUVE, *supra* note 25, at 6.

²⁸ See John Paul Titlow, *Why Can't Spotify Stop Getting Sued? It's More Complex Than It Sounds*, FAST CO. (July 25, 2017), <https://www.fastcompany.com/40441194/why-does-spotify-keep-getting-sued> [<https://perma.cc/HAX7-5HBE>].

²⁹ *Id.*

errors and omissions insurance (E&O insurance) to cover the substantial risk that not all necessary rights have been acquired.³⁰ This process is expensive and time consuming.³¹

2. Right Holders

Both exploiter's options, non-use and unlicensed use, deprive the right holder of potential revenues. If a work is not used at all, the right holder inevitably gets nothing in return. If a work is used without a license, the right holder can sue for damages, but a legal dispute often involves high costs and an uncertain outcome. Even if a work is duly licensed by an exploiter, payments to the right holders can be delayed or not made at all because of incomplete and incorrect information.³²

Another issue for right holders is that because of its intangible character, providing valid proof of ownership of a work can often be difficult.³³ A right holder can thus be prevented from enforcing his or her rights if he or she is not able to prove ownership over the work.

3. Consumers

Exploiters frequently seek to pass on their costs associated with rights clearance to consumers, and this leads to higher prices for works. If a work is not exploited because of unclear rights, it will not be available to consumers at all.

4. Public

High costs for rights clearance can also prevent the development of new innovative services and can limit competition by raising market entry barriers for new competitors. Works are often not only exploited in their original form but are used as a basis for new works ("derivative works"), as is the case with remixes or mashups. Some of these uses can be covered by

³⁰ See Art Neill, *Errors & Omissions Insurance: A Safety Net for Your Business*, FORBES (Oct. 25, 2017), <https://www.forbes.com/sites/artneill/2017/10/25/errors-omissions-insurance-a-safety-net-for-your-business/#43631fa29cfa> [<https://perma.cc/S4MP-WHBK>].

³¹ See *id.*

³² U.S. COPYRIGHT OFF., *supra* note 20, at 125; Dani Deahl, *Metadata is the Biggest Little Problem Plaguing the Music Industry*, THE VERGE (May 29, 2019), <https://www.theverge.com/2019/5/29/18531476/music-industry-song-royalties-metadata-credit-problems> [<https://perma.cc/J5P8-9ZFT>]; Sherman Lee, *Embracing Blockchain Could Completely Change the Way Artists Sell Music and Interact with Fans*, FORBES (Apr. 25, 2018), <https://www.forbes.com/sites/shermanlee/2018/04/25/embracing-blockchain-could-completely-change-the-way-artists-sell-music-and-interact-with-fans/#2a0917961a25> [<https://perma.cc/RD74-AU4H>]; RETHINK MUSIC, *FAIR MUSIC: TRANSPARENCY AND PAYMENT FLOWS IN THE MUSIC INDUSTRY 14, 20* (2015), <https://www.berklee.edu/sites/default/files/Fair%20Music%20-%20Transparency%20and%20Payment%20Flows%20in%20the%20Music%20Industry.pdf> [<https://perma.cc/5T7F-EF9U>].

³³ VAN GOMPEL, *supra* note 7, at 45.

the Fair Use Doctrine under Section 107 of the Copyright Act,³⁴ especially when they are transformative as in the case of parody or criticism.³⁵ However, if works cannot be used for derivative works in the remaining cases because the identity of the right holder is unclear, the creative process can be impeded as well.³⁶

B. Fragmentation of Ownership

A copyright grants the right holder several exclusive rights with regard to the protected work, including, for example, the right to reproduce, distribute, or publicly perform the work.³⁷ Thus, a copyright is also called a “bundle of rights.” These rights are divisible, which means that a right holder can not only transfer the copyright as a whole, but also one or more of the exclusive rights.³⁸ Further, each of the exclusive rights can be owned by more than one owner, and each owner can have different quotes. The situation becomes all the more complex when the work in question comprises multiple copyrights, which is, as already mentioned, often the case for music where there are separate rights in the musical composition and the sound recording.³⁹

In many cases, right holders do not administer their rights on their own but entrust independent entities with rights management. Artists especially lack the capacity to organize the licensing of their songs to TV and radio stations, Internet platforms, bars and clubs, and other users. Songwriters as authors of the musical composition often assign portions of their rights to music publishers, such as Sony/ATV Music Publishing (Sony/ATV), Warner/Chappell Music, and Universal Music Publishing Group (UMPG).⁴⁰

Individual rights with respect to the musical composition are administered by separate entities in many cases. For example, the reproduction and distribution right (“mechanical right”) is administered by the Harry Fox Agency, Inc. (HFA),⁴¹ and the public performance right is administered by performing rights organizations (PROs), like the American

³⁴ 17 U.S.C. § 107.

³⁵ See, e.g., *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569 (holding that a parody of the song “Pretty Woman” was covered by fair use) (1994); *SunTrust Bank v. Houghton Mifflin Co.*, 268 F.3d 1257 (11th Cir. 2001) (holding that a critical sequel of the book “Gone with the Wind” was covered by fair use).

³⁶ Gibson, *supra* note 24, at 216.

³⁷ See 17 U.S.C. § 106.

³⁸ *Id.* § 201(d)(1).

³⁹ See discussion *supra* Section I.A.

⁴⁰ DONALD S. PASSMAN, ALL YOU NEED TO KNOW ABOUT THE MUSIC BUSINESS 220–24 (10th ed. 2019); U.S. COPYRIGHT OFF., *supra* note 20, at 18–19.

⁴¹ PASSMAN, *supra* note 40, at 231–32; see U.S. COPYRIGHT OFF., *supra* note 20, at 21.

Society of Composers, Authors and Publishers (ASCAP) or Broadcast Music, Inc. (BMI).⁴² For sound recordings, where authors are artists and producers,⁴³ the rights are generally controlled by the record companies, except for licenses for non-interactive webcasting and satellite radio, which are handled by SoundExchange.⁴⁴

Even if this concentration of rights reduces the points of contact for potential exploiters, the structure is still very complex, and the fragmentation of ownership has negative effects on exploiters, right holders, consumers, and the public. As there is no “one-stop shop” for licenses, the process of rights clearance is associated with high transaction costs. The distribution of payment streams to the right holders is also time-consuming.⁴⁵ Artists often have to wait a long time before they are paid their royalties.⁴⁶ Payment distribution also involves administrative costs. Here too, exploiters will seek to spread their costs by passing it onto their consumers. Finally, high costs can prevent new services and raise market entry barriers for new competitors.

C. *Lack of Transparency in Content Usage and Payments*

Another issue is the lack of transparency in tracking the usage of works and incoming payment as a basis for royalty calculation and distribution.⁴⁷ This mainly affects right holders, especially artists. In many cases, right holders do not get information on how often their works are used and which revenues are created, and this prevents them from verifying the calculation of royalties.⁴⁸ Furthermore, right holders do not have access to details with regard to content usage, including, for example, where and in what way their works are used.⁴⁹

D. *Inequality in Revenue Distribution*

Revenue distribution is also problematic, especially in the music industry. Owing to the success of streaming services such as Spotify or

⁴² PASSMAN, *supra* note 40, at 225–26; *see* U.S. COPYRIGHT OFF., *supra* note 20, at 20.

⁴³ U.S. COPYRIGHT OFF., *supra* note 20, at 21.

⁴⁴ PASSMAN, *supra* note 40, at 150; *see* U.S. COPYRIGHT OFF., *supra* note 20, at 22.

⁴⁵ Matej Michalko, *Op Ed: How Blockchain Technology Will Disrupt Digital Content Distribution*, BITCOIN MAGAZINE (Sep. 18, 2017), <https://bitcoinmagazine.com/articles/op-ed-how-blockchain-technology-will-disrupt-digital-content-distribution> [<https://perma.cc/877R-K9HB>].

⁴⁶ *Id.*; MARCUS O’DAIR, DISTRIBUTED CREATIVITY: HOW BLOCKCHAIN TECHNOLOGY WILL TRANSFORM THE CREATIVE ECONOMY 39 (2019); Imogen Heap, *Blockchain Could Help Musicians Make Money Again*, HARV. BUS. REV. (June 5, 2017), <https://hbr.org/2017/06/blockchain-could-help-musicians-make-money-again> [<https://perma.cc/3DRP-MV8C>].

⁴⁷ U.S. COPYRIGHT OFF., *supra* note 20, at 128; RETHINK MUSIC, *supra* note 32, at 10, 14, 16.

⁴⁸ Heap, *supra* note 46.

⁴⁹ *Id.*

Apple Music, music revenues are on the rise again. In 2019, revenues from recorded music in the United States grew by 13% to \$11.1 billion, while nearly 80% of the revenues came from streaming.⁵⁰ However, artists receive only a small portion of these revenues. For example, a study conducted by Citi GPS found that artist revenues have been rising over the past few years, but artists only received 12% of the revenues in 2017.⁵¹ The main cause for the inequality in revenue distribution in the music industry is the large number of intermediaries, all of whom have a share in the revenues.⁵²

E. Piracy

Another major issue is piracy. Works in digital format can be copied and distributed on the Internet at near-zero costs and without loss of quality. Piracy mainly affects right holders who are no longer able to effectively control the use of their works, and they are deprived of revenues. For example, a study conducted by Digital TV Research estimates that the loss of revenues because of online TV and movie piracy between 2010 and 2016 increased from \$6.7 billion to \$26.7 billion and will reach \$51.6 billion in 2022.⁵³

II. BLOCKCHAIN TECHNOLOGY AS A POTENTIAL SOLUTION

The shortcomings of the current system have been known for many years. Some of them have been addressed in the 2018 Music Modernization Act (MMA), which adapts the Copyright Act to digital forms of use, for example, by establishing a blanket license for digital music providers⁵⁴ and a publicly available database for musical works.⁵⁵ The MMA has been described as “the most important piece of legislation in a generation” by Senator Lamar Alexander.⁵⁶ However, time will tell whether these

⁵⁰ Mitch Glazier, *Charting a Path to Music’s Sustainable Success*, MEDIUM (Feb. 25, 2020), <https://medium.com/@RIAA/charting-a-path-to-musics-sustainable-success-12a5625bbc7d> [<https://perma.cc/87EB-BSBG>].

⁵¹ JASON B. BAZINET ET AL., PUTTING THE BAND BACK TOGETHER: REMASTERING THE WORLD OF MUSIC 61–63 (2018), <https://ir.citi.com/NhxmHW7xb0tkWiqOOG0NuPDM3pVGJpVzXMw7n%2BZg4AfFFX%2BeFqDYnfND%2B0hUxxXA> [<https://perma.cc/7ZXL-PLG9>].

⁵² DON TAPSCOTT & ALEX TAPSCOTT, BLOCKCHAIN REVOLUTION: HOW THE TECHNOLOGY BEHIND BITCOIN IS CHANGING MONEY, BUSINESS, AND THE WORLD 227, 229 (2d ed. 2018); BAZINET ET AL., *supra* note 51, at 62.

⁵³ DIGITAL TV RESEARCH, ONLINE TV & MOVIE PIRACY LOSSES TO SOAR TO \$52 BILLION (2017), <https://www.digitaltvresearch.com/ugc/press/219.pdf> [<https://perma.cc/J5RS-S5Q5>].

⁵⁴ 17 U.S.C. §§ 115(d)(1)–(2).

⁵⁵ *Id.* § 115(d)(3)(E).

⁵⁶ *Hatch, Alexander: President Trump Signs Into Law “Most Important Legislation in a Generation to Help Songwriters”*, LAMAR ALEXANDER, U.S. SENATOR FOR TENN. (Oct. 11, 2018),

amendments are sufficient to solve the problems in the current system. “To address twenty-first century challenges we need twenty-first century solutions,”⁵⁷ and blockchain technology may be that long-awaited solution. Several projects and start-ups already use blockchain technology in connection with the administration and distribution of copyright protected works. Some of them are introduced in this article to demonstrate the possible features of a blockchain-based solution as well as to engage with open questions and challenges.

This section presents an outline of how blockchain technology can be used as a basis for (A) a copyright register and for (B) the transfer of rights through smart contracts.

A. (Block-)Chain of Title: A Copyright Register on the Blockchain

A register that records the creation of works can provide information on ownership.⁵⁸ This would not only facilitate the process of rights clearance for potential users,⁵⁹ but can also help determine whether a work is still protected under copyright law or not.⁶⁰

A copyright register can enable right holders to prove ownership in their works.⁶¹ To avoid the problem of outdated registers, in addition to the initial creation of a work, all transfers of rights should be recorded as well.⁶²

There have been several attempts to create an international and universal database for musical works, such as the International Music Joint Venture by a group of collection societies, the International Music Registry by the World Intellectual Property Organization (WIPO), and the Global Repertoire Database by a group of music industry entities (including collection societies, PROs, and tech companies), but none of them have been

<https://www.alexander.senate.gov/public/index.cfm/pressreleases?ID=0AB30BE6-E3DE-417D-85CD-1F285993BE80> [<https://perma.cc/9LYT-MWWE>].

⁵⁷ Maria A. Pallante, *The Curious Case of Copyright Formalities*, 28 BERKELEY TECH. L.J. 1415, 1416 (2013).

⁵⁸ Gangjee, *supra* note 24, at 225–26; LESSIG, *supra* note 17, at 291; VAN GOMPEL, *supra* note 7, at 47; Jane C. Ginsburg, *The U.S. Experience with Mandatory Copyright Formalities: A Love/Hate Relationship*, 33 COLUM. J.L. & ARTS 311, 312–13 (2010); Stef van Gompel, *Copyright Formalities in the Internet Age: Filters of Protection or Facilitators of Licensing*, BERKELEY TECH. L.J. 1425, 1432 (2013); Christopher Jon Sprigman, *Berne’s Vanishing Ban on Formalities*, 28 BERKLEY TECH. L.J. 1565, 1567 (2013).

⁵⁹ LAWRENCE LESSIG, *THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD* 252 (2001); LESSIG, *supra* note 17, at 249; Gangjee, *supra* note 24, at 225–26, 248; van Gompel, *supra* note 58, at 1432; Sprigman, *supra* note 58, at 1567; Gibson, *supra* note 24, at 227–28.

⁶⁰ LESSIG, *supra* note 17, at 291; VAN GOMPEL, *supra* note 7, at 48–49; van Gompel, *supra* note 58, at 1432.

⁶¹ Gangjee, *supra* note 24, at 248; VAN GOMPEL, *supra* note 7, at 45.

⁶² VAN GOMPEL, *supra* note 7, at 48.

successful.⁶³ However, the idea of a comprehensive copyright database is still alive. For example, besides the musical works database introduced by the MMA, the PROs ASCAP and BMI also announced a database for musical works in 2017.⁶⁴

Can blockchain technology be used to establish a comprehensive and reliable copyright register? After (1) a short introduction to blockchain technology and (2) a description of the possible features of a blockchain-based solution, (3) open questions and challenges are discussed in this section.

1. Blockchain Technology in a Nutshell

Simply put, a blockchain is a highly tamper-resistant and transparent database. Datasets are bundled together into blocks, and each block is time-stamped and linked to the prior block with a hash value, which is an individual serial number that identifies the content of the previous block.⁶⁵ This leads to a chain of blocks that the technology gets its name from. As each block contains the hash value of the previous block, the contents of every block in the chain cannot be changed without the alteration of every subsequent block.⁶⁶ A new block will only be added to the chain if there is a consensus between the members of the network (“nodes”) on its validity.⁶⁷ An oft-used consensus mechanism is “proof of work,” where certain nodes (“miners”) have the opportunity to earn a fee or other reward by spending computational power to solve complex mathematical problems.⁶⁸ An alternative consensus mechanism is “proof of stake,” where the nodes to validate a block are chosen by their economic stake in the network.⁶⁹

⁶³ See Klementina Milosic, *GRD’s Failure*, MUSIC BUS. J. (Aug. 2015), <http://www.thembj.org/2015/08/grds-failure> [<https://perma.cc/Q73Z-RM7H>].

⁶⁴ *ASCAP & BMI Announce Creation of a New Comprehensive Musical Works Database to Increase Ownership Transparency in Performing Rights Licensing*, ASCAP (July 26, 2017), <https://www.ascap.com/press/2017/07-26-ascap-bmi-database> [<https://perma.cc/K7VA-4NJ9>].

⁶⁵ WILLIAM MOUGAYAR, *THE BUSINESS BLOCKCHAIN: PROMISE, PRACTICE, AND APPLICATION OF THE NEXT INTERNET TECHNOLOGY* 25 (2016); SHERMIN VOSHMIGIR, *TOKEN ECONOMY: HOW BLOCKCHAINS AND SMART CONTRACTS REVOLUTIONIZE THE ECONOMY* 38–39 (2019); Kevin Werbach & Nicolas Cornell, *Contracts Ex Machina*, 67 DUKE L.J. 313, 327 (2017).

⁶⁶ PRIMAVERA DE FILIPPI & AARON WRIGHT, *BLOCKCHAIN AND THE LAW: THE RULE OF CODE* 25 (2018); VOSHMIGIR, *supra* note 65, at 53, 61; Werbach & Cornell, *supra* note 65, at 327.

⁶⁷ DE FILIPPI & WRIGHT, *supra* note 66, at 42; MOUGAYAR, *supra* note 65, at 20; VOSHMIGIR, *supra* note 65, at 54; Werbach & Cornell, *supra* note 65, at 327.

⁶⁸ DE FILIPPI & WRIGHT, *supra* note 66, at 23–26, 40; VOSHMIGIR, *supra* note 65, at 54, 60; Werbach & Cornell, *supra* note 65, at 328.

⁶⁹ DE FILIPPI & WRIGHT, *supra* note 66, at 57; VOSHMIGIR, *supra* note 65, at 71; KEVIN WERBACH, *THE BLOCKCHAIN AND THE NEW ARCHITECTURE OF TRUST* 57 (2018).

The database is not stored centrally but is distributed over the network.⁷⁰ Every node maintains a complete copy of the database, which is permanently updated when new blocks are added.⁷¹ This mode of distribution creates resilience because there is no single point of failure.⁷² Even in the event that the database kept by one or more network participants becomes corrupt, it will still be available on the network.⁷³ The decentralized storage of information is an additional safeguard against tampering, as the change in one or a few copies of the database will be ignored by the other nodes.⁷⁴

Data on a blockchain are stored chronologically and are visible to all participants of the blockchain, and this creates a high level of transparency.⁷⁵ Another feature of blockchain technology is pseudonymity. By using digital signatures and private-public key cryptography, users do not have to reveal their true identities when they store information on the blockchain or are involved in transactions.⁷⁶

2. *Features of a Blockchain-Based Copyright Register*

A blockchain-based copyright register can (a) provide right holders and users with comprehensive and reliable ownership information, and allow right holders (b) to tokenize works and rights and (c) control the usage of works.

a. *Availability of Comprehensive and Reliable Ownership Information*

Under the current legal framework, registration with the U.S. Copyright Office requires the submission of the name and address of the right holder,⁷⁷ the title of the work,⁷⁸ and the date of its publication.⁷⁹ The musical works database established by the MMA asks for similar information.⁸⁰ This information can also be included in a blockchain-based copyright register. If

⁷⁰ DE FILIPPI & WRIGHT, *supra* note 66, at 35; MOUGAYAR, *supra* note 65, at 21, 23; VOSHMIGIR, *supra* note 65, at 52; Werbach & Cornell, *supra* note 65, at 327.

⁷¹ DE FILIPPI & WRIGHT, *supra* note 66, at 35; WERBACH, *supra* note 69, at 96; VOSHMIGIR, *supra* note 65, at 52–53; Werbach & Cornell, *supra* note 65, at 327.

⁷² MOUGAYAR, *supra* note 65, at 46, 130.

⁷³ DE FILIPPI & WRIGHT, *supra* note 66, at 36; MOUGAYAR, *supra* note 65, at 130.

⁷⁴ DE FILIPPI & WRIGHT, *supra* note 66, at 2, 36; WERBACH, *supra* note 69, at 101–02.

⁷⁵ DE FILIPPI & WRIGHT, *supra* note 66, at 37–38; WERBACH, *supra* note 69, at 105; Werbach & Cornell, *supra* note 65, at 327.

⁷⁶ DE FILIPPI & WRIGHT, *supra* note 66, at 2, 38; MOUGAYAR, *supra* note 65, at 46; TAPSCOTT & TAPSCOTT, *supra* note 52, at 44; WERBACH, *supra* note 69, at 105.

⁷⁷ 17 U.S.C. § 409(1).

⁷⁸ *Id.* § 409(6).

⁷⁹ *Id.* § 409(8).

⁸⁰ *Id.* § 115(d)(3)(E)(ii).

a work has more than one right holder, details on the percentage of ownership can be recorded.

The registration is time-stamped to record its exact date.⁸¹ The U.S. Copyright Office also requires a deposit of the work.⁸² As this allows potential users to identify the work and determine the scope of protection, a deposit can also be a prerequisite for registering a work on a blockchain-based register. Furthermore, information from deposited works can be used for usage control.⁸³

Registering a work with the U.S. Copyright Office takes a lot of time. Even if registration is completed online and no further correspondence is necessary, the processing time ranges from one to five months with an average of more than two months.⁸⁴ In certain circumstances, expedited processing is available for an additional fee.⁸⁵ As a copyright register on the blockchain requires no central authority, recording ownership data on a blockchain can be done within seconds or minutes.⁸⁶ To simplify the process of registering works, a “registration button” can be included in content creation devices and software that allows a “one-click registration” of works on the blockchain.

In addition to the initial creation of a work, subsequent transfers of rights can also be saved on the blockchain register. Here too, the transaction can be time-stamped to file its exact date.⁸⁷ As information on a blockchain is stored chronologically, the chain of title for a specific work can be easily retraced and verified. If smart contracts⁸⁸ are used for the transfer of rights, the new right holder can be added automatically to the register.⁸⁹ The dissemination of the register over the network ensures that every participant always has an up-to-date version.

⁸¹ Troy Norcross, *Digital Rights Blockchain*, CITY A.M. (May 12, 2020), <https://www.cityam.com/digital-rights-blockchain/> [https://perma.cc/J477-W8HA].

⁸² 17 U.S.C. § 408(b); *see also* § 407 (establishing a deposit obligation for the benefit of the Library of Congress, where noncompliance does not affect copyright protection but can be punished with a fine).

⁸³ *See discussion infra* Section II.A.2.c.

⁸⁴ *Registration Processing Times*, U.S. COPYRIGHT OFF., <https://www.copyright.gov/registration/docs/processing-times-faqs.pdf> [https://perma.cc/6P6W-JQT6].

⁸⁵ U.S. COPYRIGHT OFF., COMPENDIUM OF U.S. COPYRIGHT PRACTICES § 207 (3d ed. 2017).

⁸⁶ Primavera De Filippi et al., *How Blockchains Can Support, Complement, or Supplement Intellectual Property*, COALA 5, https://www.intgovforum.org/multilingual/index.php?q=filedepot_download/4307/529 [https://perma.cc/8THU-CUBU].

⁸⁷ Alexander Savelyev, *Copyright in the Blockchain Area: Promises and Challenges*, NAT’L RES. U. HIGHER SCH. OF ECONS. 8 (Nov. 21, 2017) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3075246.

⁸⁸ Smart contracts are computer programs built to execute and/or enforce contractual terms automatically. *See discussion infra* Section II.B.1.

⁸⁹ *See discussion infra* Section II.B.2.a.

Some databases for copyright protected works already utilize blockchain technology. An example of this is the blockchain-based image rights management platform known as “ImageRights,” which allows photographers and agencies to register images associated with ownership information on the blockchain.⁹⁰ Traditional players are also exploring the use of blockchain technology. For example, ASCAP and the collection societies SACEM (France) and PRS For Music (UK) set up an initiative to create a blockchain-based register in 2017,⁹¹ and WIPO created a Blockchain Task Force in 2018.⁹²

A blockchain-based copyright register that ensures comprehensive and reliable information on works and right holders can facilitate the clearing of rights.⁹³ Reliability and transparency can allow right holders to prove their ownership in a specific work.⁹⁴ A register that contains information on the author, the date of creation, and the date of publication of the work can also help users determine whether a work is still protected under copyright law or not. One can also consider importing the author’s date of death from public death records to automatically flag the expiration of the term of protection of their works. Although connecting a copyright register to various public registers worldwide is not realistic at the moment, implementation can be more viable if blockchain-based public registers are

⁹⁰ See IMAGERIGHTS, <https://www.imagerights.com/> [<https://perma.cc/3SHS-HNET>].

⁹¹ *ASCAP, SACEM, and PRS for Music Initiate Joint Blockchain Project to Improve Data Accuracy for Rightsholders*, ASCAP (Apr. 7, 2017), <https://www.ascap.com/press/2017/04-07-ascap-sacem-prs-blockchain> [<https://perma.cc/Z7PA-LLV3>].

⁹² *Blockchain Task Force: Background Information*, WIPO, <https://www.wipo.int/cws/en/taskforce/blockchain/background.html> [<https://perma.cc/5BN3-DAQB>]. In 2020, WIPO launched WIPO Proof, an online service which allows users to register creative works such as art, music, lyrics, and software to create digital evidence. See *FAQ*, WIPO, <https://wipoproof.wipo.int/wdts/faqs.xhtml> [<https://perma.cc/GRE2-RD8E>]. It should be noted that although some of the technical features (e.g., hashing, timestamping) are similar, the service is not currently using blockchain technology. See *id.*

⁹³ TAPSCOTT & TAPSCOTT, *supra* note 52, at 233; O’DAIR, *supra* note 46, at 39; Lee, *supra* note 32; JAMES G. GATTO ET AL., *HOW BLOCKCHAIN TECHNOLOGY CAN IMPROVE THE MUSIC INDUSTRY* (2018); Balázs Bodó et al., *Blockchain and Smart Contracts: The Missing Link in Copyright Licensing?*, 26 INT’L J.L. & INFO. TECH. 311, 328, 330 (2018); Patrick Murk, *The True Value of Bitcoin*, CATO UNBOUND (July 31, 2013), <https://www.cato-unbound.org/2013/07/31/patrick-murck/true-value-bitcoin> [<https://perma.cc/2KDA-76XZ>].

⁹⁴ TAPSCOTT & TAPSCOTT, *supra* note 52, at 46, 237; ANTHONY MCGUIRE, *MUSIC ON THE CHAIN: A STORY OF BLOCKCHAIN, THE NEW FRONTIER OF CREATIVITY* 37–38 (2018); Birgit Clark, *Blockchain and IP Law: A Match made in Crypto Heaven?*, WIPO MAGAZINE (Feb. 2018), https://www.wipo.int/wipo_magazine/en/2018/01/article_0005.html [<https://perma.cc/BD8G-S2CF>]; Annabel Tresise et al., *What Blockchain Can and Can’t Do for Copyright*, 28 AUSTR. INTELL. PROP. J. 2, 5 (2018); De Filippi et al., *supra* note 86, at 10; Murk, *supra* note 93.

established, which is, for example, currently being explored by the state of Illinois.⁹⁵

To obtain information on a specific work, one could search the copyright register on the blockchain as one would with a traditional database, using, for example, the title of the work. However, it would be more efficient if the work itself already contains relevant information. For example, a work in digital format like an image or music file can provide the information in its metadata.⁹⁶ Similarly, a work on a tangible medium, such as a painting or CD, can store information on a radio frequency identification (RFID) chip. To avoid outdated information, there should be data exchange between the register and the work so that once the register has been updated, information attached to the work is updated as well.⁹⁷ Another possibility can be to equip the work with a reference that points to the register. For example, a digital work can have a hyperlink to the respective record on the register in its metadata, like offered by the start-up Verifi.⁹⁸ A tangible work can have a hash value or a quick response (QR) code on the back, which can allow a user to find information in the register.

b. Tokenization of Works and Rights

Copyright protected works can also be converted into tokens,⁹⁹ which are digital representations of assets on the blockchain that can be transferred.¹⁰⁰

These tokens can represent the work itself, a copy of the work, or specific rights in the work. There is also the possibility of subdivision so that each token represents a share in a work or a right. For example, the start-up Maecenas tokenizes artworks and allows everyone to own and trade shares in the work.¹⁰¹ Tokens representing works or specific rights can also be issued for future works that allow (future) right holders to receive financial support for the completion of the project. For example, the book publishing platform

⁹⁵ Pat Franks, *Blockchain for Identity Management: Can a Case be Made to Begin at Birth?*, CIRI BLOG (May 2, 2019), <https://ischool.sjsu.edu/ciri-blog/blockchain-identity-management-can-case-be-made-begin-birth> [<https://perma.cc/5ZLG-7UQV>].

⁹⁶ Clark, *supra* note 94.

⁹⁷ van Gompel, *supra* note 58, at 1436.

⁹⁸ VERIFI, <https://verifi.media/index.html> [<https://perma.cc/A68E-VNHC>] (navigate to “Frequently Asked Questions” and click “How does Verifi modernize rights data management?”).

⁹⁹ O’DAIR, *supra* note 46, at 48; Michèle Finck & Valentina Moscon, *Copyright Law on Blockchains: Between New Forms of Rights Administration and Digital Rights Management 2.0*, 50 IIC 77, 94 (2019), <https://link.springer.com/content/pdf/10.1007%2Fs40319-018-00776-8.pdf> [<https://perma.cc/H4U9-CN8T>]; Bodó et al., *supra* note 93, at 314–15.

¹⁰⁰ VOSHMGIR, *supra* note 65, at 139–40, 215–16. The term token is often used as a synonym for a cryptocurrency, but a token can represent any form of economic value.

¹⁰¹ See *What is Maecenas?*, MAECENAS, <https://www.maecenas.co/whats-maecenas/> [<https://perma.cc/9545-HU8Y>].

Publica enables writers to pre-sell their upcoming books as tokens.¹⁰² The information entered into a copyright register can form the basis for the creation of tokens. If smart contracts are used, the transfer of tokens can be performed without incurring high transaction costs.¹⁰³

c. Usage Control

A copyright register on the blockchain can also help right holders control the usage of their works. There are already automated systems that monitor content usage on the Internet. One of the most prominent examples is YouTube's Content ID for audio and video works. Right holders have to upload a sample of their work, and the system performs a scan for uses of the work within YouTube.¹⁰⁴ Once a use is detected, the right holder is notified and can decide how he or she wants to proceed: block or monetize the content, or track viewership statistics.¹⁰⁵ If such a system is connected to a comprehensive copyright register which also requires the deposit of registered works, the system can perform automated scans without the need for right holders to enter information or upload a copy of the work for different platforms. For example, the platform ImageRights allows right holders not only to register their works but also to perform automated scans for images and automated proceedings for infringements.¹⁰⁶

In addition to the original version of a work, each individual copy issued by a right holder to a licensed user can be registered on the blockchain in the form of tokens.¹⁰⁷ The system can check whether a specific copy is duly licensed. If not, it can automatically submit a takedown notice¹⁰⁸ to the provider of the platform or send an offer to license the work to the infringer.¹⁰⁹ The registration of individual copies can also offer the possibility of tracing the work back to its source.¹¹⁰ This increases the risk of discovery for people who disseminate works without the right holder's authorization.

3. Open Questions and Challenges

As seen in the previous section, a blockchain-based copyright register offers various possibilities with regard to the administration and distribution

¹⁰² See *What is a Book ICO?*, PUBLICA, <https://publica.com> [<https://perma.cc/GD7L-5MUG>].

¹⁰³ See discussion *infra* Section II.B.2.a.

¹⁰⁴ See *How Content ID Works*, YOUTUBE, <https://support.google.com/youtube/answer/2797370> [<https://perma.cc/2CJ6-ZX2S>].

¹⁰⁵ See *id.*

¹⁰⁶ See *Image Rights Discovery Services*, IMAGERIGHTS, <https://www.imagerights.com/discovery> [<https://perma.cc/3EKU-KPCT>].

¹⁰⁷ Savelyev, *supra* note 87, at 10.

¹⁰⁸ 17 U.S.C. § 512(c).

¹⁰⁹ Savelyev, *supra* note 87, at 10.

¹¹⁰ *Id.*

of copyright protected works, but there are still open questions and challenges. Some of them are discussed in this section: for example, (a) technical limitations of blockchain technology, (b) type of blockchain used, (c) administration and funding of the register, (d) data integration from various sources, (e) risk of abuse, (f) liability of bona fide users, (g) confidentiality and privacy concerns, (h) remaining transaction costs, (i) “over-licensing” and “over-enforcement,” (j) unstoppable file-sharing and streaming platforms, (k) evidential value of registrations, (l) identification of digital content, and (m) dependence on network effects.

a. Technical Limitations of Blockchain Technology

The first challenge lies in the technical limitations of the blockchain technology, which affects (i) scalability, (ii) security, and (iii) data correction.

i. Scalability

The most obvious technical restriction of blockchain technology is its lack of scalability when compared to a traditional database. Blockchains are limited by the frequency of transactions processed. For example, the Bitcoin blockchain processes between 3.3 and seven transactions per second,¹¹¹ the Ethereum blockchain supports approximately fifteen transactions per second.¹¹² In addition, blockchains consume a high amount of energy, especially when they rely on the proof of work consensus mechanism.¹¹³ It should also be noted that a blockchain is an append-only database which means that the more information stored, the more storage space, bandwidth, and computational power are needed.¹¹⁴ For these reasons, it is advisable to use a blockchain as the basis for a copyright register that does not apply a proof of work consensus mechanism but instead provides a different form of validation, for example, by user voting or by providing incentives for “good behavior” through (financial) rewards or reputation systems.¹¹⁵

Another problem is that in order to identify the registered work, right holders have to upload digital copies of their works.¹¹⁶ Digital content can be

¹¹¹ KYLE CROMAN ET AL., ON SCALING DECENTRALIZED BLOCKCHAINS (2016) <https://www.comp.nus.edu.sg/~prateeks/papers/Bitcoin-scaling.pdf> [<https://perma.cc/8N92-EWH9>].

¹¹² Alyssa Hertig, *How Will Ethereum Scale?*, COINDESK (Mar. 30, 2017), <https://www.coindesk.com/information/will-ethereum-scale> [<https://perma.cc/9F8L-CKKX>].

¹¹³ TAPSCOTT & TAPSCOTT, *supra* note 52, at 259; WERBACH, *supra* note 69, at 57, 99; O’DAIR, *supra* note 46, at 90; MOUGAYAR, *supra* note 65, at 26; Mike Orcutt, *Blockchains Use Massive Amounts of Energy—But There’s a Plan to Fix That*, MIT TECH. REV. (Nov. 16, 2017), <https://www.technologyreview.com/s/609480/bitcoin-uses-massive-amounts-of-energy-but-theres-a-plan-to-fix-it/> [<https://perma.cc/PG28-TGHK>].

¹¹⁴ DE FILIPPI & WRIGHT, *supra* note 66, at 56.

¹¹⁵ De Filippi et al., *supra* note 86, at 6; O’DAIR, *supra* note 46, at 71.

¹¹⁶ See discussion *supra* Section II.A.2.a.

stored on the blockchain,¹¹⁷ but because of the enormous amount of storage and computational power that would be necessary to save entire songs or movies, this seems impractical. As an alternative, not the work itself but its hash value, which serves as an individual “serial number” and allows the definitive identification of a work, can be written to the blockchain.¹¹⁸ However, the information on works and their right holders alone can exceed the capacity of existing blockchains.¹¹⁹ Further, when only hash values of works are saved on the blockchain, the question arises as to how the original version can be maintained in an accessible manner and linked to the register.¹²⁰

Here, storage platforms based on the InterPlanetary File System (IPFS) could offer a solution. With IPFS, files are not stored on a blockchain but on a separate distributed network.¹²¹ To link these files to the blockchain, unchangeable and permanent references to the files are created and saved on the blockchain.¹²²

ii. Security

Another issue with blockchain technology is its security. Owing to the use of cryptography and dissemination over the network, data stored on a blockchain are highly tamper-resistant but are still not completely immune to alteration. For example, an attacker who controls the majority of the computational power may be able to change records on the blockchain (a “51% attack”).¹²³ However, the more a blockchain is distributed over the network, the more expensive and therefore unlikely such an attempt will become.¹²⁴ Another problem is the development of quantum computers that can threaten the cryptographic security that blockchain technology relies

¹¹⁷ DE FILIPPI & WRIGHT, *supra* note 66, at 42; Jeffrey Neuburger, *Blockchain as a Content Distribution Technology: Copyright Issues Abound*, BLOCKCHAIN AND THE LAW (May 14, 2018), <https://www.blockchainandthelaw.com/2018/05/blockchain-as-a-content-distribution-technology-copyright-issues-abound/> [https://perma.cc/M6KW-ZJD8].

¹¹⁸ O’DAIR, *supra* note 46, at 33; Tresise et al., *supra* note 94, at 5; TAPSCOTT & TAPSCOTT, *supra* note 52, at 46.

¹¹⁹ DAVID GERARD, ATTACK OF THE 50 FOOT BLOCKCHAIN: BITCOIN, BLOCKCHAIN, ETHEREUM & SMART CONTRACTS 131 (2017).

¹²⁰ Savelyev, *supra* note 87, at 13.

¹²¹ *Here’s How IPFS Works*, IPFS, <https://ipfs.io/#how> [https://perma.cc/5TMY-5ZDU].

¹²² *Id.*

¹²³ WERBACH, *supra* note 69, at 119; VOSHMIR, *supra* note 65, at 61; Mike Orcutt, *Once Hailed as Unhackable, Blockchains are Now Getting Hacked*, MIT TECH. REV. (Feb. 19, 2019), <https://www.technologyreview.com/s/612974/once-hailed-as-unhackable-blockchains-are-now-getting-hacked/> [https://perma.cc/AV49-ZT5B]; see GERARD, *supra* note 119, at 131.

¹²⁴ DE FILIPPI & WRIGHT, *supra* note 66, at 25; WERBACH, *supra* note 69, at 100.

on.¹²⁵ On the other hand, quantum computers can also be used to increase the security of blockchains.¹²⁶

iii. Data Correction

The fact that data on the blockchain cannot be altered can be a problem if data must be modified, for example, when information was entered incorrectly or when there is a change in ownership because rights are transferred to another party.¹²⁷ In this context it should be noted that the immutability of existing data does not prevent the addition of new information in order to update previous entries.

b. Type of Blockchain Used

There is not only one blockchain (“The Blockchain”) but a variety of blockchains with different features. Therefore, the question arises which kind of blockchain can be used as a basis for a copyright register.

i. Public or Private Blockchain

A distinction can be made between public¹²⁸ and private¹²⁹ blockchains. On a public blockchain, like the one used by Bitcoin or Ethereum, everyone with a computer and an Internet connection can access existing information and add new information.¹³⁰ Private blockchains, however, have a supervising entity that grants only selected actors access and editing rights.¹³¹ There is also the possibility of hybrid forms, which, for example, enables everyone to see entries but reserves adding information to selected parties.¹³² Owing to the size of the network in which the blockchain is distributed, public blockchains offer better protection against tampering and loss of data.¹³³ They also increase transparency because everyone can access the information stored on the blockchain. An advantage of private blockchains

¹²⁵ Aleksey K. Fedorov et al., *Quantum Computers Put Blockchain Security at Risk*, NATURE (Nov. 19, 2018), <https://www.nature.com/articles/d41586-018-07449-z> [<https://perma.cc/WR3G-AHS4>].

¹²⁶ *Id.*

¹²⁷ Finck & Moscon, *supra* note 99, at 98.

¹²⁸ Public blockchains are often also referred to as permissionless blockchains.

¹²⁹ Private blockchains are often also referred to as permissioned blockchains.

¹³⁰ TAPSCOTT & TAPSCOTT, *supra* note 52, at 67; DE FILIPPI & WRIGHT, *supra* note 66, at 2, 31; VOSHMGIR, *supra* note 65, at 73; Allison Berke, *How Safe are Blockchains? It Depends.*, HARV. BUS. REV. (Mar. 7, 2017), <https://hbr.org/2017/03/how-safe-are-blockchains-it-depends> [<https://perma.cc/K8CJ-3TG9>].

¹³¹ TAPSCOTT & TAPSCOTT, *supra* note 52, at 67; DE FILIPPI & WRIGHT, *supra* note 66, at 31; VOSHMGIR, *supra* note 65, at 73; WERBACH, *supra* note 69, at 59; Berke, *supra* note 130.

¹³² VOSHMGIR, *supra* note 65, at 73; Catherine Mulligan et al., *Blockchain Beyond the Hype: A Practical Framework for Business Leaders* 5 (Apr. 2018), http://www3.weforum.org/docs/48423_Whether_Blockchain_WP.pdf [<https://perma.cc/3KGN-Q625>].

¹³³ TAPSCOTT & TAPSCOTT, *supra* note 52, at 67; DE FILIPPI & WRIGHT, *supra* note 66, at 32.

is that less sophisticated validation systems are necessary if the parties admitted to the blockchain are already trustworthy.¹³⁴

The idea behind a copyright register on the blockchain is that every right holder should be able to register his or her works in an uncomplicated manner without relying on a central authority or a trusted third party. In addition, every potential user should be able to retrieve the information stored on the blockchain. All this suggests a public blockchain.

ii. Existing or New Blockchain

Should an existing blockchain, for example, the Bitcoin or Ethereum blockchain, or a blockchain specifically designed for a copyright register be used? An existing blockchain has the advantage of already being widely used and distributed, which improves protection against tampering and loss of data.¹³⁵ However, transaction fees for existing blockchains can rise when the number of users and processed transactions increase.¹³⁶ In addition, blockchains for cryptocurrencies use technical features that do not necessarily have to be just as suitable for storing information on works and right holders, especially with regard to the consensus mechanism used.¹³⁷ Therefore, there is a strong case for using a blockchain that has been specially designed to suit the requirements of a copyright register.

c. Administration and Funding of a Copyright Register

Should a blockchain-based copyright register be administered by a public authority, like the U.S. Copyright Office? On the one hand, the U.S. Copyright Office has extensive experience managing a copyright register. However, another option may be to entrust publicly-regulated private registrars, like the ones used for the registration of domain names, with the administration of the register.¹³⁸ This is advantageous because several private entities can handle a large number of registrations better than a single agency.¹³⁹

Private registrars can compete with respect to the level of fees or additional services that would ensure the cheapest and best service for right holders and users.¹⁴⁰ The concerns that private registrars may disappear and

¹³⁴ TAPSCOTT & TAPSCOTT, *supra* note 52, at 67; DE FILIPPI & WRIGHT, *supra* note 66, at 32; WERBACH, *supra* note 69, at 60.

¹³⁵ DE FILIPPI & WRIGHT, *supra* note 66, at 25; TAPSCOTT & TAPSCOTT, *supra* note 52, at 41; Werbach & Cornell, *supra* note 65, at 328–29.

¹³⁶ DE FILIPPI & WRIGHT, *supra* note 66, at 41.

¹³⁷ See discussion *supra* Section II.A.3.a.i.

¹³⁸ LESSIG, *supra* note 17, at 289; Gangjee, *supra* note 24, at 239.

¹³⁹ Gangjee, *supra* note 24, at 239.

¹⁴⁰ LESSIG, *supra* note 17, at 289; Gangjee, *supra* note 24, at 239.

that data may be lost in the process¹⁴¹ are not justified if the register is stored on a public blockchain. Owing to the dissemination of the blockchain over the network, data will still be available even if the registrar that stored the data for the first time ceases to exist.¹⁴² If a public blockchain is used, everyone can add and access information on works without a trusted third party or authority being involved, so that even private registrars will not be necessary.

However, even if an already existing blockchain serves as a basis for the register, the provision of necessary technical infrastructure and the administration of the register will incur costs. It may therefore be appropriate to charge a fee, as is the case for registrations with the U.S. Copyright Office.¹⁴³ The electronic registration of a single work currently costs \$45; the electronic recording of documents, which include the recording of the transfer of rights, is priced at \$95.¹⁴⁴ However, the costs for a register on the blockchain can be much lower than those incurred on a traditional database.¹⁴⁵ For example, right holders can carry out the registration process themselves, and if smart contracts are used for the transfer of rights, new right holders can be added automatically to the register.¹⁴⁶

d. Data Integration from Various Sources

There are already databases for copyright protected works. For example, the PROs maintain databases for their repertoire of musical works,¹⁴⁷ and the U.S. Copyright Office offers a database for works in general.¹⁴⁸ There are several private entities that hold copyright information as well.¹⁴⁹ Some of them offer a registration system for right holders, while others, like online platforms, exploit content and collect copyright information for this purpose.

¹⁴¹ Gangjee, *supra* note 24, at 239.

¹⁴² TAPSCOTT & TAPSCOTT, *supra* note 52, at 46; De Filippi et al., *supra* note 86, at 11; Savelyev, *supra* note 87, at 9.

¹⁴³ 17 U.S.C. § 708(a).

¹⁴⁴ Fees, U.S. COPYRIGHT OFF., <https://www.copyright.gov/about/fees.html> [<https://perma.cc/5MNX-VPGY>].

¹⁴⁵ De Filippi et al., *supra* note 86, at 5.

¹⁴⁶ See discussion *infra* Section II.B.2.a.

¹⁴⁷ See, e.g., *BMI Search*, BMI, <https://www.bmi.com/search> [<https://perma.cc/E6DA-USGW>]; *ASCAP Clearance Express (ACE) Repertory*, ASCAP, <https://www.ascap.com/repertory> [<https://perma.cc/WJJ3-R3EU>].

¹⁴⁸ See *Copyright Catalog*, U.S. COPYRIGHT OFF., <http://cocatalog.loc.gov/cgi-bin/Pwebrecon.cgi?DB=local&PAGE=First> [<https://perma.cc/LXL3-Y7GT>].

¹⁴⁹ See MARCO RICOLFI ET AL., SURVEY OF PRIVATE COPYRIGHT DOCUMENTATION SYSTEMS AND PRACTICES 4 (2011), https://www.wipo.int/export/sites/www/meetings/en/2011/wipo_cr_doc_ge_11/pdf/survey_private_crdocsystems.pdf [<https://perma.cc/APD7-TLVQ>].

A major problem is that information is scattered across many different databases,¹⁵⁰ and not every database is available to the public.¹⁵¹ The integration of data from different sources is cost-intensive, and entities that maintain such databases often have different interests. For example, the abovementioned Global Repertoire Database was not pursued further when some of the parties pulled out.¹⁵² Possible reasons given are disputes around funding and control over the database, fear among the parties around losing revenues under a more efficient licensing system, and even fear of their redundancy.¹⁵³ The problem that not every entity holding copyright information is interested in contributing their information to a copyright register can be fixed if Congress requires these entities to share their copyright information. For example, data in the musical works database established under the MMA are not only available “to members of the public in a searchable, online format”¹⁵⁴ but also to entities “in a bulk, machine-readable format, through a widely available software application.”¹⁵⁵ Even without such a legal obligation, increased cooperation can result from the fact that a large amount of information is already public and thus the retention of information is no longer considered necessary.¹⁵⁶

Even if existing databases are successfully linked together and migrated to a blockchain-based register, there is still a problem pertaining to the quality of the data. Information stored on a blockchain is highly tamper-resistant, but blockchain technology itself is not a magic cure for poor quality data.¹⁵⁷ In computer science, this is referred to as “Garbage In, Garbage Out,” which means that whenever you provide a computer with flawed data, the output will also be flawed. For example, existing databases for music often have to deal with incomplete, inaccurate, and contradictory information.¹⁵⁸

¹⁵⁰ van Gompel, *supra* note 58, at 1450.

¹⁵¹ *Id.* at 1451–52.

¹⁵² Milosic, *supra* note 63.

¹⁵³ *Id.*

¹⁵⁴ 17 U.S.C. § 115(d)(3)(E)(v).

¹⁵⁵ *Id.*

¹⁵⁶ Bodó et al., *supra* note 93, at 329.

¹⁵⁷ DE FILIPPI & WRIGHT, *supra* note 66, at 114; O’DAIR, *supra* note 46, at 139; Kai Stinchcombe, *Blockchain is Not Only Crappy Technology But a Bad Vision For the Future*, MEDIUM (Apr. 5, 2018), <https://medium.com/@kaistinchcombe/decentralized-and-trustless-crypto-paradise-is-actually-a-medieval-hellhole-clca122efdec> [<https://perma.cc/FH35-BUHC>]; Finck & Moscon, *supra* note 99, at 98; Bodó et al., *supra* note 93, at 328.

¹⁵⁸ Milosic, *supra* note 63; Jeremy Silver, *Blockchain or the Chaingang? Challenges, Opportunities and Hype: The Music Industry and Blockchain Technologies*, CREATE Working Paper 2016/05, 50 (May 2016), <https://www.create.ac.uk/publications/blockchain-or-the-chaingang-challenges-opportunities-and-hype-the-music-industry-and-blockchain-technologies/> [<https://perma.cc/HR3S-2M72>]; Deahl, *supra* note 32.

Different databases frequently use different data standards,¹⁵⁹ and this makes it even more difficult to merge them. However, it is never too late to start. Even if these problems affect existing works, blockchain technology can be used to record the creation of works and transfers of rights with regard to future works using one standard format.¹⁶⁰ Furthermore, the automated registration of the creation of works and transfers of rights can ensure more complete and accurate information. If this proves effective, information on existing works can be individually reviewed and gradually added to the blockchain register. Algorithms and Artificial Intelligence (AI) can be relied on for this task. This process will involve additional costs, but these costs may be covered by fees that can be shifted onto right holders when they register their works and/or transfer their rights.¹⁶¹

e. Risk of Abuse

A copyright register on the blockchain is highly tamper-resistant with regard to the alteration of existing data, but this does not prevent bad faith registrations,¹⁶² such as someone registering another person's work and claiming the work to be his own. The risk of abuse is even higher when everyone can register works on the blockchain.¹⁶³

However, it should be noted that misuse is also possible under the current system. The U.S. Copyright Office examines whether the registered work satisfies the requirements for copyright protection and whether other legal and formal requirements have been met,¹⁶⁴ but facts stated in the registration are not verified unless they are contradictory.¹⁶⁵ The U.S. Copyright Office also does not verify whether the same or similar work has been registered previously.¹⁶⁶ It is therefore possible that a work may be registered by different people. For example, in April 2019, Craig Wright, an Australian computer scientist and self-proclaimed Bitcoin inventor, registered Nakamoto's Bitcoin whitepaper¹⁶⁷ and the initial source code of the Bitcoin software¹⁶⁸ with the U.S. Copyright Office and claimed

¹⁵⁹ U.S. COPYRIGHT OFF., *supra* note 20, at 123–24; Deahl, *supra* note 32.

¹⁶⁰ O'DAIR, *supra* note 46, at 71.

¹⁶¹ See discussion *supra* Section II.A.3.c.

¹⁶² DE FILIPPI & WRIGHT, *supra* note 66, at 114; O'DAIR, *supra* note 46, at 71; Finck & Moscon, *supra* note 99, at 98.

¹⁶³ DE FILIPPI & WRIGHT, *supra* note 66, at 114 n.40.

¹⁶⁴ 17 U.S.C. § 410(a).

¹⁶⁵ U.S. COPYRIGHT OFF., COMPENDIUM OF U.S. COPYRIGHT PRACTICES § 602.4(C) (3d ed. 2017).

¹⁶⁶ *Id.* § 602.4(D).

¹⁶⁷ Registration number: TXu002136996, United States Copyright Office.

¹⁶⁸ Registration number: TX0008708058, United States Copyright Office.

authorship.¹⁶⁹ This caused a big stir in the blockchain scene, and as a response, Wei Liu, a crypto-entrepreneur from China, also registered the whitepaper to show that anyone can claim to be its author.¹⁷⁰ To prevent fraudulent registrations, one can think about appointing a select group of people who are entrusted with validating information and resolving disputes.¹⁷¹ However, the idea behind a blockchain-based copyright register is the fast and uncomplicated registration of works without relying on a central authority or trusted third party. One solution can be, as mentioned above, the validation of registrations by user voting or by providing incentives for “good behavior” through (financial) rewards or reputation systems.¹⁷² From a technical perspective, an automatic screening for identical works that have already been registered can be performed before saving a registration on the blockchain. As this only prevents the double registration of already-registered works, AI and probabilistic analysis of fraud can be employed as well.¹⁷³

If a work is assigned to the wrong author in the U.S. Copyright Office’s register, the real author can file an application for supplementary registration to correct the wrong entry.¹⁷⁴ A blockchain-based register can establish an alternative dispute resolution process to avoid time-consuming and expensive litigation around the correction of the database.¹⁷⁵ For this purpose, the Uniform Domain Name Dispute Resolution Policy (UDRP), which is used to resolve disputes around domain names,¹⁷⁶ can serve as a model. In this context, it should also be noted that the immutability of information stored on a blockchain does not prevent the addition of new information to rectify incorrect entries.¹⁷⁷

¹⁶⁹ John Biggs, *Craig Wright Attempts to Copyright the Satoshi White Paper and Bitcoin Code*, COINDESK (May 21, 2019, 12:47 UTC), <https://www.coindesk.com/craig-wright-attempts-to-copyright-the-satoshi-white-paper-and-original-bitcoin-code> [https://perma.cc/SMG5-9EK9].

¹⁷⁰ John Biggs, *‘Everyone Can Be Satoshi’: Liu Breaks Silence on Contest of Craig Wright’s Bitcoin Copyright*, COINDESK (May 30, 2019 17:23 UTC), <https://www.coindesk.com/everyone-can-be-satoshi-wei-liu-on-contesting-craig-wrights-copyright> [https://perma.cc/M34D-N5LP]. In this context it should be mentioned that there have been several registrations for the whitepaper and/or the software before. See Jamie Redman, *U.S. Copyright Office Responds to Craig Wright’s Bitcoin Registrations*, BITCOIN.COM (May 23, 2019), <https://news.bitcoin.com/us-copyright-office-responds-to-craig-wrights-bitcoin-registrations/> [https://perma.cc/SVB5-YXMW].

¹⁷¹ GARRICK HILEMAN & MICHEL RAUCHS, *GLOBAL BLOCKCHAIN BENCHMARKING STUDY* 61 (2017).

¹⁷² De Filippi et al., *supra* note 86, at 6; O’DAIR, *supra* note 46, at 71.

¹⁷³ De Filippi et al., *supra* note 86, at 6.

¹⁷⁴ 17 U.S.C. § 408(d); 37 C.F.R. § 202.6 (2018).

¹⁷⁵ Tresise et al., *supra* note 94, at 14.

¹⁷⁶ See *Uniform Domain-Name Dispute-Resolution Policy*, ICANN, <https://www.icann.org/resources/pages/help/dndr/udrp-en> [https://perma.cc/69CZ-9YBW].

¹⁷⁷ See discussion *supra* Section II.A.3.a.iii.

Another possibility may be the introduction of criminal sanctions for bad faith registrations. The deliberate falsification of the U.S. Copyright Office's register is penalized under Section 506(e) of the Copyright Act,¹⁷⁸ and Congress can extend this protection to blockchain-based copyright registers.

f. Liability of Bona Fide Users

As the previous paragraphs have pointed out, a blockchain-based register is not entirely immune to incorrect information, regardless of whether it was entered intentionally. Copyright infringement is a strict liability tort which means that an infringer does not have to act intentionally or negligently to be liable.¹⁷⁹ Therefore, a user who checked the copyright register before using a work can still be liable for infringement. This would be the case if the wrong right holder is registered and the user acquires a license from him. Another possibility is that the work in question was tagged as being in the public domain although the term of protection has not yet expired. To protect users and increase the acceptance of the register, users that rely on the information in the copyright register should be shielded from liability.¹⁸⁰ The extension of the Fair Use Doctrine to bona fide users or even the possibility of acquiring rights in works in good faith are proposed as solutions.¹⁸¹

It may be argued that an exemption from liability for bona fide users can lead to a disadvantage for right holders because they would be de facto obliged to monitor the register and have wrong entries corrected. To protect right holders from financial losses, an insurance mechanism is suggested.¹⁸² On the other hand, as right holders also benefit from a properly maintained register, they may be expected to participate in the administration of the entries. Furthermore, right holders are better able to identify incorrect entries in relation to their works than users, who will lack the necessary information in most cases.

g. Confidentiality and Privacy Concerns

In the majority of cases, right holders do not want their works to be disclosed prior to publication. Some right holders may also have an interest

¹⁷⁸ 17 U.S.C. § 506(e).

¹⁷⁹ *Shapiro, Bernstein & Co. v. H.L. Green Co.*, 316 F.2d 304, 308 (2d Cir. 1963); *Costar Grp., Inc. v. Loopnet, Inc.*, 373 F.3d 544, 549 (4th Cir. 2004); PAUL GOLDSTEIN, *GOLDSTEIN ON COPYRIGHT* § 7.0.1 (3d ed. 2020). *Contra* Patrick R. Goold, *Is Copyright Infringement a Strict Liability Tort?*, 30 *BERKELEY TECH. L.J.* 305, 338 (2015).

¹⁸⁰ Savelyev, *supra* note 87, at 15, 20 (stating that this is limited to blockchain-based registers under the control of government authorities).

¹⁸¹ *Id.* at 15–16, 20.

¹⁸² *Id.* at 20.

not to be directly associated with the works in which they own rights.¹⁸³ In addition, they may not want to have other specific information, such as their contact details, released to the public. If intermediaries such as music publishers, record companies, or PROs handle licensing, this type of information does not necessarily have to be accessible to the public. However, if information is stored on a blockchain and is therefore accessible for everyone in the network, it may give rise to confidentiality and privacy concerns,¹⁸⁴ which is especially the case when a public blockchain is used. In addition, a blockchain register may need to be compliant with the European Union’s General Data Protection Regulation (GDPR)¹⁸⁵ due to its very broad territorial scope: the GDPR applies to persons or entities established within the European Union, regardless of whether the data processing takes place in the European Union.¹⁸⁶ It also applies to persons or entities not established within the European Union, where processing activities are in connection with the offering of goods or services (paid or unpaid) or monitoring the behavior of natural persons based within the European Union.¹⁸⁷ Because of the immutability of information stored on a blockchain, a much-discussed issue is the implementation of the “right to be forgotten,”¹⁸⁸ which allows a person to request the deletion of his or her personal data under certain conditions.¹⁸⁹ The California Consumer Privacy Act (CCPA),¹⁹⁰ which has a narrower scope of application than the GDPR,¹⁹¹ also provides a right to have personal data deleted.¹⁹²

¹⁸³ *But see* Silver, *supra* note 158, at 42 (“[W]hy should it be a trade secret who owns the UK or the Scandinavian recording distribution rights or the publishing rights or the Estonian sub-publishing rights? These should not be trade secrets, they should be in the public domain and putting them there would instantly increase the ease of licensing and doing business generally across the industry.”).

¹⁸⁴ DE FILIPPI & WRIGHT, *supra* note 66, at 115–16; VOSHMIR, *supra* note 65, at 56.

¹⁸⁵ Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC, 2016 O.J. (L 119) 1 [hereinafter GDPR].

¹⁸⁶ *Id.* art. 3(1).

¹⁸⁷ *Id.* art. 3(2).

¹⁸⁸ Matthias Berberich & Malgorzata Steiner, *Blockchain Technology and the GDPR – How to Reconcile Privacy and Distributed Ledgers?*, 2 EUR. DATA PROTECTION L. REV. 422, 426 (2016); Michele Finck, *Blockchains and Data Protection in the European Union*, 4 EUR. DATA PROTECTION L. REV. 17, 30–31 (2018).

¹⁸⁹ GDPR, *supra* note 185, art. 17.

¹⁹⁰ California Consumer Privacy Act, CAL. CIV. CODE §§ 1798.100–1798.199 (Deering, LEXIS through 2020 Sess.).

¹⁹¹ *See* CAL. CIV. CODE § 1798.140(c). The CCPA applies to persons or entities doing business in the state of California that (a) have over \$25,000,000 in annual gross revenues, (b) collect personal information of 50,000 or more consumers, households, or devices, or (c) derive 50% or more of its annual revenues from selling consumers’ personal information. *Id.*

¹⁹² *Id.* § 1798.105.

First, it should be mentioned that it is not the work itself stored on the blockchain but its hash value.¹⁹³ This allows the definitive identification of a work but does not disclose the work itself or any sensitive information about the work.¹⁹⁴ Furthermore, if right holders can be unambiguously determined, there is no need to reveal their real identity. Blockchain technology provides the possibility for users to act under a pseudonym,¹⁹⁵ which ensures a high level of confidentiality and privacy. However, right holders can still be reidentified by sophisticated data mining and big data techniques.¹⁹⁶ Regarding the possibility of deleting personal data on request, it is possible to store personal data off chain where it can be altered and to save the reference to this file on the blockchain.¹⁹⁷

h. Remaining Transaction Costs

A copyright register can minimize the costs for identifying the right holder, but other transaction costs, such as those incurred on contacting the right holder, negotiating an agreement, and paying licensing fees, continue to remain and can impede the use of a work.¹⁹⁸ However, a copyright system that requires one to obtain a license in advance inevitably leads to transaction costs.¹⁹⁹ A blockchain-based copyright register can significantly reduce these costs. The use of smart contracts for transferring rights can make individual contracting and negotiating superfluous, and this can lead to even lower transaction costs.²⁰⁰

i. “Over-Licensing” and “Over-Enforcement”

A comprehensive and reliable copyright register allows right clearance in an easy way. However, copyright protected works may not only be used under a license but also in situations where the work in question is already in the public domain or the intended use is covered by exceptions or limitations. The most important one among these is the Fair Use Doctrine, as set forth under Section 107 of the Copyright Act.²⁰¹ The idea behind this provision is to balance the interest of right holders and users to allow

¹⁹³ See discussion *supra* Section II A.3.a.i.

¹⁹⁴ Norcross, *supra* note 81.

¹⁹⁵ See discussion *supra* Section II.A.1.

¹⁹⁶ DE FILIPPI & WRIGHT, *supra* note 66, at 39, 116, 175–76. Due to the possibility of reidentification, data stored on a blockchain is considered personal data—despite pseudonymization—in the sense of Article 4(1) of the GDPR, which leads to the applicability of the GDPR. Berberich & Steiner, *supra* note 188, at 423–24; Finck, *supra* note 188, at 22–23.

¹⁹⁷ Finck, *supra* note 188, at 30.

¹⁹⁸ Niva Elkin-Koren, *Can Formalities Save the Public Domain? Reconsidering Formalities for the 2010s*, 28 BERKELEY TECH. L.J. 1537, 1545 (2013); Gangjee, *supra* note 24, at 233.

¹⁹⁹ See Elkin-Koren, *supra* note 198, at 1545.

²⁰⁰ See discussion *infra* Section II.B.2.

²⁰¹ 17 U.S.C. § 107.

creativity and freedom of speech.²⁰² As factors to be considered in determining whether a specific use is fair, Section 107 of the Copyright Act enumerates:

(1) the purpose and character of the use . . . ; (2) the nature of the copyrighted work; (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work.²⁰³

i. “Over-Licensing”

It is argued that a convenient right clearance process can lead to “over-licensing” because users obtain a license despite the fact that they can use the work without permission.²⁰⁴ The most important factor in the analysis of fair use is the effect the use has on the potential market for the work.²⁰⁵ This factor examines whether the defendant’s work could serve as a substitute for the plaintiff’s work.²⁰⁶ In such contexts, courts will look at “traditional, reasonable, or likely to be developed markets.”²⁰⁷ Over-licensing creates previously non-existent licensing markets, and this makes it more difficult for other users to argue that using the work in question is covered by fair use.²⁰⁸

However, the decision of whether a work can be used freely, or whether a license has to be obtained, is inherent to the copyright system. The more information a potential user can gain about a work and its right holder, the better he or she can decide whether a license is necessary or not. For example, a copyright register that also records the author’s date of death can automatically flag works whose terms of protection have already expired and that are therefore in the public domain. Furthermore, a questionnaire can be integrated in the register that walks a potential user through yes or no questions to assess whether the intended use falls under an exception or limitation. A model for this is *The Fair Use App* by New Media Rights,

²⁰² See *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569, 577 (1994) (“The fair use doctrine thus permits and requires courts to avoid rigid application of the copyright statute when, on occasion, it would stifle the very creativity which that law is designed to foster.”) (quoting *Stewart v. Abend*, 495 U.S. 207, 236 (1990)); 4 WILLIAM F. PATRY, PATRY ON COPYRIGHT § 10:2 (2020).

²⁰³ 17 U.S.C. § 107.

²⁰⁴ Elkin-Koren, *supra* note 198, at 1561; Gangjee, *supra* note 24, at 232.

²⁰⁵ *Harper & Row, Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 566 (1985); 4 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 13.05[A][4] (2020).

²⁰⁶ *Campbell*, 510 U.S. at 593; *Peter Letterese & Assocs. v. World Inst. of Scientology Enters.*, 533 F.3d 1287, 1315 (11th Cir. 2008); 4 NIMMER & NIMMER, *supra* note 205, § 13.05[A][4].

²⁰⁷ *Am. Geophysical Union v. Texaco Inc.*, 60 F.3d 913, 930 (2d Cir. 1994); see *Campbell*, 510 U.S. at 592 (“The market for potential derivative uses includes only those that creators of original works would in general develop or license others to develop.”).

²⁰⁸ James Gibson, *Risk Aversion and Rights Accretion in Intellectual Property Law*, 116 YALE L.J. 882, 895–96 (2007).

which is designed to help filmmakers decide whether they can use copyright protected works in movies or documentaries without acquiring a license.²⁰⁹ However, this can also be misused if the user himself or herself determines whether a license is required or not.

ii. “Over-Enforcement”

A related problem is that the automated enforcement of infringements can lead to “over-enforcement.” In contrast to the problem of over-licensing, users do not voluntarily decide to acquire an unnecessary license but are treated by the right holder as copyright infringers, despite the fact that a license is not required. While works that are already in the public domain can be excluded more or less easily from an automated scan, assessing whether a use is covered by the Fair Use Doctrine is far more difficult. The reason for this is that the fair use analysis “is not to be simplified with bright-line rules” and “calls for case-by-case analysis.”²¹⁰ The four factors enumerated in Section 107 of the Copyright Act are not exhaustive,²¹¹ and they may not be “treated in isolation” but rather “[a]ll are to be explored, and the results weighed together, in light of the purposes of copyright.”²¹² This makes the Fair Use Doctrine flexible, but the outcome of a legal dispute is also difficult to predict.²¹³ One may think of the use of AI which can, for example, already predict court decisions.²¹⁴ One problem that may be encountered is insufficient and contradictory data to train such a system properly; there are only a handful of Supreme Court decisions that deal with fair use, and decisions by lower courts are not always consistent.²¹⁵ It is also doubtful whether an AI system would be able to recognize, for example, whether a use is transformative because it “adds something new, with a further purpose or different character, altering the first with new expression,

²⁰⁹ See *The Fair Use App*, NEW MEDIA RIGHTS (2020), <https://www.newmediarights.org/fairuse/> [<https://perma.cc/B3YG-NRL7>].

²¹⁰ *Campbell*, 510 U.S. at 577.

²¹¹ *Leadsinger, Inc. v. BMG Music Publ’g*, 512 F.3d 522, 529 (9th Cir. 2008); *Castle Rock Entm’t, Inc. v. Carol Publ’g. Grp.*, 150 F.3d 132, 141 (2d Cir. 1998); 4 PATRY, *supra* note 202, § 10:156; 4 NIMMER & NIMMER, *supra* note 205, § 13.05[A][5][b].

²¹² *Campbell*, 510 U.S. at 578.

²¹³ David Nimmer, “*Fairest of Them All*” and *Other Fairy Tales of Fair Use*, 66 LAW & CONTEMP. PROBS. 263, 280 (2003) (“Basically, had Congress legislated a dartboard rather than the particular four fair use factors embodied in the Copyright Act, it appears that the upshot would be the same.”).

²¹⁴ See Matthew Hutson, *Artificial Intelligence Prevails at Predicting Supreme Court Decisions*, SCIENCE (May 2, 2017 1:45 PM), <https://www.sciencemag.org/news/2017/05/artificial-intelligence-prevails-predicting-supreme-court-decisions> [<https://perma.cc/FV8K-ZQ9G>].

²¹⁵ Nimmer, *supra* note 213, at 281 (“At base, therefore, the four factors fail to drive the analysis, but rather serve as convenient pegs on which to hang antecedent conclusions.”).

meaning or message”²¹⁶ or “expands [the work’s] utility.”²¹⁷ The same applies for the question whether the “heart of the . . . work” is used²¹⁸ or whether the market for the work is harmed because the defendant’s work serves as a substitute for the plaintiff’s work.²¹⁹ In addition, an AI system can also have problems with weighting the different factors in a way that is consistent with the rationale underlying the Fair Use Doctrine. Therefore, at the moment, it seems at least possible that an AI system makes a preselection and cases of doubt will then undergo human review.²²⁰ Further, a dispute resolution system, like the one used by YouTube’s Content ID,²²¹ can be established to allow users to deal with unjustified takedown notices or demands for licensing fees.

Notwithstanding the above, the right holder’s reaction to piracy should be increasingly less oriented toward aggressive legal enforcement and aim instead at developing attractive distribution models. According to a study conducted by AudienceProject, the main reasons for the use of illegal sources for digital content are the lower costs and the availability of more content.²²² To provide exploiters with a means to facilitate rights clearance can not only lower costs for consumers but can also make more works available. The employment of smart contracts for licensing can make works even less expensive and more convenient to access.²²³

j. Unstoppable File-Sharing and Streaming Platforms

Over-licensing and over-enforcement relate to concerns around how blockchain technology can be implemented to the disadvantage of users. On the other hand, the technology can also be used to build new kinds of file-sharing and streaming platforms, such as Alexandria²²⁴ and Lbry.²²⁵ Here, an index of available content is recorded on the blockchain, and the storage and distribution of files is not managed by a central authority but rather over the network. Even if the creators of these platforms can be held liable for

²¹⁶ *Campbell*, 510 U.S. at 579 (citations omitted).

²¹⁷ *Authors Guild v. Google, Inc.*, 804 F.3d 202, 214 (2d Cir. 2015).

²¹⁸ *Harper & Row Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 600 (1985).

²¹⁹ *Campbell*, 510 U.S. at 593; *Peter Letterese & Assocs. v. World Inst. of Scientology Enters.*, 533 F.3d 1287, 1315 (11th Cir. 2008); 4 NIMMER & NIMMER, *supra* note 205, § 13.05[A][4].

²²⁰ Niva Elkin-Koren, *Fair Use by Design*, 64 UCLA L. REV. 1082, 1097–98 (2017).

²²¹ *See Dispute a Content ID Claim*, YOUTUBE HELP, <https://support.google.com/youtube/answer/2797454?hl=en> [<https://perma.cc/2FSA-XWD7>].

²²² Rune Werliin, *Insights 2017 – Traditional TV & Streaming in the Nordics, UK & US*, AUDIENCEPROJECT 46 (2017), https://www.audienceproject.com/wp-content/uploads/audienceproject_study_traditional_tv_streaming.pdf [<https://perma.cc/N6SV-NDNA>].

²²³ *See* discussion *infra* Section II.B.2.

²²⁴ *See* ALEXANDRIA, <https://www.alexandria.io/> [<https://perma.cc/YA57-S5PM>].

²²⁵ *See* LBRY, <https://lbry.com/> [<https://perma.cc/E8BC-QP8W>].

secondary infringement for “act[ing] with a purpose to cause copyright violations by use of software suitable for illegal use,”²²⁶ it would be nearly impossible to delete references to the content from the index in case of copyright infringements due to the immutability of information stored on a blockchain.²²⁷ This would enable the dissemination of unauthorized copies and thus harm right holders.

However, blockchain technology, like the Internet, is a multi-purpose technology whose illegal application can never be completely excluded. In this context, it should be noted that blockchain technology provides new ways to control digital content.²²⁸ In addition, it can make more content available at lower prices, which could eliminate core reasons for the use of illegal sources.²²⁹

k. Evidentiary Value of Registrations

Irrespective of whether blockchain evidence is admissible in courts at all,²³⁰ the evidentiary value of a copyright registration on the blockchain by itself is low. Similar to mailing a letter with a copy of the work to oneself and retaining the sealed and postmarked envelope (a “poor man’s copyright”),²³¹ a registration only shows that someone has registered a specific work on a specific date. This can help an author show that he or she was in possession of a work before another person. However, a registration neither proves that the work was created by the author nor that the work meets the requirements for copyright protection. In a similar manner, the recording of a transfer of rights neither proves that the transfer took place nor that such transfer is valid.

One possibility offered by the start-up Bernstein²³² is to not only record the finished work but also document the process of creation on the blockchain by saving drafts, notes, and other materials produced while creating the final work. This can allow a person to prove that they created the work themselves. One may also think of rebuttable presumptions. For example, under the current legal framework, a registration with the U.S.

²²⁶ Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd., 545 U.S. 913, 938 (2005).

²²⁷ DE FILIPPI & WRIGHT, *supra* note 66, at 119–20.

²²⁸ See discussion *supra* Section II.A.2.c. and *infra* Section II.B.2.c.

²²⁹ See discussion *supra* Section II.A.3.i.ii.

²³⁰ See Angela Guo, *Blockchain Receipts: Patentability and Admissibility in Court*, 16 CHI.-KENT J. INTELL. PROP., 440, 444–48 (2017).

²³¹ See *Frequently Asked Questions about Copyright*, U.S. COPYRIGHT OFF., <https://www.copyright.gov/help/faq/faq-general.html> [<https://perma.cc/R8HJ-Z3FB>] (“The practice of sending a copy of your own work to yourself is sometimes called a ‘poor man’s copyright.’ There is no provision in the copyright law regarding any such type of protection, and it is not a substitute for registration.”).

²³² See *Blockchain Applications for Securing IP in Fashion and Design*, BERNSTEIN, <https://www.bernstein.io/fashion-design-blockchain> [<https://perma.cc/KAY9-NJ5D>].

Copyright Office before or within five years after the first publication creates prima facie evidence of the validity of the copyright and of the facts stated in the certificate.²³³ A transfer of copyright ownership, which includes assignments and grants of exclusive licenses,²³⁴ can be registered with the U.S. Copyright Office.²³⁵ In case there are conflicting transfers, the one executed first prevails if it has been recorded.²³⁶ Congress can establish a similar presumption in the way that the person recorded on a blockchain-based copyright register is considered as the current holder of a valid copyright, unless someone proves the contrary to be true.²³⁷ Until Congress takes action, the registration of a work or a transfer of rights on the blockchain can at least be automatically added to the register of the U.S. Copyright Office.

l. Identification of Digital Content

As even minimal changes to a file leads to different hash values, storing only the hash value of a file on the blockchain allows the identification of identical files only. This can cause problems not only when it comes to proving ownership but also in the context of usage control. For this reason, it is advisable to store additional information on the blockchain, as it would allow the unambiguous identification of a file even when it has been altered. For example, the project Content Blockchain, which provides right holders with a blockchain-based platform for licensing content,²³⁸ has developed the International Standard Content Code (ISCC) with six different layers for the identification of digital content.²³⁹

m. Dependence on Network Effects

Since the current legal framework does not impose any formalities regarding the creation of a copyright and the validity of a transfer of rights,²⁴⁰ registration is at the discretion of the right holder. To exploit the potential of a blockchain-based solution fully, there has to be a significant number of right holders and users participating in the register.²⁴¹ This concerns not only the registration of works but also of the transfer of rights. If such transfers

²³³ 17 U.S.C. § 410(c).

²³⁴ *Id.* § 101.

²³⁵ *Id.* § 205(a).

²³⁶ *Id.* § 205(d).

²³⁷ See Savelyev, *supra* note 87, at 16.

²³⁸ See CONTENT BLOCKCHAIN, <https://content-blockchain.org/> [<https://perma.cc/X5EJ-QSLV>].

²³⁹ See Titusz Pan, *ISCC Concept*, CONTENT BLOCKCHAIN, <https://content-blockchain.org/drafts-and-concepts/iscc-concept/> [<https://perma.cc/J73T-3G5B>].

²⁴⁰ See discussion *supra* Section I.A.

²⁴¹ Finck & Moscon, *supra* note 99, at 97–98; Savelyev, *supra* note 87, at 17; Silver, *supra* note 158, at 38.

are performed by smart contracts, the new right holder can be added to the register automatically,²⁴² but the existence of “off-chain transfers” can still make the information in the register unreliable.²⁴³

The high participation of right holders and users can be arrived at by providing them with an easy-to-use and effective registration system. However, in order to ensure that the database is complete and up-to-date as far as possible, mandatory registration is preferable over the voluntary submission of information. This can be achieved by making the registration of a work a constitutive requirement for copyright protection, as is the case under trademark and patent law. Similarly, recording the transfer of rights can be a constitutive requirement for the validity of an underlying contract.

i. Compatibility with Article 5(2) of the Berne Convention

The question arises as to whether a mandatory registration complies with the international legal framework, especially Article 5(2) of the Berne Convention,²⁴⁴ which provides that “[t]he enjoyment and the exercise of these rights shall not be subject to any formality.”²⁴⁵

First, the wording of the provision should be examined. The term “enjoyment of rights” encompasses the coming into existence of rights,²⁴⁶ while the “exercise of rights” is related to their enforcement.²⁴⁷ Thus, all formalities that are necessary for obtaining protection or pursuing infringements are subject to Article 5(2) of the Berne Convention.²⁴⁸ On the contrary, the grant of additional benefits for works that comply with

²⁴² See discussion *infra* Section II.B.2.a.

²⁴³ Bodó et al., *supra* note 93, at 323; Finck & Moscon, *supra* note 99, at 98.

²⁴⁴ World Intellectual Property Organization [WIPO], Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886, as revised at Paris on July 24, 1971 and amended in 1979, S. Treaty Doc. No. 99-27 (1986) [hereinafter Berne Convention]. Article 5(2) of the Berne Convention is incorporated into the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) through Article 9(1) of the TRIPS Agreement and into the World Intellectual Property Organization Copyright Treaty (WCT) through Art. 1(4) of the WCT. See generally World Trade Organization [WTO], Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994); WIPO, WIPO Copyright Treaty (WCT), Dec. 20, 1996, S. Treaty Doc. No. 105-17 (1997), 2186 U.N.T.S. 121, 36 I.L.M. 65 (1997). Almost all countries in the world are members of at least one of these treaties. See generally *Berne Convention for the Protection of Literary and Artistic Works*, WIPO, <http://www.wipo.int/export/sites/www/treaties/en/documents/pdf/berne.pdf> [<https://perma.cc/5UCT-WKDP>] (listing members of Berne Convention); *Amendment of the TRIPS Agreement*, WTO, https://www.wto.org/english/Tratop_e/trips_e/amendment_e.htm [<https://perma.cc/7VST-2AKQ>] (listing members of TRIPS Agreement); *WIPO-Administered Treaties*, WIPO, https://www.wipo.int/treaties/en/ShowResults.jsp?lang=en&treaty_id=16 [<https://perma.cc/6FJL-S83Y>] (listing members of WCT).

²⁴⁵ Berne Convention, *supra* note 244, art. 5(2).

²⁴⁶ VAN GOMPEL, *supra* note 7, at 195; Ginsburg, *supra* note 58, at 315.

²⁴⁷ VAN GOMPEL, *supra* note 7, at 201–11; Ginsburg, *supra* note 58, at 315.

²⁴⁸ VAN GOMPEL, *supra* note 7, at 195, 201; Ginsburg, *supra* note 58, at 315.

formalities, such as evidentiary or procedural advantages, do not fall under the prohibition on formalities set forth under Article 5(2) of the Berne Convention.²⁴⁹ As mentioned, registration with the U.S. Copyright Office before or within five years after the first publication creates prima facie evidence of the validity of the copyright and of the facts stated in the certificate.²⁵⁰ Furthermore, only if the work is registered, can a plaintiff sue for statutory damages and attorney’s fees.²⁵¹

The transfer of a right affects neither its “enjoyment” nor its “exercise” and is thus not within the scope of Article 5(2) of the Berne Convention.²⁵² As a result, recording the transfer of rights into a register can be a constitutive requirement for the validity of the underlying contract.²⁵³ However, a register that includes only rights to works that have been transferred does not show the entire range of available works.

The words “these rights” under Article 5(2) of the Berne Convention refer to Article 5(1) of the Berne Convention,²⁵⁴ which states that “[a]uthors shall enjoy, in respect of works for which they are protected under this Convention, in countries of the Union other than the country of origin, the rights which their respective laws . . . grant to their nationals, as well as the rights specially granted by this Convention.”²⁵⁵ The prohibition of formalities under Article 5(2) of the Berne Convention thus applies only to non-domestic works, which means that contracting states are free to impose formalities on domestic works.²⁵⁶ For example, the registration for works of U.S. origin with the U.S. Copyright Office is required for the filing of a civil action for copyright infringement.²⁵⁷ Thus, every country can establish a mandatory copyright register for domestic works and can use the data to

²⁴⁹ Bodó et al., *supra* note 93, at 325; van Gompel, *supra* note 58, at 1440.

²⁵⁰ 17 U.S.C. § 410(c).

²⁵¹ *Id.* § 412.

²⁵² VAN GOMPEL, *supra* note 7, at 204; Ginsburg, *supra* note 58, at 316; *see* van Gompel, *supra* note 58, at 1454.

²⁵³ VAN GOMPEL, *supra* note 7, at 204; Ginsburg, *supra* note 58, at 316.

²⁵⁴ VAN GOMPEL, *supra* note 7, at 161.

²⁵⁵ Berne Convention, *supra* note 244, art. 5(1).

²⁵⁶ VAN GOMPEL, *supra* note 7, at 161–62; Ginsburg, *supra* note 58, at 314; Gangjee, *supra* note 24, at 214; Sprigman, *supra* note 58, at 1566; van Gompel, *supra* note 58, at 1441.

²⁵⁷ 17 U.S.C. § 411(a). In this context it should be noted that the term “registration” in the sense of § 411(a) of the Copyright Act “refers to the [U.S.] Copyright Office’s act granting registration, not to the copyright claimant’s request for registration.” Fourth Estate Pub. Benefit Corp. v. Wall-Street.com, LLC, 139 S. Ct. 881, 890 (2019). Therefore, an infringement claim for U.S. works is only possible when the U.S. Copyright Office has finally registered the work. *Id.* at 886.

create an international register.²⁵⁸ However, this would require coordinated cooperation among all countries.²⁵⁹

After the wording of Article 5(2) of the Berne Convention, which advocates against a broad registration obligation, the purpose of the provision should be examined. The idea behind Article 5(2) of the Berne Convention is to prevent authors from fulfilling formalities in each state where they wanted their works to be protected.²⁶⁰ However, over a century later, digital technology offers effective ways of administering transnational copyright registrations, so the concerns that lead to the abolishment of formalities under Article 5(2) of the Berne Convention do not exist any longer.²⁶¹ Therefore, it is argued that the provision should be amended.²⁶² In this context, it should be noted that changing Article 5(2) of the Berne Convention and allowing member states to introduce mandatory formalities for non-domestic works requires the unanimous support of all members.²⁶³ As the TRIPS Agreement and the WTC refer to Article 5(2) of the Berne Convention,²⁶⁴ their member states must also be involved.²⁶⁵ An amendment of Article 5(2) of the Berne Convention will be a long process and will therefore probably not be possible in the foreseeable future. However, the question arises as to whether changing the provision is necessary at all. One could also interpret Article 5(2) of the Berne Convention in light of its purpose, in a way that does not prevent a mandatory registration on a blockchain-based register. Because blockchain technology offers an easy, fast, cheap, and safe way to store, distribute, and access data worldwide, an obligation to register the creation of works on the blockchain does not impose a heavy burden on authors. Furthermore, authors will also benefit from a comprehensive and reliable register.

Notwithstanding the above, a national legislator can offer a two-tier copyright regime in accordance with the wording of Article 5(2) of the Berne Convention by providing basic protection for unregistered works and an extended protection for registered works. As shown above, this is already the case for works that are registered with the U.S. Copyright Office. Congress can expand these benefits for registration in a blockchain-based register. Furthermore, current projects that offer voluntary registration can help show

²⁵⁸ VAN GOMPEL, *supra* note 7, at 162.

²⁵⁹ *Id.* at 163.

²⁶⁰ *Id.* at 156; Gangjee, *supra* note 24, at 216.

²⁶¹ VAN GOMPEL, *supra* note 7, at 292; Gangjee, *supra* note 24, at 216–17.

²⁶² VAN GOMPEL, *supra* note 7, at 291–92.

²⁶³ *Id.* at 291.

²⁶⁴ *See* Berne Convention, *supra* note 244.

²⁶⁵ VAN GOMPEL, *supra* note 7, at 291.

that a blockchain-based register works and offers advantages for right holders and users. To make these services more attractive, providers can ensure their customers the benefits of the current legal framework by adding works registered on the blockchain automatically to the register of the U.S. Copyright Office. If transfers of rights are performed by smart contracts, the transfers can also be registered automatically.²⁶⁶

ii. Disadvantages for Small Right Holders

It is argued that a mandatory registration can place small authors (e.g., individual authors) at a disadvantage in comparison to large copyright owners (e.g., corporations).²⁶⁷ This is because the fulfillment of mandatory formalities can impose additional costs in terms of time and money,²⁶⁸ and copyright protection can be lost because of the lack of awareness with respect to formalities,²⁶⁹ or to the value of a work.²⁷⁰ This situation can lead to a decrease in the diversity of works available to the public.

On the other hand, small authors can benefit from a system that allows potential users to easily find and license their works. One may also think of a grace period for small authors within which a registration can be made up.²⁷¹ Digital technology provides a cheap and simple means to fulfill the registration requirement.²⁷² This applies especially to blockchain technology, where content creation devices and software can offer a built-in “one-click registration,” and smart contracts can add new right holders automatically to the register.

B. Smart Licenses:

Transfer of Rights Through Smart Contracts

Besides storing information on ownership, blockchain technology can also provide a framework for the exchange of ownership through smart contracts. After (1) a short introduction into smart contracts, (2) a description of the features of a blockchain-based solution and (3) open questions and challenges are discussed.

²⁶⁶ See discussion *infra* Section II.B.2.a.

²⁶⁷ Graeme W. Austin, *Symposium: Metamorphosis of Artists' Rights in the Digital Age*, 28 COLUM. J.L. & ARTS, 397, 415–16 (2005); Elkin-Koren, *supra* note 198, at 1551; Gangjee, *supra* note 24, at 227, 240; van Gompel, *supra* note 58, at 1442; Ginsburg, *supra* note 58, at 342.

²⁶⁸ Austin, *supra* note 267, at 416; Gangjee, *supra* note 24, at 227; Elkin-Koren, *supra* note 198, at 1555; Ginsburg, *supra* note 58, at 342–43.

²⁶⁹ Ginsburg, *supra* note 58, at 342; Gangjee, *supra* note 24, at 227, 242; Elkin-Koren, *supra* note 198, at 1555; Gibson, *supra* note 24, at 225 (regarding notice).

²⁷⁰ Elkin-Koren, *supra* note 198, at 1552.

²⁷¹ LESSIG, *supra* note 59, at 252.

²⁷² Gangjee, *supra* note 24, at 228–29; LESSIG, *supra* note 59, at 251; Gibson, *supra* note 24, at 229.

1. *Smart Contracts in a Nutshell*

Smart contracts are computer programs that execute and/or enforce contractual terms automatically.²⁷³ This process is based on “if-then” rules: *if* a predefined condition is met, *then* the smart contract performs a predefined action.

In this context, it should be noted that smart contracts do not necessarily depend on blockchain technology. For example, a vending machine that releases goods after a specific amount of money is inserted can be considered a simple form of a smart contract.²⁷⁴ Another example for the already-prevalent smart contracts in relation to the administration and distribution of copyright protected works is Digital Rights Management (DRM), a type of system that controls and limits a user’s ability to use the content provided to him.²⁷⁵ Nevertheless, blockchain technology provides a powerful framework for smart contracts. Owing to its transparency and tamper protection, smart contracts running on a blockchain can be used for transactions made directly between the contracting parties without the need for a trusted third party to supervise and verify the transactions.²⁷⁶ Smart contracts on a blockchain are signed with cryptographic private keys representing the individual parties,²⁷⁷ which enables them to act under pseudonyms and therefore protect their identity.²⁷⁸ In addition, blockchain-based cryptocurrencies allow payments to be carried out within seconds at low transaction costs.

2. *Features of a Transfer of Rights Through Smart Contracts*

The transfer of rights through smart contracts can (a) enable direct transfers of rights between right holders and users, (b) allow right holders to control pricing and other conditions, (c) make tracking of content usage and payments possible, (d) improve revenue distribution, and (e) create a secondary market for digital content.

²⁷³ See TAPSCOTT & TAPSCOTT, *supra* note 52, at 101; VOSHMIR, *supra* note 65, at 88; Jake Goldenfein & Andrea Leiter, *Legal Engineering on the Blockchain: ‘Smart Contracts’ as Legal Conduct*, 29 L. & CRITIQUE 141, 142 (2018); Max Raskin, *The Law and Legality of Smart Contracts*, 1 GEO. L. TECH. REV. 305, 309 (2017); Nick Szabo, *Formalizing and Securing Relationships on Public Networks*, 2 FIRST MONDAY (Sept. 1, 1997), <https://firstmonday.org/ojs/index.php/fm/article/view/548/469> [<https://perma.cc/SHXR-8DRE>]; Werbach & Cornell, *supra* note 65, at 320.

²⁷⁴ Szabo, *supra* note 273.

²⁷⁵ Finck & Moscon, *supra* note 99, at 91; Trevor I. Kiviat, *Beyond Bitcoin: Issues in Regulating Blockchain Transactions*, 65 DUKE L.J. 569, 605 (2015).

²⁷⁶ DE FILIPPI & WRIGHT, *supra* note 66, at 43–44, 74, 81; WERBACH, *supra* note 69, at 65; Finck & Moscon, *supra* note 99, at 92–93; Werbach & Cornell, *supra* note 65, at 333.

²⁷⁷ Werbach & Cornell, *supra* note 65, at 371.

²⁷⁸ DE FILIPPI & WRIGHT, *supra* note 66, at 29.

a. Direct Transfer of Rights Between Right Holders and Users

By using smart contracts, the transfer of rights can be executed directly between right holders and potential users, like exploiters or consumers.²⁷⁹ A right holder can determine price and other conditions in advance, and a potential user can obtain these rights without any further negotiation. For example, the British artist Imogen Heap offered her song *Tiny Human* on the Ethereum blockchain-based platform Ujo using a smart contract.²⁸⁰

The transfer of rights through smart contracts can lower transaction costs for right clearance. Furthermore, middlemen—like PROs, music publishers, record companies, or content distribution platforms who were previously required—may become superfluous as the “[b]lockchain present[s] the possibility of rightsholders becoming the intermediaries themselves.”²⁸¹ This can lead to a higher share of revenues for right holders and especially benefit artists, who suffer from the great number of intermediaries in the music business.²⁸²

As artists are in direct contact with their fans, a closer relationship between them is possible.²⁸³ For example, users who promote the artist’s works to others can be awarded a share of the additional revenues.²⁸⁴ As the Icelandic artist Bjork demonstrated,²⁸⁵ artists can also issue their own tokens, which can be traded for merchandising or concert tickets.²⁸⁶ Alternatively, users can venture into art by buying tokens, as one would with shares of a company, with the hope that such tokens would increase in value once the artist becomes famous.²⁸⁷ The sale of tokens can provide an additional source of income for right holders, especially for artists at the beginning of their careers.²⁸⁸

²⁷⁹ TAPSCOTT & TAPSCOTT, *supra* note 52, at 47; GATTO ET AL., *supra* note 93; Tresise et al., *supra* note 94, at 9; Milan Sallaba et al., *Blockchain @ Media — A new Game Changer for the Media Industry?*, DELOITTE 13 (2017), <https://www2.deloitte.com/content/dam/Deloitte/tr/Documents/technology-media-telecommunications/deloitte-PoV-blockchain-media.pdf> [<https://perma.cc/VUW4-4HBK>].

²⁸⁰ See UJO MUSIC, https://imogen2.surge.sh/#/imogen_heap/tiny_human/tiny_human [<https://perma.cc/X8PN-G2R5>].

²⁸¹ Tresise et al., *supra* note 94, at 14.

²⁸² See discussion *supra* Section I.D.

²⁸³ TAPSCOTT & TAPSCOTT, *supra* note 52, at 239; Heap, *supra* note 46; GATTO ET AL., *supra* note 93; Sallaba et al., *supra* note 279.

²⁸⁴ Lee, *supra* note 32; GATTO ET AL., *supra* note 93; Silver, *supra* note 158, at 30.

²⁸⁵ John Paul Titlow, *Bjork’s New Album Goes All-In on the Blockchain Craze*, FAST CO. (Nov. 11, 2017), <https://www.fastcompany.com/40489724/bjorks-new-album-goes-all-in-on-the-blockchain-craze> [<https://perma.cc/QM4V-HA9C>].

²⁸⁶ MCGUIRE, *supra* note 94, at 48–49, 64, 67, 104; Lee, *supra* note 32.

²⁸⁷ TAPSCOTT & TAPSCOTT, *supra* note 52, at 239; MCGUIRE, *supra* note 94, at 49, 64, 104.

²⁸⁸ MCGUIRE, *supra* note 94, at 67–68, 104.

The possibility of transferring rights through smart contracts can be integrated into a blockchain-based copyright register.²⁸⁹ This will create a one-stop shop for rights where a user can not only retrieve information about a specific work and its right holder but can also acquire rights within seconds. This combination can also help keep the register up-to-date. In the case a transaction involving the assignment of a copyright or the grant of an exclusive license, the new right holder can be added automatically to the register. To support right holders in administering their rights, non-exclusive licenses can also be recorded.

b. Control over Pricing and Other Conditions

Smart contracts enable right holders to set prices and other conditions for the use of their works in a flexible and independent way. Right holders can offer different versions of their works at different prices. For example, a song for private use can be cheaper than a song with the right to modify or use in a commercial context.

Currently, many content distribution platforms, like Netflix and Spotify, offer their services on a subscription basis for a monthly flat fee. More and more right holders, such as Disney and WarnerMedia, are launching their own platforms on which their content is exclusively available.²⁹⁰ As a result, content is spread across multiple platforms, which forces users to take up multiple subscriptions.²⁹¹ To solve this problem, cryptocurrencies can be employed as a means of payment. Cryptocurrencies allow micropayments as small as a fraction of a cent, without high transaction costs, and can therefore be used to establish “pay per use” pricing structures. Users only pay for the duration or frequency of use. Even billing on a per-second basis will be possible.²⁹² This will not only benefit consumers, but also commercial exploiters who can choose parts of a work they really need, such as a short section of a song for a remix or a movie trailer.²⁹³ Right holders can establish their own cryptocurrency or use an existing currency such as Bitcoin or Ether.²⁹⁴

²⁸⁹ See discussion *supra* Section II.A.

²⁹⁰ Brian Steinberg, *Why Consumers Are Already Losing in the Streaming Wars*, VARIETY (July 18, 2019 8:30 AM PT), <https://variety.com/2019/tv/uncategorized/streaming-wars-netflix-nbc-warnermedia-disney-plus-1203271050/> [<https://perma.cc/97BJ-KKYW>].

²⁹¹ *Id.*

²⁹² Michalko, *supra* note 45; Ryo Takahashi, *How Can Creative Industries Benefit from Blockchain?*, WORLD ECON. FORUM (July 18, 2017), <https://www.weforum.org/agenda/2017/07/how-can-creative-industries-benefit-from-blockchain/> [<https://perma.cc/45TP-RRXQ>]

²⁹³ Takahashi, *supra* note 292.

²⁹⁴ TAPSCOTT & TAPSCOTT, *supra* note 52, at 233; Rachel O’Dwyer, *Does Digital Culture Want to be Free? How Blockchains Are Transforming the Economy of Cultural Goods*, in ARTISTS RE:THINKING THE BLOCKCHAIN 301 (Ruth Catlow et al. eds., 2017); Sallaba et al., *supra* note 279, at 11.

Furthermore, smart contracts allow dynamic pricing.²⁹⁵ Prices can be adjusted to suit current market demand²⁹⁶ and thus maximize revenues.²⁹⁷ A smart contract can automatically cause a rise in prices during times of high demand by consumers, for example, in the evenings or over the weekend, and lower prices when demand declines. Similarly, licensing fees for commercial exploiters, for example, for a song to be used in a movie or a commercial, can be higher when demand from other exploiters increases or when the work is popular among consumers.²⁹⁸

On the other hand, right holders, especially artists, can also ignore market demand and set prices based on different criteria. Works can be offered for free on special occasions, or users can be asked to pay whatever the content is worth to them. For example, the blockchain-based streaming platform Musicoin offers music for free and without advertisements but asks their users to tip the artists whose songs they listen to.²⁹⁹ This can increase the appreciation for creative works and can also establish a closer relationship between artists and their fans. Even if some consumers decide to pay nothing, right holders can still evaluate their transaction data.³⁰⁰ Artists can also completely refrain from charging money for their works and can demand other forms of consideration, such as the sharing and recommendation of their works to other users. This can be helpful in the beginning of an artist's career or when an artist is primarily relying on earning money with concerts and merchandising.

c. Tracking Content Usage and Payments

Smart contracts can help track the usage of content and incoming payments.

Transparency in revenue calculation can be enhanced if it is possible to verify the extent to which a work has been used and how much revenue has been generated from its use.³⁰¹ Right holders can also evaluate transaction

²⁹⁵ TAPSCOTT & TAPSCOTT, *supra* note 52, at 234; Takahashi, *supra* note 292.

²⁹⁶ Takahashi, *supra* note 292.

²⁹⁷ Gadi BenMark et al., *How Retailers Can Drive Profitable Growth Through Dynamic Pricing*, MCKINSEY & CO. (Mar. 27, 2017), <https://www.mckinsey.com/industries/retail/our-insights/how-retailers-can-drive-profitable-growth-through-dynamic-pricing> [<https://perma.cc/3RHV-8XB8>].

²⁹⁸ TAPSCOTT & TAPSCOTT, *supra* note 52, at 234.

²⁹⁹ See *What Is Musicoin*, MUSICOIN, <https://musicoin.org/how-it-works> [<https://perma.cc/G3U9-CWFC>].

³⁰⁰ See discussion *infra* Section II.B.2.c.

³⁰¹ TAPSCOTT & TAPSCOTT, *supra* note 52, at 232–33; Takahashi, *supra* note 292; RETHINK MUSIC, *supra* note 32, at 28; Savelyev, *supra* note 87, at 11; Silver, *supra* note 158, at 25; Bodó et al., *supra* note 93, at 331; Sallaba et al., *supra* note 279, at 15.

data and learn more about those who engage with their works.³⁰² This information can be used to target marketing measures and to make sales more effectively.³⁰³ For example, artists can plan their concert tours in locations where most of their fans live. Smart contracts can also control content usage. If the agreed scope or time of use is exceeded, a user can be informed automatically, and in the event of repeated violations, access to the work can be blocked. If the user delays payment, access to the work can be denied.³⁰⁴

d. Revenue Distribution

Smart contracts can execute the payment of revenues according to the right holder's terms.³⁰⁵ If there are several right holders, a smart contract can automatically split revenues between them.³⁰⁶ For example, the underlying smart contract for Imogen Heap's song *Tiny Human* distributes incoming payments to each creative talent involved in the song.³⁰⁷ This can make the system faster and more efficient and thus reduce administration costs, which can, in turn, lead to a higher share of revenues for right holders³⁰⁸ and lower costs for users.³⁰⁹ Payments made by users can be processed by using blockchain-based cryptocurrencies, which allow micropayments and therefore instant distribution of revenues to right holders.³¹⁰ This can solve the imbalance wherein users can access digital content straightaway, but right holders, especially artists, often have to wait for a long time to get paid.³¹¹

e. Secondary Market for Digital Content

A blockchain-based copyright register in combination with smart contracts can also be the foundation for a market for "used" digital content. The buyer of a copyright protected work stored on a physical medium (e.g.,

³⁰² TAPSCOTT & TAPSCOTT, *supra* note 52, at 233; O'DAIR, *supra* note 46, at 47; O'Dwyer, *supra* note 294, at 303; MCGUIRE, *supra* note 94, at 49–50, 65.

³⁰³ Sallaba et al., *supra* note 279.

³⁰⁴ TAPSCOTT & TAPSCOTT, *supra* note 52, at 47.

³⁰⁵ MCGUIRE, *supra* note 94, at 40; GATTO ET AL., *supra* note 93; Sallaba et al., *supra* note 279, at 15.

³⁰⁶ O'Dwyer, *supra* note 294, at 302; MCGUIRE, *supra* note 94, at 40; Takahashi, *supra* note 292; Heap, *supra* note 46; GATTO ET AL., *supra* note 93; Tresise et al., *supra* note 94, at 9; RETHINK MUSIC, *supra* note 32, at 27.

³⁰⁷ Heap, *supra* note 46.

³⁰⁸ See GATTO ET AL., *supra* note 93; Tresise et al., *supra* note 94, at 9; De Filippi et al., *supra* note 86, at 19.

³⁰⁹ See De Filippi et al., *supra* note 86, at 19.

³¹⁰ TAPSCOTT & TAPSCOTT, *supra* note 52, at 233; O'DAIR, *supra* note 46, at 40; Michalko, *supra* note 45; Norcross, *supra* note 81.

³¹¹ TAPSCOTT & TAPSCOTT, *supra* note 52, at 228–29; O'DAIR, *supra* note 46, at 39; Lee, *supra* note 32.

CD, DVD) is permitted to transfer the medium to a third party without prior authorization of the right holder.³¹² The First Sale Doctrine, codified in Section 109(a) of the Copyright Act, provides that “the owner of a particular copy . . . lawfully made under this title . . . is entitled, without the authority of the copyright owner, to sell or otherwise dispose of the possession of that copy”³¹³ However, the situation is different if the same work is not saved on a physical medium but is contained on a digital file (e.g., MP3 file). This is because the First Sale Doctrine limits only the distribution right but does not authorize reproductions of the work.³¹⁴ Even if the transmission of a work on the Internet is interpreted as a distribution in the sense of Section 106(3) of the Copyright Act,³¹⁵ such a transfer inevitably leads to reproduction because a new embodiment of the work is created on the recipient’s device.³¹⁶ The main reason this reproduction cannot be justified by the Fair Use Doctrine lies in its potential market harm: permitting buyers of digital files to transfer them to third parties can increase the risk of unauthorized copies.³¹⁷ Even if the initial copy of the file is deleted during the transfer, physical copies of a work are worn down when they are used, while digital files retain their original quality even when they are used extensively.³¹⁸ Thus, creating a secondary market for “used” digital files, where they are sold for a lower price than on the primary market, can harm the latter.³¹⁹

Blockchain technology and smart contracts can strike a balance between the interests of right holders and users. If individual copies of a work are registered on a blockchain,³²⁰ every time someone accesses the file, it can be checked whether this particular copy has already been used by another person.³²¹ This can ensure that a file is only used by one person at a time and can therefore preclude the dissemination of unauthorized copies. If works are licensed through smart contracts, the underlying contract can be programmed in such a way that it allows a transfer to another user only after

³¹² See, e.g., *Kirtsaeng v. John Wiley & Sons*, 568 U.S. 519 (2013).

³¹³ 17 U.S.C. § 109(a).

³¹⁴ *Capitol Records, LLC v. ReDigi Inc.*, 910 F.3d 649, 656 (2d Cir. 2018); U.S. COPYRIGHT OFF., DMCA SECTION 104 REPORT 80 (2001); 4 NIMMER & NIMMER, *supra* note 205, § 8.12[F]; 4 PATRY, *supra* note 202, § 13:16; see also 17 U.S.C. § 106(3) (limiting distribution rights); § 106(1) (prohibiting reproductions).

³¹⁵ See *N.Y. Times Co. v. Tasini*, 533 U.S. 483, 498 (2001) (holding that an online news database violated authors’ distribution rights by selling electronic copies of their articles for download); *A&M Records v. Napster*, 239 F.3d 1004, 1014 (9th Cir. 2001). *Contra* 4 PATRY, *supra* note 202, § 13:11.

³¹⁶ *Capitol Records*, 910 F.3d at 657; U.S. COPYRIGHT OFF., *supra* note 314, at 79.

³¹⁷ U.S. COPYRIGHT OFF., *supra* note 314, at 83–84.

³¹⁸ *Capitol Records*, 910 F.3d at 662, 664; U.S. COPYRIGHT OFF., *supra* note 314, at 82.

³¹⁹ *Capitol Records*, 910 F.3d at 662–64.

³²⁰ See discussion *supra* Section II.A.2.c.

³²¹ *Murk*, *supra* note 93; *Sallaba et al.*, *supra* note 279, at 17.

a specific event has occurred, for example, the release of a new version of the software or an artist's new album, or a specific period of time has lapsed (e.g., one year after the first release of the work). This can protect the primary market when the demand for the work is at its highest. In addition, smart contracts can remunerate the right holder for every subsequent sale of a copy of the work, and this can allow her to benefit from transactions in the secondary market.³²² For example, the book publishing platform Publica pays a share of the resale price of the book to its author.³²³ If market harm can be excluded, or at least lessened as shown, the transfer of works in digital form to another user can be covered by the Fair Use Doctrine.

3. *Open Questions and Challenges*

Although smart contracts seem to offer various advantages for the transfer of rights, there are some challenges and open questions, like (a) technical restrictions, (b) inflexibility and irreversibility of smart contracts, (c) risk of abuse, (d) over-licensing and over-enforcement, (e) formal requirements, (f) conflicts with existing licenses and contractual obligations, (g) new tasks for self-publishing right holders, (h) confidentiality and privacy concerns, (i) differences between jurisdictions, and (j) usability of smart contract platforms.

a. *Technical Restrictions*

The capacity of current blockchains can not only be exceeded by storing information on works and right holders in a copyright register³²⁴ but also by running complex smart contracts for the transfer of rights.³²⁵ Existing blockchains that support the implementation of smart contracts like Ethereum can be slow and expensive.³²⁶ Here too, using a blockchain specifically designed for the transfer of rights through smart contracts can be a solution.

b. *Inflexibility and Irreversibility of Smart Contracts*

Smart contracts are not really smart. To follow the implemented “if-then” rules, smart contracts depend on data sources (“if”) and can only execute what has been previously defined (“when”). As smart contracts cannot contain rules for every possible scenario, unforeseen events can cause

³²² O'DAIR, *supra* note 46, at 50; Savelyev, *supra* note 87, at 10; Sallaba et al., *supra* note 279, at 17.

³²³ See PUBLICA, *supra* note 102.

³²⁴ See discussion *supra* Section II.A.3.a.i.

³²⁵ GERARD, *supra* note 119, at 131; Silver, *supra* note 158, at 14–15.

³²⁶ DE FILIPPI & WRIGHT, *supra* note 66, at 29.

problems.³²⁷ The issue is intensified by the fact that smart contracts encoded on a blockchain are designed to be irreversible, which means that they cannot be altered, and transactions cannot be undone once executed.³²⁸ This feature upholds the principle of *pacta sunt servanda* and eliminates the possibility of a breach of contract but can lead to problems when the agreement needs to be changed.

The positive aspect of this is that smart contracts can force the contracting parties to draft their contractual agreements with foresight and clarity. The transfer of rights in copyright protected works, where the subject is the use of the work against payment, is a comparatively simple matter that can be handled well by smart contracts. This applies particularly to transactions with consumers when it comes to downloading or streaming individual videos or songs. Licensing to exploiters, such as TV or radio stations and Internet platforms, can also be standardized, making it possible to use smart contracts. A dispute resolution mechanism can be built into the smart contract to allow the parties to a transaction to settle disputes in a fast and efficient manner.³²⁹ Subsequently, an additional smart contract can be set up to reverse the first transaction.³³⁰

c. Risk of Abuse

Inflexibility and irreversibility of smart contracts also increase the risk of abuse when smart contracts are manipulated or errors in the program code are taken advantage of.³³¹ This is illustrated by the example of The DAO, a decentralized venture capital fund set up in 2016 which administered itself through a set of smart contracts implemented on the Ethereum blockchain.³³² The DAO managed to raise approximately 12 million Ether (worth around \$150 million at the time).³³³ An unknown attacker used a bug in the underlying smart contract to remove approximately 3.6 million Ether.³³⁴

³²⁷ *Id.* at 200; WERBACH, *supra* note 69, at 126, 163; VOSHMGIR, *supra* note 65, at 124; Werbach & Cornell, *supra* note 65, at 369.

³²⁸ DE FILIPPI & WRIGHT, *supra* note 66, at 29, 43–44, 75, 155, 201–02; Werbach & Cornell, *supra* note 65, at 333, 335, 352; Goldenfein & Leiter, *supra* note 273, at 143; THE CARDOZO BLOCKCHAIN PROJECT, “SMART CONTRACTS” & LEGAL ENFORCEABILITY 5 (Oct. 16, 2018), <https://larc.cardozo.yu.edu/blockchain-project-reports/2/> [<https://perma.cc/YN9N-VCPK>].

³²⁹ DE FILIPPI & WRIGHT, *supra* note 66, at 75; WERBACH, *supra* note 69, at 214; Tresise et al., *supra* note 94, at 14; Werbach & Cornell, *supra* note 65, at 335, 375.

³³⁰ Orcutt, *supra* note 113.

³³¹ DE FILIPPI & WRIGHT, *supra* note 66, at 200; GERARD, *supra* note 119, at 131; Stinchcombe, *supra* note 157; Orcutt, *supra* note 113.

³³² Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act, Exchange Act Release No. 81,207, 117 SEC Docket 5, at 2–3 (July 25, 2017), <https://www.sec.gov/litigation/investreport/34-81207.pdf> [<https://perma.cc/F4LK-FBAW>].

³³³ *Id.*

³³⁴ *Id.* at 9.

After an intensive debate within the community, Ethereum decided upon a “hard fork” and changed the protocol to reverse the transaction.³³⁵

However, the risk of abuse always exists when computer systems are employed. A possible measure may be to establish a reputation system, like the one used by online marketplaces like eBay or Airbnb, to show which parties are trustworthy.³³⁶ One may also think of a government agency³³⁷ or private auditing services³³⁸ that examine and certify smart contracts. For example, the accounting and consulting firm Ernst & Young has established a service that tests and monitors smart contracts on the Ethereum blockchain.³³⁹ In addition, a dispute resolution mechanism can be used to deal with situations in which one of the parties does not agree with the result of the transaction.³⁴⁰

d. Over-Licensing and Over-Enforcement

As smart contracts operate on “if-then” rules, they will encounter issues with vague legal terms.³⁴¹ Similar to the automated enforcement of copyright infringements,³⁴² a smart contract can fail to assess whether an intended use is covered by exceptions or limitations such as fair use. This can lead to over-licensing because the smart contract forces users to obtain a license although none is needed.³⁴³ If alleged infringements are reported to the right holder or are enforced by the smart contract itself (e.g., by blocking access to the work), over-enforcement may also occur.

One solution can be that users enforce their rights to use a work without permission or payment before a court³⁴⁴ or through a dispute resolution mechanism. As an alternative, besides the purchase of a license, a smart contract can also include the option for free-of-charge use if prerequisites such as fair use are fulfilled. Here too, a questionnaire can be provided to assist the user in deciding whether to choose this option, but this can also be misused.³⁴⁵

³³⁵ *Id.*

³³⁶ TAPSCOTT & TAPSCOTT, *supra* note 52, at 234.

³³⁷ DE FILIPPI & WRIGHT, *supra* note 66, at 181–82.

³³⁸ WERBACH, *supra* note 69, at 125, 207; Werbach & Cornell, *supra* note 65, at 375.

³³⁹ *EY Launches Smart Contract Testing Service for Blockchain Clients*, EY (Apr. 16, 2019), https://www.ey.com/en_gl/news/2019/04/ey-launches-smart-contract-testing-service-for-blockchain-clients [<https://perma.cc/8E5Y-3QXA>].

³⁴⁰ *See* discussion *supra* Section II.B.3.b.

³⁴¹ DE FILIPPI & WRIGHT, *supra* note 66, at 77; WERBACH, *supra* note 69, at 125; Werbach & Cornell, *supra* note 65, at 365.

³⁴² *See* discussion *supra* Section II.A.3.i.ii.

³⁴³ Tresise et al., *supra* note 94, at 8; Finck & Moscon, *supra* note 99, at 99.

³⁴⁴ Bodó et al., *supra* note 93, at 323.

³⁴⁵ *See* discussion *supra* Section II.A.3.i.i.

e. Formal Requirements

As a general rule, contracts do not have to fulfill formal requirements, so they can be executed in writing or orally, in ways that are expressed or implied.³⁴⁶ However, Section 204(a) of the Copyright Act requires the transfer of copyright ownership, which includes the assignment of a copyright and the grant of an exclusive license, to be in writing and signed.³⁴⁷ Does the transfer of rights through smart contracts satisfy these requirements?

The rationale behind Section 204(a) of the Copyright Act is “to protect copyright holders from persons mistakenly or fraudulently claiming oral licenses [or transfers]”³⁴⁸ and to “enhance . . . predictability and certainty of ownership.”³⁴⁹ Smart contracts executed on a blockchain ensure that every transaction is recorded and remains unchanged. It is thus possible to trace back every owner of a specific work, which serves the purpose of Section 204(a) of the Copyright Act by creating a transparent chain of title.

Furthermore, the Electronic Signatures in Global and National Commerce Act (E-Sign Act) provides that a “signature [or] contract . . . may not be denied legal effect, validity, or enforceability solely because it is in electronic form[.]”³⁵⁰ and “[a] contract . . . may not be denied legal effect, validity, or enforceability solely because an electronic signature or electronic record was used in its formation.”³⁵¹ An electronic signature is defined as “an electronic sound, symbol, or process, attached to or logically associated with a contract or other record and executed or adopted by a person with the intent to sign the record.”³⁵² The Fourth Circuit held in *Metropolitan Regional Information Systems* that clicking a “yes” checkbox in response to the terms of use provided by an operator of an Internet platform constitutes a valid transfer under Section 204(a) of the Copyright Act.³⁵³ The transfer of rights through a smart contract works in a similar manner. The right holder determines the conditions for the transfer in advance, and a potential user can accept them by mouse click. The E-Sign Act also permits the use of

³⁴⁶ RESTATEMENT (SECOND) OF CONTRACTS § 4 (AM. L. INST. 1981).

³⁴⁷ See discussion *supra* Section I.A.

³⁴⁸ *Metro. Reg'l Info. Sys., Inc. v. Am. Home Realty Network, Inc.*, 722 F.3d 591, 600 (4th Cir. 2013); *SCO Grp. v. Novell, Inc.*, 578 F.3d 1201, 1211 (10th Cir. 2009); *Eden Toys, Inc. v. Florelee Undergarment Co.*, 697 F.2d 27, 36 (2d Cir. 1982).

³⁴⁹ *Metro. Reg'l Info. Sys.*, 722 F.3d at 600; *SCO Grp.*, 578 F.3d at 1211; *Konigsberg Int'l, Inc. v. Rice*, 16 F.3d 355, 357 (9th Cir. 1994).

³⁵⁰ 15 U.S.C. § 7001(a)(1).

³⁵¹ *Id.* § 7001(a)(2).

³⁵² *Id.* § 7006(5).

³⁵³ 722 F.3d at 602.

electronic agents³⁵⁴ under the condition that “the action of any such electronic agent is legally attributable to the person to be bound.”³⁵⁵ Smart contracts on a blockchain are signed with cryptographic private keys that represent individual parties,³⁵⁶ and this makes attribution possible. Therefore, a smart contract can be considered as an electronic agent,³⁵⁷ and a transfer of rights can also be executed automatically without the right holder’s or user’s actual awareness of a specific transaction.

f. Conflicts with Existing Licenses or Contractual Obligations

There may also be a conflict with existing licenses, for example, when a right holder has already granted a “traditional” exclusive license, and the same use is licensed again by a smart contract.³⁵⁸ However, the problem of overlapping licenses has always existed. If the registration of a transfer of rights is necessary for its validity,³⁵⁹ a smart contract can check the register to see if the specific use has already been licensed before granting a license. Cases of doubt can be flagged and evaluated manually.

Existing contractual obligations of right holders can also be a problem. This is especially true for songwriters and artists who often have long-term contractual obligations with record companies. Sometimes, artists assign the rights in their work for the entire term of copyright protection.³⁶⁰ These obligations prevent them from distributing their works on their own. On the other hand, the situation may be different for future works. Upcoming songwriters and artists can use smart contracts for the distribution of their works from the beginning of their careers without entering into contracts with record companies.

g. New Tasks for Self-Publishing Right Holders

Intermediaries in the content industry often fulfill more functions than just content distribution or payment allocation and processing. For example, record companies also have tasks such as artist development, marketing, and enforcement of infringements.³⁶¹ PROs also enforce the rights of their

³⁵⁴ 15 U.S.C. § 7006(3) (“The term ‘electronic agent’ means a computer program or an electronic or other automated means used independently to initiate an action or respond to electronic records or performances in whole or in part without review or action by an individual at the time of the action or response.”).

³⁵⁵ *Id.* § 7001(h).

³⁵⁶ Werbach & Cornell, *supra* note 65, at 371.

³⁵⁷ DE FILIPPI & WRIGHT, *supra* note 66, at 295; THE CARDOZO BLOCKCHAIN PROJECT, *supra* note 328, at 22.

³⁵⁸ Bodó et al., *supra* note 93, at 323.

³⁵⁹ See discussion *supra* Section II.A.3.m.

³⁶⁰ TAPSCOTT & TAPSCOTT, *supra* note 52, at 228.

³⁶¹ Heather McDonalds, *The Record Label’s Role in the Music Industry*, THE BALANCE (Oct. 28, 2019), <https://www.thebalance.com/what-is-a-record-label-2460614> [<https://perma.cc/3GG7-CSAR>].

members.³⁶² If intermediaries are completely replaced by smart contracts, right holders must undertake these tasks themselves.³⁶³ This can leave them with less time for their creative work or cause them to incur additional costs if they hire a third party.

On the other side, the distribution of works through smart contracts enables right holders to learn more about their customers, and this information can be used to promote and sell their works. Right holders can get in touch with consumers and establish a closer relationship, and this can also lead to new possibilities for promotion. Smart contracts can also be used to monitor and control the use of content. This can provide right holders with an effective means to prevent and prosecute infringements of their rights.

Another problem is that most right holders are not always able to set up smart contracts on their own and are therefore dependent on third party services. However, right holders can use pre-existing templates,³⁶⁴ comparable to the licenses offered by the Creative Commons Project.³⁶⁵ Such a recourse to a library of smart contracts can reduce transaction costs.³⁶⁶ Besides, right holders would also be free to tailor their contracts to suit their needs³⁶⁷ (e.g., by using smart contract generators), which allows the creation of smart contracts in a user-friendly manner.³⁶⁸

h. Confidentiality and Privacy Concerns

The transfer of rights through smart contracts can also increase concerns around confidentiality and privacy.³⁶⁹

First, this affects right holders, who oftentimes do not want to reveal detailed information to the public, such as on contractual terms or revenues received for the use of their works. However, with information stored on a blockchain, right holders can decide whether they want to share particular information with the public or not.³⁷⁰

Every piece of content ever consumed and the circumstances (e.g., time, location) specific to them would be registered on the blockchain. This information can be used for the surveillance and profiling of consumers.

³⁶² John Bowe, *The Music-Copyright Enforcers*, N.Y. TIMES MAG. (Aug. 6, 2010), <http://www.nytimes.com/2010/08/08/magazine/08music-t.html> [<https://perma.cc/D4TL-DGRG>].

³⁶³ Takahashi, *supra* note 292.

³⁶⁴ DE FILIPPI & WRIGHT, *supra* note 66, at 82; WERBACH, *supra* note 69, at 206; Savelyev, *supra* note 87, at 12; Werbach & Cornell, *supra* note 65, at 375.

³⁶⁵ See *Share Your Work*, CREATIVE COMMONS, <https://creativecommons.org/share-your-work/> [<https://perma.cc/DP2E-EYAK>].

³⁶⁶ Savelyev, *supra* note 87, at 12.

³⁶⁷ *Id.*

³⁶⁸ DE FILIPPI & WRIGHT, *supra* note 66, at 86; Finck & Moscon, *supra* note 99, at 102–03.

³⁶⁹ See discussion *supra* Section II.A.3.g.

³⁷⁰ O'DAIR, *supra* note 46, at 44.

However, content distribution platforms like Netflix already use their user's interaction data, for example, for the development of new content.³⁷¹ As smart contracts running on a blockchain offer the possibility for parties to act under a pseudonym, a consumer's identity does not have to be revealed, although reidentification is possible.³⁷² Furthermore, consumers can decide whether they want to share their data with right holders and whether they want a fee in return for doing so.³⁷³

i. Differences Between Jurisdictions

Smart contracts can be used to transfer rights across jurisdictions, but there is still the problem that no international copyright exists but rather a bundle of national rights. Even with international treaties like the Berne Convention making most concepts similar, the laws in individual countries still differ significantly, for example, with respect to limitations and exceptions or terms of protection. However, the characteristics of specific jurisdictions can be programmed into smart contracts. Users can choose the countries they intend to use the work in, and the smart contract can apply appropriate rules. Global licensing standards can be designed to fit every country.³⁷⁴ Here too, the Creative Commons licenses³⁷⁵ can serve as an example.³⁷⁶

j. Usability of Smart License Platforms

Streaming platforms like Spotify and Netflix offer a vast amount of content on a subscription basis and are thus convenient for consumers. Would consumers be willing to access content from a variety of different sources?³⁷⁷ If the possibility of transferring rights through smart contracts is implemented into a comprehensive copyright register, it would not only create a one-stop shop for commercial exploiters but also for consumers. Even if there are several smart contract-based content platforms, users can search for works through specially designed meta search engines that allow cross-platform searches and lead users directly to the requested content.

However, the existence of several content distribution platforms can make it too burdensome for users to purchase different cryptocurrencies for

³⁷¹ Jon Markman, *Netflix Harnesses Big Data to Profit from Your Tastes*, FORBES (Feb. 25, 2019), <https://www.forbes.com/sites/jonmarkman/2019/02/25/netflix-harnesses-big-data-to-profit-from-your-tastes/#728f36e866fd> [https://perma.cc/2829-3PCY].

³⁷² See discussion *supra* Section II.A.3.g.

³⁷³ TAPSCOTT & TAPSCOTT, *supra* note 52, at 45.

³⁷⁴ Bodó et al., *supra* note 93, at 330–31.

³⁷⁵ See CREATIVE COMMONS, *supra* note 365.

³⁷⁶ Bodó et al., *supra* note 93, at 330.

³⁷⁷ Tresise et al., *supra* note 94, at 10.

each platform.³⁷⁸ One possible solution is the use of an already existing cryptocurrency like Bitcoin or Ether, or the implementation of a universal cryptocurrency for digital content. However, currently there are not many people engaged in the use of cryptocurrencies, which are often not very user-friendly.³⁷⁹ For example, in order to be able to send and receive payments, an additional software program (a “wallet”) is necessary. Cryptocurrencies are often subject to significant price fluctuations, as well.³⁸⁰ This volatility can not only make it unattractive for right holders to be paid in cryptocurrencies³⁸¹ but can also deter users from using cryptocurrencies as a mode of payment. However, volatility can decrease as cryptocurrencies become more widely used as means of payment.³⁸² Alternatively, a “stablecoin,” a cryptocurrency backed by an underlying asset (especially a traditional fiat currency like the US dollar),³⁸³ can be used.³⁸⁴

CONCLUSION

Blockchain technology can be used to establish a database for copyright protected works and to transfer rights through smart contracts without relying on trusted third parties or authorities. Although a blockchain-based database is slower and more expensive than a traditional database, it provides more security, stability, transparency, and tamper protection.

The implementation of both ideas, a blockchain-based copyright register and the transfer of rights through smart contracts, is already possible under the current legal framework. However, to exploit the potential of a blockchain-based system fully, some legislative changes may be necessary. This includes, for example, exempting bona fide users from liability, providing a rebuttable presumption of ownership for right holders listed in a blockchain-based register, and establishing a mandatory registration system for works and transfers of rights.

The technology is still in its development stages, and there are many open questions and challenges. One of the main issues remains technical restrictions, especially the lack of scalability. Another major issue is “over-enforcement.” Blockchain technology provides not only the means for DRM

³⁷⁸ *Id.*

³⁷⁹ TAPSCOTT & TAPSCOTT, *supra* note 52, at 255.

³⁸⁰ MOUGAYAR, *supra* note 65, at 18, 75; VOSHMGIR, *supra* note 65, at 176–77.

³⁸¹ O’DAIR, *supra* note 46, at 66; WERBACH, *supra* note 69, at 144–45; Finck & Moscon, *supra* note 99, at 97.

³⁸² MOUGAYAR, *supra* note 65, at 18, 75.

³⁸³ VOSHMGIR, *supra* note 65, at 178; Denise Quirk, *What Are Stablecoins? A Guide to Fiat-Pegged Cryptocurrencies*, MEDIUM: THE CAPITAL (Feb. 1, 2019), <https://medium.com/altcoin-magazine/stable-coin-a-guide-to-fiat-pegged-cryptocurrencies-feae3e0b77e8> [<https://perma.cc/T9FH-JGHR>].

³⁸⁴ O’DAIR, *supra* note 46, at 66; Finck & Moscon, *supra* note 99, at 97.

but for smart rights management. Just as blockchain technology eliminated the “double-spend problem” for digital tokens,³⁸⁵ it can also solve the “double-use problem” for digital files.³⁸⁶ On the other hand, the technology can be used to override statutory provisions aimed at balancing the interests of right holders and users, especially the Fair Use Doctrine. Right holders should use these possibilities in their own interest with caution. If users are restricted too much, their willingness to use blockchain-based administration and distribution services will also reduce.

If these problems can be overcome, blockchain technology can fundamentally change the traditional structure of content administration and distribution to the benefit of right holders, exploiters, consumers, and the public. This does not necessarily mean the end for traditional intermediaries like content distribution platforms, PROs, and record companies. However, blockchain technology is most likely to shift the power to right holders and change the role of these intermediaries. Further, new players such as registrars and smart contract editors and auditors will enter the stage. Intermediaries should thus strive to familiarize themselves with the potential of blockchain technology and get involved in the creation of blockchain-based solutions early.

³⁸⁵ The “double-spend problem” refers to the situation that the same single digital token is spent more than once. TAPSCOTT & TAPSCOTT, *supra* note 52, at 30–31.

³⁸⁶ O’Dwyer, *supra* note 294, at 298–99.